



**UNIVERSITY OF IOANNINA
SCHOOL OF HEALTH SCIENCES
FACULTY OF MEDICINE**

SECTOR OF CLINICAL AND BASIC FUNCTIONAL SCIENCES
DEPARTMENT OF PHYSIOLOGY

THE EFFECTS OF GEOPHYSICAL ANOMALIES ON THE BIOSPHERE

LYDIA GIANNOULOPOULOU

PHD THESIS

IOANNINA 2019



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"The approval of the doctoral dissertation by the Department of Medicine of the University of Ioannina does not imply acceptance of the opinions of the author Law 5343/32, article 202, paragraph 2 (legal registration of the medical department)".

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FOREWARD

The hypothesis of this research is that geophysical anomalies can have biological effects and they are related to ancient monument architecture through the hormesis process.

The effect of location and its geophysical properties on biology was known since ancient times. This thesis makes an attempt to define geophysical anomalies and analyze the various parameters that constitute them.

Furthermore, the mechanisms through which these anomalies interact with human biology, flora and fauna are analyzed.

The effect of intensity along with the time exposure is taken into consideration regarding the contradictory effects of the various parameters of geophysical anomalies - *hormesis*.

Finally, the geophysical properties of the location of various ancient monuments around the world is examined, regarding the potential correlation to the phenomenon of hormesis.

The results conclude that there is a combined effect of ancient monuments' location and architecture on human biology and plants, and an attempt to suggest possible function of these monuments is carried out.

Keywords: geophysical anomalies, geopathic stress, temples, hormesis, magnetism, radiation, healing, geophysical anomalies, earth radiation, magnetic field, bioelectromagnetism

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GENERAL PART

Introduction

The science of Geobiology concerns the study how a site and its various characteristics affect the development of the biosphere.

Hippocrates, the father of Medicine, in his work "Concerning Nutrition", mentions that the geographic location and ground typology are equally important health factors as nutrition is.

He states: "The success of proper diagnosis lies in the fact that the physician must know the nature of man as a whole. Human health, in order to be achieved and maintained, needs proper nutrition in proportion to gender, age, work, yearly season, climatic change, in sync with the geographical location of the place where one lives and the prevailing conditions, the typology of the soil, and finally the influences of the sun, moon, and universe in our lives (Hippocrates, 1992).

Δεῖ δὲ, ὡς ἔοικε, τῶν πόνων διαγινώσκειν τὴν δύναμιν καὶ τῶν κατὰ φύσιν καὶ τῶν διὰ βίης γινομένων, καὶ τίνες αὐτῶν ἐς αὐξήσιν παρασκευάζουσι σάρκας καὶ τίνες ἐς ἔλλειψιν, καὶ οὐ μόνον ταῦτα, ἀλλὰ καὶ τὰς ζυμμετρίας τῶν πόνων πρὸς τὸ πλῆθος τῶν σιτίων καὶ τὴν φύσιν τοῦ ἀνθρώπου καὶ τὰς ἡλικίας τῶν σωμάτων, καὶ πρὸς τὰς ὥρας τοῦ ἐνιαυτοῦ καὶ πρὸς τὰς μεταβολὰς τῶν πνευμάτων, καὶ πρὸς τὰς θέσεις τῶν χωρίων ἐν οἷσι διαιτῶνται, πρὸς τε τὴν κατάστασιν τοῦ ἐνιαυτοῦ. Ἄστρον τε ἐπιτολὰς καὶ δύσιας γινώσκειν δεῖ, ὅπως ἐπίσθηται τὰς μεταβολὰς καὶ ὑπερβολὰς φυλάσσειν καὶ σίτων καὶ ποτῶν καὶ πνευμάτων καὶ τοῦ ὅλου κόσμου, ἐξ ὧν περ αἱ νοῦσοι τοῖσιν ἀνθρώποισι φύονται.

It has been observed that the various features of the subsoil, its morphology and its composition may create beneficial or adverse effects on humans, flora and fauna.

Architecture, as currently practiced, does not take into account the possible effect of the ground from the point of view of geophysical anomalies created by various geological causes.

Earth radiation anomalies are related to various phenomena, such as the piezoelectricity, radioactivity, geochemical gases, seismic faults, gravity anomalies, electromagnetic emission, electro-kinetic phenomena of subterranean water flow, spinning electric fields, ion flow, conductivity discontinuities, non-dipolar magnetic fields, geoplasma and geoneutrons. Specific geological materials can also alter and/or augment these phenomena.

This thesis considers physical aspects of these anomalies, and the way they can interact with biology; in particular how they can affect humans, animals and plants.

The human body, via different parameters, can interact with these phenomena, due to the existence of magnetite, iron, silica and water, and also its own electromagnetic fields. Research has shown that long term exposure at geologically stressed locations can have diverse negative effects on people, especially on the brain activity, blood health and the immune system.

Various similar effects have been noted on flora and fauna. There are studies that have shown the significant effects of these anomalies on laboratory animals with clear results focused on malignancies.

Furthermore, there are indications that different types of geophysical anomalies can affect plants, and various parameters are responsible for the result in yield, weight, shape and time growth.

On the other hand, short term exposure can activate healing mechanisms and promote evolution of species under circumstances. The phenomenon of stress induction on organisms can have both constructive and destructive results, and it seems to be linked to dosage and time exposure (*hormesis*). We need to find out if these anomalies have a positive/ negative effect on biology and specify the parameters responsible.

1. Definitions

Geophysical anomalies are the zones within which significant changes take place in the parameters of various fields, such as the natural magnetic, gravitational and electric fields. These are locally distorted due to underlying geological causes and the resulting anomalies are measurable. The existence of some local differentiation of the subsoil can be scientifically analyzed and given an explanation of the results.

The parameters that are involved in a geophysical anomaly are the following:
Soil and air conductivity

- 1) DC Magnetic fields
- 2) Rotating electromagnetic fields
- 3) Air ion intensity
- 4) Soil temperature
- 5) Ground and air humidity
- 6) Seismic activity
- 7) Infra- and Ultrasounds
- 8) Radioactivity
- 9) Existence of groundwater
- 10) Existence of faults
- 11) Gravity intensity
- 12) Geoneutrons
- 13) Scalar waves
- 14) Existence of quartz or magnetite in the subsoil

1.1 General categories

Geoelectric phenomena

These phenomena are associated with the generation of electricity in the ground, therefore creating local field anomalies.

The earth's electromagnetic field is created by the interaction between the magnetic field originating from the circulating electric charges within the melted iron-nickel core of the planet and the charged ionosphere gases.

The solar motion and winds, as well as the lunar motion create diurnal and annual fluctuations in the values of the geomagnetic field.

The changes in the intensity of the field can generate an electrical current in any conductive substance present, through a phenomenon called induction. Therefore, the daily fluctuations in the intensity of the geomagnetic field can produce electric currents running through the ground near the surface, also called telluric currents.

These currents also generate their own magnetic field, which can intensify or reduce the existing geomagnetic field according to its polarization. The resulting change in the geomagnetic field is proportional to the change in the telluric current's intensity. (Hessler & Wescott, 1959).

Geological phenomena

The geological structure of the soil plays an important role in the generation of geophysical anomalies.

Different types of subsoil have different properties, one of them being the electrical conductivity. A conductivity discontinuity occurs in locations where two different types of subsoil meet, and that phenomenon can also weaken or potentiate the diurnal magnetic fluctuations, sometimes over some hundred fold (Rikitake & Honkura, 1986).

The generated magnetic field change produces additional electrical charges; in these locations the ground electric currents are much more intense than the adjacent area. The oppositely charged air molecules are then attracted by these telluric currents.

Rocks with high electrical conductivity include basalt, volcanic lava, limestone, granite, and the ones with high content of clay, magnetite, iron, magnesium; these are proficient mediums for channeling electric currents, therefore intensifying the local geophysical anomalies.

Particularly some types of granite are radioactive and can emit radon and neutron radiation. Ion generation is a result of radon and radiation interaction, therefore creating further distortions in the local field.

Copper is the second most highly conductive metal after pure gold; therefore copper-rich rocks exhibit high conductivity to telluric currents. Also the quartz content of subsoils is equally important for generating field anomalies, as it can store electrical charges like no other mineral (piezo-electric phenomenon).

Another factor that determines the ground's electrical conductivity is its water content. Therefore areas rich in underground water bodies can exhibit more intense field anomalies.

Hydro-geophysical phenomena

Water, as seen, due to its high electrical conductivity, plays an important role in the creation of local geophysical anomalies.

Apart from subsoil water content, the existence of underground streams can intensify these distortions especially in grounds with limestone presence. Limestone has a strong interaction with the water flow, as its geological structure is ideal for electricity production through hydro-geophysical means.

In this case, in a process called adsorption, electrons are removed from the water's molecules as it passes through the porosity of the rock and are attached to it (Mizutani, Ishido, Yokokura, & Ohnishi, 1976). Therefore, water molecules are positively charged and have left the chalk negatively charged. The charge is intensified as water dissolves in chalk, where calcium carbonate molecules are broken down (Burke & Halberg, 2005).

This results in chalk having a significant negative charge and the flowing water is positively charged. As opposites are attracted, an electric current is generated in the ground. Therefore underground water flow can generate a magnetic field, whose fluctuation is dependent on the porosity of the rock; in the case of chalk the fluctuations are high as it is very porous (Martin III, Haupt, & J., 1982).

Light phenomena

Various luminous phenomena have been recorded especially above seismic faults, but also above intense geophysical anomalies involving a strong metallic content without seismic record. These usually manifest with a spherical shape, indicating that they are generated by a flowing electric current. The phenomenon is explained by Dr. Levensgood: the photons of the camera's flash are absorbed by the already electrified air molecules, and due to the extra energy they are driven to a higher energy state. According to geologist Dr. Bruce Cornet, these were concentrated on a line of strong negative magnetic anomaly (Burke & Halberg, 2005).

During pre-seismic periods the stress of pressured rocks results in electromagnetic signals emission and as such in light phenomena. (Kerr, 1995). Laboratory testing that similar luminous spheres can be generated by rock pressure, regardless of their quartz content (Brady & Rowell, 1986).

According to various tests, 5kV /inch DC electric fields are sufficient to generate a glowing sphere of ionized air (Powell & Finkelstein, 1970).

Light phenomena can occur as a result of activation of geophysical fields in zones of faults and rock heterogeneity by intensive pulse ionospheric events, and especially low frequency EMF (Yasui, 1973) (Dmitriev A. N., 1998).

These phenomena can be triggered by ionospheric phenomena, generation of electrical charges on surfaces of splitting rocks, solar and seismic activity, sharp changes in hydrostatic pressure, air temperature and pressure, and geomagnetic field (St-Laurent, Derr, & Freund, 2006)

Combination of phenomena

The most intense effects of the above phenomena occurs on the boundary of disturbed zones, and not at its center or peak. For example, in the boundary of conductivity discontinuities, the vertical component of the geomagnetic field exhibits extreme fluctuations.

In locations where a combination of magnetic, seismic and gravitational discontinuities occurs, the aforementioned phenomena are highly strengthened.

1.2 Specific categories

Piezoelectric or piezomagnetic effect

The piezoelectric/piezomagnetic effect concerns the electrical or magnetic charge accumulated in certain solid materials (such as crystals with defects, certain ceramics and biological matter such as bones, DNA and various proteins) as a reaction when mechanical stress is applied. (Freund M. T., 2003) (Adler, Le Mouel, & Zlotnicki, 1999)

It was discovered in 1824 by David Brewster, and was experimentally generated by Pierre and Jacques Curie in 1880. (Hacker, Pauser, & Augner, 2011)

In nature, piezoelectric discharges can be generated in ground locations with high quartz content but it has also been known from tourmaline, topaz, cane sugar and Rochelle salt. The upper earth's crust has a mean content of 12% in quartz. Inside an ideal quartz crystal, the electrical charge of the elements silicon and oxygen cancel each other out. (Hacker, Pauser, & Augner, 2011)

When mechanical pressure is applied to a crystal lattice cell, a tiny electrical voltage is generated. On the other hand, when applying voltage to quartz it can result in oscillation.

Therefore it is clear that intense geophysical anomalies can be generated in locations with high quartz content and rock pressure, such as tectonic fault zones.

Radioactivity

During radioactive decay, radioactivity occurs when an unstable atomic nucleus loses energy by emitting radiation in alpha, beta or gamma rays, neutrinos. Materials containing such unstable nuclei are radioactive. Specific nuclear states can also decay through neutron or proton emission (UNSCEAR, 1993).

Minerals with thorium, uranium content are slightly radioactive; the main resulting emission is gamma ray radiation through the rock.

Uranium is a rare element, present in small amounts in rocks such as granite. Therefore ground with high granite content is usually found to have higher levels of radioactivity.

Ground radioactivity is a low source of gamma radiation, a parameter found in significant fluctuations within geophysical anomaly zones.

It is common that in areas with local field distortion (gravitational, magnetic and electric), higher than normal radioactivity levels can occur.

Geochemical gas emission

The release of geochemical gases, such as radon, is generated by various geological conditions within a highly seismogenic area (UNSCEAR, 1993).

Concentration of elements, mineralization, and formation of ore deposits results from fluid degassing through fault zones.

Natural abnormal concentrations of trace elements such as F, Si, Co, Zn, As, Se, Sr, I, U and Rn, as well as volcanic gases can be found in areas with local field distortion (Volfson, Wolfgang, & Pechenkin, 2010).

Radon gas emission is caused by salts of uranium and other radioactive elements. (Riggs, 1999). There is also a significant correlation of increased radon release through active faults in a pre-earthquake period ((Osika, 1981), (King, King, Evans, & Zhang, 1996) (King, Zhang, & Zhang, 2006)).

It is common that strong geophysical anomalies are found in tectonic areas, and as such the presence of geochemical gases can be a significant indicator of local field distortions.

Ion flow

Ions are positively or negatively charged atoms or molecules. The phenomenon concerns an upwards flow of positive or negative ions emanating from geological formations.

They can be found in the air, especially above geophysical anomalies, through a process called induction: any medium moving through a zone of fluctuating magnetic field acquires electric charge or current.

Therefore, above geophysical anomalies, where the local magnetic field exhibits high fluctuations, intensely electrically charged air can be detected.

The most common electrically charged molecules are air ions. The most prevalent are the positively charged carbon dioxide molecules, which sink as they are heavier, and the lighter, negatively charged oxygen molecules, which rise higher than the carbon dioxide (Burke & Halberg, 2005).

Strong magnetic, electrical or electromagnetic anomaly

This type of anomaly concerns the strong local difference in the magnetic, electrical or electromagnetic properties of the underlying geological structures, which differ in magnetic susceptibility and electric conductivity, respectively.

The earth's magnetic field has a mean value of 45.000 nT. Strong anomalies in the field can be as much as 100 nT up to more than 1000 nT. These are created in a border zone of two areas of differing magnetic susceptibility geomagnetic field intensity.

Lithospheric magnetic anomalies are associated with magnetized rocks, such as ore concentrations, magmatic and ore bodies (Gunn & Dentith, 1997). They are also observed within increased crust permeability zones (Simonenko, 1968) where intense rock

fracturing forms induces the conditions for igneous intrusions and fluid penetration. The presence of magnetite within the rocks matrix can also induce these kind of anomalies. Intensity fluctuations of the local magnetic field within these anomalies are enhanced during geomagnetic storms (Kutinov & Chistova, 2004)

Intensive positive magnetic anomalies are usually associated with basic - ultrabasic intrusions as well as large magnetite and pirrotine deposits. Weak positive magnetic anomalies are related to with granite presence and metamorphic rocks; weak negative anomalies are related to non-magnetic sedimentary rocks. (Zagainov, 1974).

Electrical anomalies also occur in the areas where strong telluric currents flow, according to the ground's specific geology, water and mineral content.

The two types of aforementioned anomalies can result in a combined electromagnetic anomaly.

Strong gravity anomaly

This phenomenon concerns the sudden local variation of the gravitational field intensity, and is related to the change in density of underlying geological structures in accordance to Newton's laws.

Rich underground oil deposits can cause alterations in the gravity field. Underground cavities as well as thickened crust weaken the gravity field; the presence of metallic ores strengthens it. Salt domes usually manifest as lower gravity areas, as salt has lower density than the adjacent rocks (Burke & Halberg, 2005).

Tectonic faults also are partially reflected by gravity anomalies, indicating heterogeneities in the composition of the crystalline basement (Heiskanen & Moritz, 1967).

However, the gravity anomalies may interpreted by a particular little known law of Einstein: when the time-space gravity tensor, which is related within the validity of his equation with geological stress, changes due to the latter's change due to the forces developed by earthquakes, then time and space are distorted strictly locally.

Areas with local distortion of electromagnetic fields can sometimes exhibit local gravitational anomalies.

Tectonic faults

A fault is a fracture or discontinuity in a volume of rock, across which there has been significant displacement as a result of rock-mass movement. Large faults result from the action of tectonic forces

There are three main characteristics within fault zones : a) positive magnetic anomalies and fluctuations of the geomagnetic field, b) air ion fluctuations connected with tectonic movements and c) fluid migration and emanation of gases (Rudnik & Melnikov, 2010).

Fault zones constitute a powerful conductivity discontinuity, with all the resulting processes that follow.

The rock fracturing facilitates in these zones creates mineralized groundwater flow, that results in increase of chemical element contents and radioactive isotopes in soil (Kasimov, Kovin, Proskuryakov, & Shmelkova, 1978) (Trifonov & Karakhanian, 2004) (King, Zhang, & Zhang, 2006) (Boyarskikh, 2012)).

At the boundaries of the tectonic plates, ULF radiation is more intense in comparison to the one detected above surrounding area, as shown in an experiment measuring the energy of the electric field component E_z of the ULF radiation in seismic zones (Athanasίου, Machairidis, David, & Anagnostopoulos, 2013).

Non-dipolar magnetic field

The non-dipole field is a part of the geomagnetic field after removing the major geocentric dipole contribution. Two source regions contribute to the non-dipolar magnetic field: the earth's lithosphere and the dynamo in earth's core. (Constable, 2005)

Research shows that the mean value of these fields increases with time (Loay, 2012).

Most of the energy of the geomagnetic field is absorbed by the main North /South dipole, but a part penetrates the ground surface. Inside the earth, non-dipole magnetism has the a spiral or circular flowing vortex. (Lonetree & Miller, 2013).

The presence of these non-dipolar fields seems to be higher in areas of strong magnetic anomalies.

Ground electric potential anomalies

This phenomenon is related to the creation of electrical potential in contact of geological structures with different electrical properties.

Conductivity discontinuities generated ground electric currents; they are extremely low frequency electric currents that travel near the surface of the Earth (Burke & Halberg, 2005).

They continuously flow towards the equator during daytime, and towards the poles during the night.

The electric potential of the ground's surface can be measured, enabling the calculation of the telluric currents' magnitudes and directions, as well as the ground's conductance.

Therefore in areas of geophysical distortions, greater electric potential gradients can be observed.

Geoneutrons

This phenomenon is related to anomalies in the flow of neutrons emanating from geological structures.

Neutron radiation is a form of ionizing radiation which occurs as the emission of free neutrons. T nuclear fission or fusion can cause the release of free neutrons, which then react with nuclei of other atoms to form new isotopes.

Slow travelling neutrons are an integral part of natural radiation.

Free neutrons in the biosphere are produced by: 1. natural processes in the earth's core (geoneutrons), 2. secondary neutrons as a result of cosmic rays interacting with the earth's atmosphere (Langer D. , 2008).

Both are located in shallow areas of the earth's crust, where geophysical anomalies are prevalent (Langer H. , 1997).

2. Bioelectromagnetism and Heliobiology

2.1 Bioelectromagnetism

General

Bioelectromagnetism is a science that researches the electric, electromagnetic, and magnetic phenomena which occur in biological tissues. These include: the reaction of excitable tissue, the electric currents and potentials, the magnetic field of the body, the response cells to electromagnetic stimulation as well as the tissue's electric and magnetic properties (Malmivuo & Plonsey, 1995).

Natural electromagnetic energy constitutes a common parameter in all organisms on the planet. According to Becker, nature favors organisms that are capable to receive information from the environment cosmos through electromagnetic signals and to adjust consequently their inner processes (Becker & Marino, 2010). He also mentions that “electromagnetic energy was used by the body to integrate, interrelate, harmonize, and execute diverse physiological processes”.

Importance of bioelectromagnetism

The various bioelectric processes of the cell membrane constitute very important functions in biology. The cell membrane potential can be used in various ways. The membrane potential is changed rapidly when the channels for sodium ions are opened. Intercellular communication of the nervous system occurs through rapidly moving electric signals.

A change in membrane potential is responsible for life: when the sperm enters the egg at, ion channels are turned on; access of other sperm is prevented by the resultant membrane potential.

The transmission of information and control signals occurs due to the electric nature of biological tissues; therefore it is vital for life. Examples include vision, audition- signals sent from the periphery to the brain; movement - signals sent from the brain to muscles; homeostasis- electric signals mediating heart rate and contraction.

The healing effects of bioelectromagnetism were known in medicine throughout its history; the first written mention appeared on ancient 4000 B.C Egyptian hieroglyph describing the electric sheatfish.

Healing and health are dependent on cell electricity: they run at -20 to -25 mV (Tennant, 2013). The growth of new cells for healing can occur at -50 mV; in chronic sickness and pain, cell voltage drops below -20 mV. Voltage also controls oxygen levels, which also drop in case of voltage drop; as a result ATP production is reduced significantly. Furthermore, various parasites, viruses and fungi get activated after oxygen level reduction, which further induces chronic disease.

Electromagnetic fields are also responsible for transfer information from the environment to the organism. Informational interactions have a significant role in biological processes; these include the transmitting, coding, and storing information. The amount of information and not the amount of energy introduced into the system is the one responsible for biological effects due to these interactions. It is the informational signal that redistributes the energy in the system, and regulates the various processes.

Concerning geophysical factors, electromagnetic forces constitute the most important medium for transferring information. With the appropriate frequency range and field type employed, they transmit information where living organisms are located, regardless of meteorological conditions and the time of the day, in rivers, seas, within the earth's crust, and finally in the organisms' tissues.

Low-strength electromagnetic fields within the physiological frequency range can induce changes in the electroencephalogram, the electrocardiogram, biological rhythms, calcium metabolism; within non-physiological frequencies and intensities electromagnetic fields stimulates adaptive homeostatic behavior (Becker & Marino, 2010).

According to (Presman, 1970) natural electromagnetic fields had an important role in the organisms' evolution, specifically the extremely low frequency spectrum which is similar to biologic signals frequencies.

Periodic changes in natural electromagnetic environment can affect vital function such as the rhythm of the important physiologic processes, space orientation of animals. Furthermore, in pathologic situations, changes in the electromagnetic environment induced by solar flares, lightning discharges and others, can induce disruption of physiologic processes.

(Larter & Ortoleva, 1981) discuss that natural electric fields function as patterning system in early development; they also present their relation to information storage, conservation and breaking of symmetry, as well as mechanisms applied to an electrically controlled self-organizing system.

According to Presman, isolated organs and cells are less sensitive to electromagnetic fields, solutions of macromolecules are even less sensitive, whereas entire organisms are most sensitive (Presman, 1970).

Positive and negative magnetic fields

Scientists have discovered that positive and negative parts of dipolar magnetic fields can have various effects on the human body (Trivieri, 2002).

The physiological effects of positive magnetic fields include:

- Acid production
- Oxygen deficiency
- Cellular edema
- Exacerbation of existing symptoms
- Infection acceleration
- Biological disorganization
- Pain and inflammation increase
- Wakefulness and action
- Catabolic hormone production
- Toxic end-products of metabolism
- Free radical production
- Acceleration of brain electrical activity

They have also been associated with cancer, depression, chromosomal abnormalities, inflammation and learning difficulties.

The physiological effects of negative parts of magnetic fields include:

- PH normalization
- Body oxygenation
- Cellular edema resolution
- Symptoms reduction
- Infection inhibition
- Biological normalization
- pain and inflammation reduction
- Rest, relaxation, and sleep
- Anabolic hormone production
- Metabolically produced toxins clearing
- Free radical elimination
- Slows down electrical activity of the brain

They have also been used effectively in the treatment of cancer, rheumatoid arthritis, headaches and migraines, insomnia and other sleep disorders, circulatory problems, fractures and pain.

2.2 Heliobiology

General

Heliobiology is the study of the sun's effect on biology, and was founded by biophysicist Alexander Chizhevsky, and includes the correlation of solar activity with epidemics, mortality from various diseases, the nervous system activity, psychic disturbances and the development of microorganisms (Palmer, 2016).

The solar activity has a direct effect on the geomagnetic field, along with other parameters. The geomagnetic field deflects the solar wind. When there is intense solar activity, the magnetic field lines shrink which makes them stronger (Burke & Halberg, 2005).

Research indicates that there is a variety of physiological, psychological, and behavioral changes related to geomagnetic and solar disturbances. Increased rates of violent crimes, revolutions and terrorist attacks have been correlated with the solar and geomagnetic cycles (Alabdulgader, et al., 2018)

Increased solar activity has been also been correlated with innovation and creativity in architecture, arts, sciences, and positive social change, as well as with the fluctuations of financial markets (Alabdulgader, et al., 2018).

The basic solar cycle has been observed to be 10.5 to 11 years, which is modulated by ultraviolet and radio flux emission. It has been seen in research that the solar and geomagnetic fields can have a significant effect on human health, especially on the nervous and cardiovascular systems (Babayev et al, 2012).

The biological processes that seem to be mostly affected by sharp variations in solar activity and geomagnetic distortions are blood pressure, melatonin-serotonin balance, respiratory, reproductive, immune, and system neurological processes. Geomagnetic disturbances have been also correlated with increase in depression, mental disorders, psychiatric admission, suicide attempts, homicides and traffic accidents (Alabdulgader, et al., 2018).

Chernouss et al (2001) concluded that in the northern region people are more sensitive to geomagnetic field changes. Generally, people living in higher latitudes seem to be affected greatly by geomagnetic disturbances.

Intense geomagnetic activity has a strong correlation with cardiovascular health: during times of high solar activity severe changes were observed in the blood flow (Gurfinkel et al, 1995) as well as excess deaths due to myocardial infarction (Cornelissen, et al., 2002).

Unusually low geomagnetic activity can also have adverse health effects: increase of sudden infant death syndrome was correlated during times of ultra low geomagnetic field values (O'Connor & Persinger, 1997).

Research also exhibits a negative correlation between HRV and geomagnetic activity (Stoupel, et al., 2004, Watanabe et al, 2000, Cornelissen, et al., 2002). Enhanced geomagnetic activity affects the internal rhythms synchronization, via the Schumann resonance signals (Palmer, 2016).

Melatonin, a hormone critical for immune function, retinal physiology, antioxidation is an important parameter regarding the effects of environmental conditions on health (Reiter, 2003). According to Weydahl et al (2001) geomagnetic activity above 80 nT reduced salivary melatonin; according to the authors showed that the excretion of melatonin metabolite (6-OHMS) had a reduction of up to 38% lower on days with higher geomagnetic activity.

Schumann resonance

Schumann Resonance is extremely low frequency magnetic field micro-pulses, from about 7.83 Hz to 25 Hz, mostly concentrated at about 10 Hz, generated within the electrodynamic cavity between the earth's surface and the ionosphere. Magnetic storms are induced by the dispersing of charged particles in the earth's field by solar flares. These particles form the Van Allen belt, which protect from high energy cosmic ray absorption (Becker & Selden, 1998).

Schumann resonance radio signals can be a mechanism linking geomagnetic activity and health. The human brain alpha-rhythm has the same frequency as the one with lowest energy in the Earth-Ionosphere cavity. According to (Hainsworth, 1983) the human central nervous system has biorhythm synchronization through the use of Schumann resonance frequencies.

In a condition where these frequencies are distorted during geomagnetic activity, the mechanism is affected and can induce stress leading to health problems such as heart disease and mental illness.

It seems that the Schumann signals stable during time, as its frequencies are determined by the earth-ionosphere cavity. The Earth's climate has changed considerably in the last 200,000 years. A positive correlation between the tropical surface-air-temperature anomaly and the amplitude of the fundamental Schumann resonance was found by (Williams, 1992).

According to (Cherry, 2002), the amount of melatonin produced by the pineal gland is modulated by the absorption of Schumann Resonance signals by the human brain.

Human magnetic sensitivity may involve the retina. (Olcese, Reuss, & Vollrath, 1985) found that only rats with intact retinas were sensitive to magnetic fields and suggested that this retinal magneto-sensitivity could serve to modulate pineal gland function and therefore melatonin levels. However, (Warman, Dijk, Warman,, Arendt, & Skene, 2003) state that the retinal photoreceptors responsible for this sensitivity are yet to be established. The authors go on to argue that although the human circadian system is particularly sensitive to the phase advancing effects of short wavelength light and that spectral sensitivity of light induced melatonin suppression, the visual photonic system is not primarily involved.

Scalar or longitudinal waves

Scalar waves are non-hertzian longitudinal electric or magnetic waves (Meyl K. , 2003).

In physics, a quantity described as "scalar" only contains information about its magnitude. In contrast, a "vector" quantity contains information both about its magnitude and about its direction.

Some examples of scalar waves include: acoustic waves, waves in water, mechanical waves of compression or rarefaction; plasma waves and biophotons; the longitudinal waves used by Tesla - they were potential vortex wave that can identify as neutrino radiation (Meyl K. , 2003)

Electromagnetic waves are transverse hertzian waves with vector quantities derived as solutions to a set of vector wave equations; examples include cosmic radiation, x-rays, microwaves, radio waves.

Earth radiation, according to (Meyl K. , 2003) has also standing wave nature, which can be interpreted as slowed down neutrino radiation. Areas with geophysical anomalies are considered be points of interference of such longitudinal waves.

3. Interaction with biology

3.1 Humans

3.1.1 Mechanisms

According to researchers, geophysical anomalies of the subsoil can induce disease (Derek, 1994), which has effects on the body's homeostasis and can be described as a geopathogenic region (Kharat, 2000).

Ecological processes are modulated by a variety of geo-environmental parameters: landscape formation, soil properties and local climate; these can determine biological diversity and territory originality. Geochemical and geophysical properties of a location define a biotope (Trofimov, 2000). Humans can also be affected by geological and geophysical anomalies such as faults tectonic activity, geomagnetic anomalies, conductivity discontinuities, geochemical gasses (Shitov A. , 2010).

The effect of natural electromagnetic waves and various types of geoanomalies on human biology is obvious, due to:

- The presence of magnetite and magnetic crystals in the brain, the area of the ethmoid and ears ((Kirshivink, Kobayashi-Kirshivink, & Woodford, 1992), (Marinaga, 1992), (Ruttan, Persinger, & Koren, 1990))
- The presence of iron in the blood
- The body's composition of 70% water, which has high electrical conductivity and creates magnetic crystals (Fesenko & Gluvstein, 1995)
- The property of the tissues to function as semiconductors without special resistance, known as non-thermal effect (Oschman, 2000)
- The production of electromagnetic fields from the heart and the brain, the electrical transmission of signals through the nerves. The strongest electromagnetic field is that of the heart, 100 times larger than that of the brain (McCraty R. , 2003).

According to Becker (Becker & Marino, Electromagnetism life, 2010), the human body uses electromagnetic energy for the integration, interrelation, harmonization, and execution of various biological processes.

Humans and all living organisms are a network of reception, production and emission of electromagnetic fields. The electrical processes of various biological systems, the cells' iron content, the proteins' function as semiconductors of the cell membrane as well as the intra and extracellular water as liquid crystals constitute biology as receiver, producer, and transmitter of electromagnetic information. It is known that cell body microtubules

are conductors of electromagnetic waves ($f = 10^{13}$ Hz and their harmonics), which coordinate cellular functions (Rahnama, Tuszynski, & Bókkon, 2011), whereas centrosomes contain silicon oxides which emit and receive electromagnetic signs.

3.1.2 General

Electromagnetic fields as information

Natural electromagnetic fields are a common environmental parameter for all organisms. Adaptability is a quality that nature favors; organisms that are capable of accepting electromagnetic information about the earth, atmosphere and the cosmos and adjusting their biological processes and reaction, can have accordingly better health and higher survival chance.

Natural electromagnetic energy is critical as it is the means of information transfer to organisms about its environment, therefore supporting behavioral changes. This is also confirmed by studies on biological cycles and animal navigation (Becker & Marino, *Electromagnetism life*, 2010).

Low strength electromagnetic fields within the physiological frequency range can induce changes in brain waves, heart rate, biological rhythms, calcium metabolism as well as human behavior. Electromagnetic fields outside the physiological frequency and intensity range can generate adaptive homeostatic reactions in humans. (Becker & Marino, 2010)

Bioinformatics has demonstrated that communication within the human body is both electrical and chemical. Information is contained within nerve electrical stimuli as well as biochemical compounds-signals. The cells contain various information receptors, functional structures and biochemical pathways for information translation and transfer from the nucleus for execution (Oschman, 2000).

There is also data supporting that the earth's magnetic fields are carriers of biologically information connecting living systems. Therefore our thoughts, emotions and intentions expressing through the body's electromagnetic fields, matter and that coherent, cooperative intent can impact global events and the quality of life on Earth (McCarty, 2014).

Persinger (Persinger M. , 1987) states: "temporal and regional variations in psychological processes have been associated with three geological factors: geochemical features, geomagnetic changes, and tectonic stress. In the geochemical field, the presence of copper, aluminum, zinc, and lithium can affect the incidence of thinking disorders, such as schizophrenia and senile dementia. These common elements are found in many soils and groundwater".

The human body's resonance

Human beings have both a mechanical as well as an energetic nature. There are various sources of energetic stimuli which interact with the essential ones for the function of the cell, the organ and the organism.

The human body has the capacity to resonate with a variety of fields, including infrasounds, low and high frequency natural waves, gamma rays and others (Persinger, 2014)

Concerning the human body, there are fundamental electromagnetic frequencies it produces, which characterize its structure and function (Andreev, Belyi, & Sit'ko, 1984). Resonance between tissue and cell coordination by very high frequency and low intensity radio waves was discovered by Russian and Ukrainian radio physicists, who recorded resonant frequencies of humans, animals as well as biological and chemical substances (Kositsky, Nizhelska, & Ponezha, 2001). Furthermore, the transmission and recording of very low intensity photons from the human body demonstrated different frequency signatures for each organ (Cohen & Popp, 2003).

The existence of a DC perineural field, which produces DC magnetic fields the brain has also been measured by a SQUID magnetometer; constant in the order of one billionth of the intensity of the geomagnetic field, which is in average about 50.000 nT (Oschman, Energy Medicine, the scientific basis., 2000).

Rocard, demonstrated that most individuals are sensitive to gradients between 200 -300 nT/m (Rocard, 1964). The limit for interacting with subsurface activity for most sensitive people is a gradient of 10 nT/m.

Harvalik (Harvalik, 1978) demonstrated that the most sensitive regions of the body are in the area of the renal and adrenal glands, as well as within the brain, especially the pineal gland. Sensitivity is reduced in kidney dysfunction episodes. Furthermore, changes in the static magnetic fields' direction can lead to melatonin synthesis reduction in the pineal gland.

The two most fundamental magnetic fields on the biosphere are: the one within living organisms, generated by ion transfer to the nerves, as well as by the heart and brain, and the one generated by the earth's liquid core and rotation. The interaction between the two fields is evident; according to Becker (Becker & Selden, The Body Electric, 1998) the geomagnetic field is responsible for maintaining the system of controlling bodily functions within normal range.

Cell growth and repair, based on cell division regulation, is synchronized with the Earth's magnetic field, according to Becker (Becker & Selden, 1998). This is evident as the process of cell division overall occurs in several longer stages, which overall last one day, including breaking down, alignment and equal distribution of cell chromosomes as well as cellular DNA duplication of all.

The geomagnetic field can induce changes that exceed the capability of human adaptation, the regulatory activities can be greatly affected, such as the central nervous system, hormonal, neurotransmitter, cellular, electrophysiological, membrane-related and others (Stoupe E. , 1999).

The magnetic isotope effect ((Buchachenko, 2009) (Buchachenko, Kouznetsov, & Berdinsky, 2006)) may also contribute to biological effects of magnetobiological interactions; 30 minutes exposure at 1 μ T frequency or time varying magnetic fields can induce discernible changes in molecular signaling pathways.

3.1.3 Correlation experiments

Various experiments have been done that demonstrate apparent correlations between a variety of geophysical anomalies and different diseases.

Shitov (Shitov A. , 2010) found strong correlation between various diseases and geophysical anomalies (Fig. 1), including intrusions, magnetic anomalies and faults.

The highest and most stable relationships were found between prevalence rates of blood diseases, diseases of nervous, respiratory and genitourinary systems, total morbidity and gamma radiation anomalies (Shitov A. , 2010).

In the research done by Rudnik (Rudnik & Melnikov, 2010) it was clearly shown that cancer incidence rate was greatly augmented in the intersection of fault lines (Fig.2).

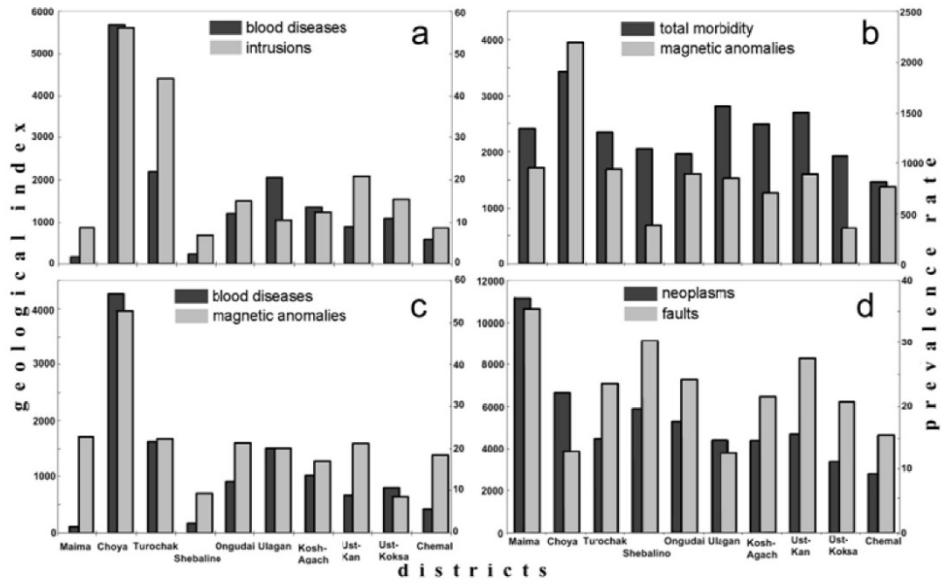


Figure 1. Relationships between prevalence rates in the adult population and geological indices in 2002: (a) blood diseases versus intrusions; (b) total morbidity versus magnetic anomalies; (c) blood diseases versus magnetic anomalies; (d) neoplasms versus faults. (Shitov A. , 2010)

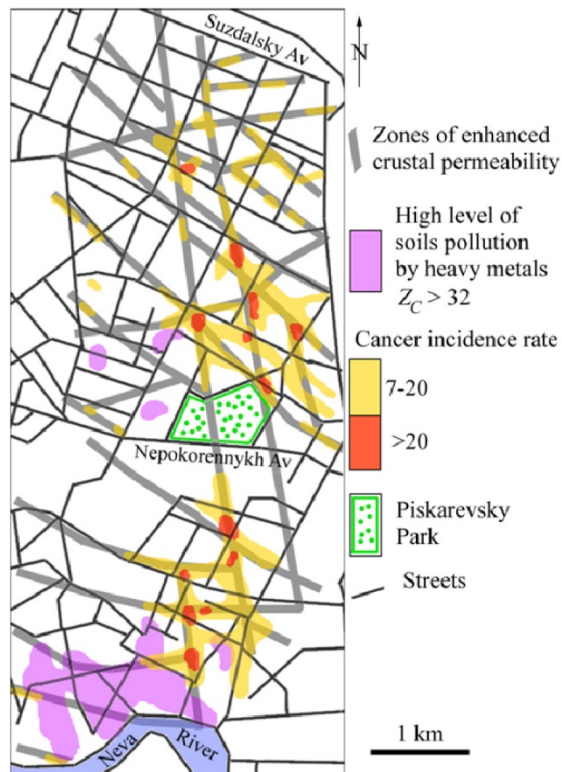


Figure 2. Portion of the Kalininsky District of Saint Petersburg: cancer incidence rate (per 1,000 population) in the years 1991–1992, ZEPC, and areas marked by a high level of soil pollution with heavy metals (Rudnik & Melnikov, 2010)

Dubrov (Dubrov A. P., 2008) studied areas with geophysical anomalies and found that there was much higher morbidity regarding various diseases in comparison with areas having homogeneous geophysical parameters (Fig.3).

| Disease | Geophysical anomaly | Undisturbed zone |
|--------------|---------------------|------------------|
| Total | 1205+-25 | 792+-5 |
| Infections | 45.4+-0.3 | 17.7+-1.9 |
| Oncology | 7.96+-0.15 | 5.58+-0.04 |
| Mental | 4.94+-0.08 | 1.14+-0.23 |
| Hypertension | 4.48+-0.17 | 0.83+-0.02 |

Figure 3: Incidence of various diseases in people living on a geophysical anomaly and in an undisturbed zone (Dubrov A. P., 2008)

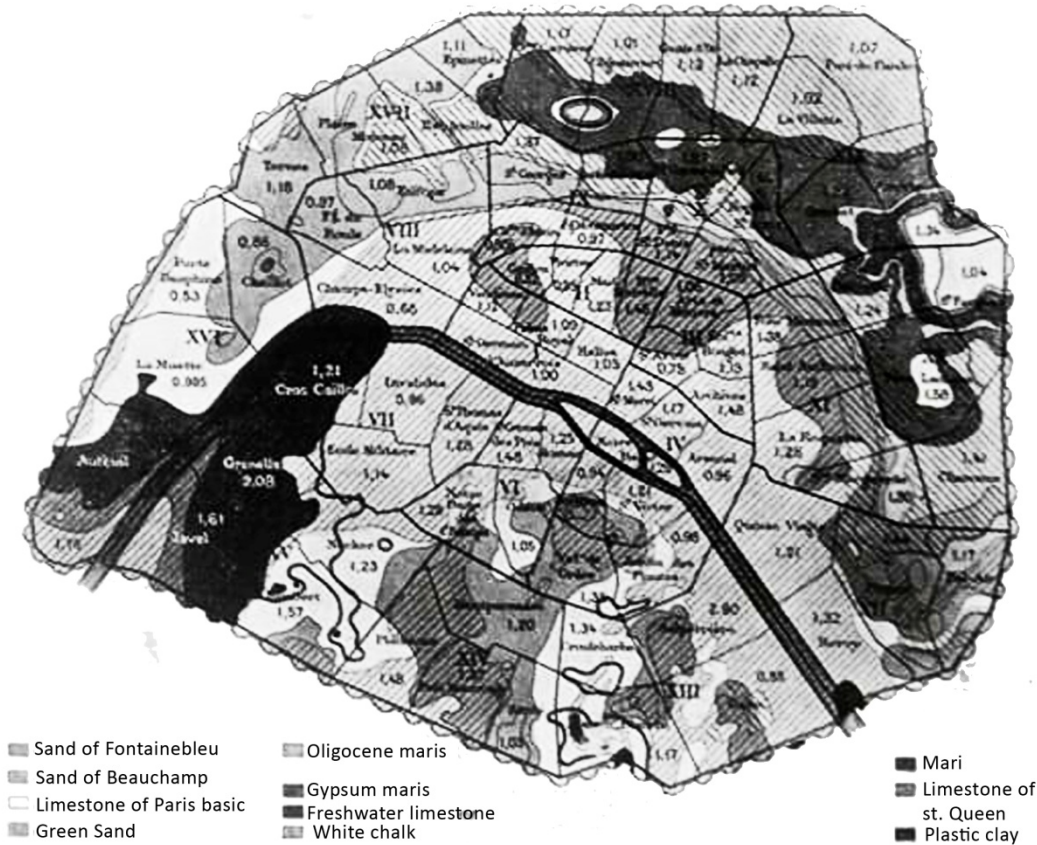


Figure 4: Incidence of cancer and geological map of Paris (Lakhovsky, 1935)

Analysing cancer densities and their correlation to geological subsoils in Paris, it was found that the lowest values occurred in areas with sand and sandstone, gypsum, and alluvial deposits rich in gravel and sand. The areas with the highest cancer incidences were the ones on plastic clay, marly, chalk, iron ores, carboniferous beds and slate (Lakhovsky, 1935).

Aschoff, a physician, was the first to use the blood's electromagnetic oscillations, which are measurable by a simple blood test. After 20,000 tests, he noticed that people with electromagnetically oscillating blood lived without exception in a disrupted geopathic zone, either in their sleeping area or in their workplace. Individuals with only magnetically oscillating blood were not exposed to a geopathic disorder and were healthy. Due to the stress from the electric current and radiation (mostly gamma ray) emitted by a geopathic zone, the blood loses its natural structure and becomes electrically polarized in the opposite charge. He also mentions that neutron radiation emitted by geopathic zones can cause mutations in the cells. (Aschoff D. , 2014), (Aschoff, et al., 1994),

Hacker, also a medical doctor, reports that longitudinal scalar waves emitted at different locations can cause various effects symptoms on biology. Together with his team, they conducted randomized double blind clinical trial, 52 test persons in 2 locations, one identified with a geophysical anomaly and the other one neutral.

They carried out GDV analysis (Gas Discharge Visualization) as well as Immunoglobulin-A (IgA) and A-Amylase measurements. The results were coherent, as in higher GDV mean area, IgA levels were also higher, indicative of relaxation, and in the geopathic zones with lower GDV Mean Area, A-amylase was higher, indicative of stress state. (Hacker, Augner, & Pauser, 2012).

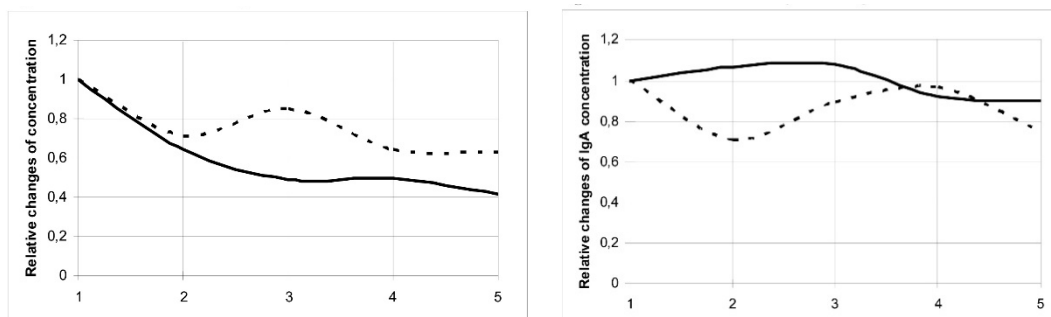


Figure 5. Left: The normalized time course (9:00 a.m. to 1:00 p.m.) of the cortisol concentration in saliva obtained at a potential “neutral zone” (black line), and at a potential “geopathic stress zone” (dotted line). Note that the stress zone in times lead to increased cortisol levels compared to those obtained from the more neutral place.

Right: The normalized time course (9:00 a.m. to 1:00 p.m.) of salivary IgA measured at a potential “neutral zone” (black line), and at a potential “geopathic stress zone” (dotted line). The potential stress zone gave a slightly different time course to that obtained at the more neutral place (Hacker, Eder, Augner, & Pauser, 2008)

The GDV pulsed through the fingertips a very stable high voltage is (10 Kv, 1024 Hz square pulses) for a duration of 0.5 sec, and a visible discharge around the fingertip is produced by the electric field. The results were 10.152 pixels in the neutral zone, and 9.354 in the geophysical anomaly, statistically significantly smaller (Hacker, 2005).

The corona discharges showed weakening of immune system and pineal glands which indicates distortions in the melatonin production, as well as in the cardiovascular and the urinary systems (Hacker, 2005).

One of the most interesting and well documented studies regarding the effect of geophysical anomalies in the human body is the study carried out in the University of Vienna, by a group of 20 scientists. The focus was on the investigation of location dependent changes of certain parameters of the human organism; a total of 24 biological parameters and phenomena were measured on 985 test subjects in 6,943 investigations that were determined attempted to quantify the effect of a geophysical anomaly on humans. (Bergsmann, 1990)

Location dependent influence on the regulatory behavior was detected. Therefore, 17 positive results are opposed by 6 negative results; even one single significant result would have been recognized as proof for a location effect. There were significant changes in serotonin, zinc and calcium levels, and also in immunoglobulins, such as IgA (Bergsmann, 1990).

An experiment conducted with 20 volunteers in a very powerful geophysical anomaly in the Cliff of Tears, an area in North America, revealed a significant difference in blood pressure after exposure to the area. In this location, visitors mention that male visitors would nosebleed, while women had a sudden menstruation (Burke & Halberg, 2005).

Dharmatikari defines geopathic zones as places on earth known for causing health problems. He and his team made measurements in individuals in a geopathic and neutral zone. The results showed that the electrical potential and skin resistance of the body increased and skin resistance was reduced when they were exposed to a geopathic zone in comparison to the neutral zone (Dharmadhikari, Meshram, Kulkarni, Kharat, & Pimplikar, 2001).

Long-term research in various countries demonstrated that geophysical anomalies constitute a high risk factor for oncological, psycho-neurological and atherosclerotic diseases (Dubrov A. , 2008). Researchers consider that 50% of the oncology disease cases are induced by geophysical anomalies (Dubrov A. , 2008).

Studies carried out by geologists by Melnikov and Rudnik in two districts of Saint Petersburg, including 294.000 people showed that the total cancer occurrence was 3.88, in geophysical anomalies 6.39, in geophysical anomaly crossings 7.39 and outside geophysical anomalies 1.68 cases of oncology diseases per 1000 of the population per annum (Melnikov & Rudnik, 2010).

Furthermore, in a building located within the active geological faults the number increased to 20–29 cases per 1000 of the population per annum, with an average diseases rate 14; in nodes of geological faults the disease rate increased to 60–100 cases per 1000 (Melnikov & Rudnik, 2010).

Scientists in India have measured cardiac pulse, pressure, brain waves and blood levels of neurotransmitters as affect by electromagnetic fields of different frequencies; volunteers had the most reactions at 0.01 Hz in direct current and 50 nT magnetic field (Subrahmanyam, Narayan, & Srinivasan, 1985). The aforementioned are fundamental parameters of diurnal geomagnetic fluctuations, especially in geoanomaly locations (Burke & Halberg, 2005).

Geophysicist Apostol made muscle contractions measurements in volunteers as they moved over various geophysical grounds. The results showed a strong correlation of muscle contractions, gravitational anomalies and geologic incisions (Apostol A. , 1995).

According to research, local magnetic field variations may increase cancer risk, cardiovascular and psychiatric disorders. Tectonic faults and their activity, sub-soil lithology (via different chemical load) can also affect somatic as well as mental health (Sliupa, et al., 2004). The significant difference in the physical parameters noticed lead to the conclusion that geophysical anomalies exerted different influence on the normal functioning of the human body especially changes in heart rate.

According to Dharmadhikari, (Dharmadhikari, 2010) common effects of geophysical anomalies are feeling run-down and exhausted, depression, nervousness, headaches, tingling in arms and legs; as a result, immune system and other organ functions can be compromised. In his opinion, geoanomalies do not directly cause disease, but rather lower the immune system and consequently one's ability to manage virus and bacteria.

In another study, body voltage and skin resistance were measured using a biofeedback system, both on detected geophysical anomalies and neutral zones; the results showed clear correlation between the measured parameters and the locations (Dharnadhikari, 2011).

Another important study was carried out in Vilnius University, directed by Sliupa (Sliupa, et al., 2004) to observe the effect of four geological factors on human health: (1) potential fields, (2) concentration of geochemical elements in the soil, (3) tectonics, (4) landscape.

The study reveals strong statistical correlation of gravity and magnetic fields, some landscape features and chemical elements with human diseases, such as cancer, schizophrenia, suicides, respiratory, cardiac-vascular diseases (Sliupa, et al., 2004).

According to the study “the human health is shown to have some statistical correlation with the Earth's fields. This relationship is essentially strong as regards the magnetic field. The intensity of the potential field is of less importance than its variability. The latter commonly reflects the more complex tectonic fabric of the Earth's crust. This influence is, however, of different type, it may be positive with respect to some diseases whereas negative with regard to other diseases. Infection and respiratory disease events increase in number with increasing variability of the gravity field, whereas the variability of the magnetic field has a reverse correlation. It is commonly believed that the gravity field reflects more deep variations in the composition of the Earth's crust, whereas the magnetic field mirrors shallower geological bodies. The local variations of the magnetic field, by contrast, increase risk of cancer (very strong positive statistic load), cardiac-vascular and schizophrenia” (Sliupa, et al., 2004).

The study continues: “Some chemical elements contained in the soil seem to have some impact on the human health. This influence, similarly to potential fields, may be either positive or negative. Only cancer shows positive statistic relationship with Ti, Zr, (in other words this elements increase the risk level), whereas the other diseases ((schizophrenia, suicides, respiratory, cardio vascular) are remedies by Pb, Sn, Y, I, Rb, Sr reach environment. In geological terms, these two groups form two different correlation classes. The former is related to mineral association resistive to denudation (they are expected in re-deposited sandy lithologies), whereas the latter is typical for carbonate-rich lithologies, also for the higher biogenic matter content.” (Sliupa, et al., 2004)

Extremely low frequencies are part of the natural terrestrial radiation. According to Carpenter (Carpenter, Sage, & David, 2012), ELF intensity can result with chronic exposure in DNA damage, affect cellular communication, cellular metabolism and repair, cancer surveillance within the body; neurological effects, cognitive function and memory; depression; cardiac effects; pathological leakage of the blood-brain barrier; and impairment of normal immune function, fertility and reproduction.

3.1.4 Effects on different systems of the human biology

Psychology

Geophysiology, geoneuroscience, environmental psychophysiology study the complex relations between the geophysical environment and human behavior.

According to Mulligan (Mulligan, Cloes, Mach, & Persinger, 2011), geopsychology is the relationship between the geophysical and geochemical variables and human psychology. Geomagnetic variations sufficient to explain about 10% of the variance have been associated with cardiovascular stability and the brains cerebral sensitivity. There are strong correlations between long term geophysical fluctuations and a population's cognitive shift and its responses to environmental crisis (Mulligan, Cloes, Mach, & Persinger, 2011).

In Bancroft Ontario, Canada, is an area located on granite, on a fault zone with high tectonic activity ((Lumbers, 1967), (Divi & Fyson, 1973)). Intense creativity has been observed by people in this area, who claim that the location is the main cause. The highest measure of deviation above the average was 6.500 nT; there were 15 peak anomalies with intensities above 3.300 nT in the test area with an average of 4.100 nT, compared to all other anomalies 1.700 nT. (Rocard, 1964). The equivalent gradients for 15 peaks was 100-200 nT/m, which Rocard considers optimal detection levels (Rocard, 1964). Both main highways in Bancroft are located on of 15 high magnetic peaks with gradients of 100 nT/m, so most people would exposed to these gradients on a weekly basis.

In test using the Myers- Briggs type indicator, it was found that most people were disproportionally more intuitive than sensing, more cognitive than thinking. The right hemisphere has been found to have higher sensitivity to geomagnetic variations. These individuals show alterations in mood and productivity as a function of geomagnetic activity (Babayev & Allahverdiyeva, 2007).

Geopsychological phenomena are a result of interactions between brain and the environment. According to Persinger, there is a correlation between complex partial epileptic sign scores and ambient magnetic field intensity, due to the sensitivity of the temporal lobe to environmental intensity magnetic fields and are also associated with creativity. The neurostructure can create alterations in the interaction between brain geophysical environment (Persinger M. , 2001).

Persinger and Richards (Persinger & Richards, 1995) showed that vestibular experiences were enhanced when the global daily geomagnetic fluctuations exceeded 15-20 nT at the time or during the previous night.

According to Persinger, behavioral dysfunctions such as personality and anxiety disorders are commonly associated with changes in brain structures, such as the temporal lobe and ventral striatum, that are sensitive to geochemical elements concentration; the relation of psychiatric incidences and geochemistry has been suggested (Persinger M. , 1987).

According to Joffe, interactions between Schumann Resonances and our physiology are especially strong, as they can modulate brain wave activity; consequently they can directly effect the sympathetic and parasympathetic activity in our body (Joffe, Damasevicius, Landauskas, McCraty, & Vainoras, 2017).

The research by Joffe, showed correlations in 200 people between fluctuations of the geomagnetic field and the results from evaluation of wellness through a questionnaire, developed by HeartMath Institute (Joffe, Damasevicius, Landauskas, McCraty, & Vainoras, 2017).

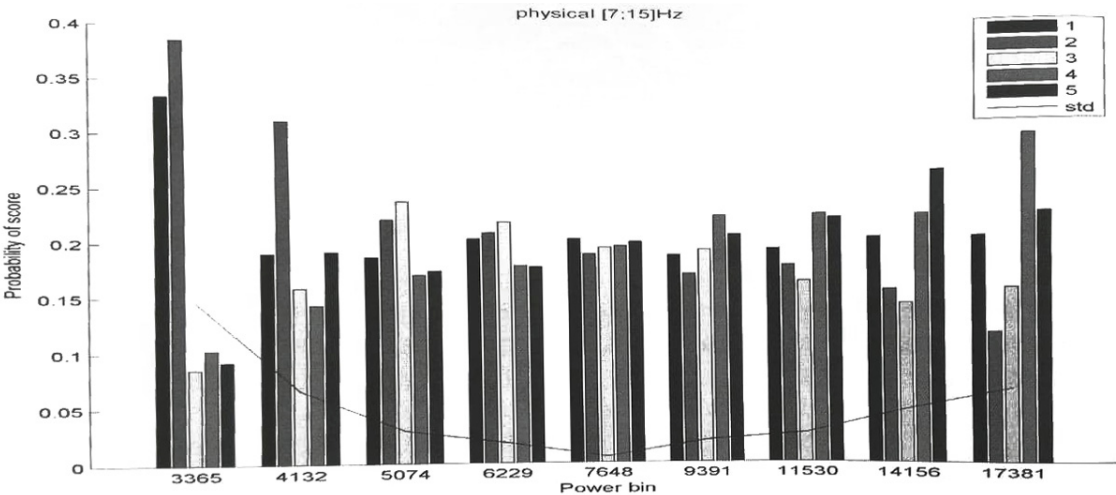


Figure 6. Distribution of participants answers regarding physical wellness (1-bad, 5-excellent) in respect of the earth magnetic field power in frequency range of 7-15 Hz. (Joff et al., 2017)

The authors conclude from this study that low Schumann Resonance frequencies have positive effects (Delta, Theta, Alfa waves) and high Schumann Resonance frequencies (Gamma) have, mainly negative effects on physical wellness. Low amplitudes of low Schumann Resonance frequencies induce bad physical wellness (Joffe, Damasevicius, Landauskas, McCraty, & Vainoras, 2017).

Brain

Various studies demonstrate the various geophysical anomalies can have a strong effect on the human brain.

The recall of semantic memory is increased, when 1 μ T magnetic field is applied across the temporal loads for 30 minutes (Richards, Persinger, & Koren, 1996).

According to research (Ahmed & Wieraszko, 2008), different hippocampal networks can be coupled through the application of appropriately patterned magnetic field. Information and memory within the brain space are occupied by magnetic fields (Persinger M. , 2008)

Sferics are short bursts of 10 kHz electromagnetic waves that display pulse rates between 1-100 Hz and intensity below 100 nT (Walach, Betz, & Schweickhardt, 2001). According to research, (Vaitl, Propson, Stark, Walter, & Schienle, 2001) there was a strong correlation between the occurrence of sferics and occurrence of migraines.

Stoupel also reported 200% increase of migraine cases during days with amplitudes 70-120 nT (Stoupel E. , 2002). Kuritzky found that percentage of headaches during geomagnetic storms, with fluctuations greater than 40 nT were up to 35% respectively. (Kuritzky, Zoldan, Hering, & Stoupel, 1987); the correlations was later replicated (De Matteis, et al., 1994).

Other research (Rajaram & Mitra, 1981) demonstrated direct correlations between monthly incidence of epileptic convulsions and monthly geomagnetic activity and between geomagnetic activity and seizures and dizziness cases (Stoupel, Martfel, & Rotenberg, Admissions of patients with epileptic seizures (E) and dizziness (D) related to geomagnetic and solar activity levels: differences in female and male patients., 1991).

Periodicities of solar and geomagnetic fluctuations reflect the population's dominant hemisphere style, according to research (Vladimirskii & Kislovskii, 1995).

Severe geomagnetic activity can induce increased bursts of activity in the alpha and theta range prevalent over the right hemisphere; the sympathetic nervous system dominated on the days of moderate activity, and the parasympathetic on the days of severe activity (Babayev & Allahverdiyeva, 2007).

A significant correlation has been found between solar-geomagnetic cycles and the manifestation of human brain asymmetry; the research indicates that the period of

oscillations for left and right hemispheric dominance was 20-25 years, equal to a generation. The conclusion was that the parameter that modulated hemispheric dominance was the interplanetary magnetic field during the month of conception. (Volchek, 1995)

It has also been shown that perinatal geomagnetic conditions are associated with adult behaviors (Hodge & Persinger, 1991). Studies show a strong correlation between increased geomagnetic activity around birth and increased temporal lobe activity, as well as scores for inferences of anxiety (Persinger & Janes, 1975), (Ossenkopp & Nobrega, 1979)).

Another research demonstrated that the association between epileptic seizures and geomagnetic activity was dependant on tidal gravitational waves. According to the study, consciousness-related cerebral function is affected by subtle changes in geomagnetic activity. Replicated in the laboratory, it was noticed that magnetic variations of 50 nT - usually occurring in nature - had a direct effect on the brain's electrical sensitivity (resulting in seizures) and also influenced the concentration ability (Mikulecky, Moravcikova, & Czanner, 1996).

Consequently, human beings are impregnated with the geomagnetic field; very small geomagnetic changes directly affect human biology, and directly affect the brain. (Persinger M. , 1983).

Research into the pineal gland has shown the link between states of consciousness and geomagnetic fluctuations (Persinger M. , 1988). The pineal gland, which is most sensitive to fluctuations late at night. These fluctuations are linked with increasing frequency of epileptic episodes and hallucinations. The pineal gland is responsible for melatonin and an endogenous hallucinogen (6-MeOTHBC) production; it also has enzymes which affect serotonin. The pineal gland function is affected by geomagnetic variations, and as a result so is the production of melatonin, 6-MeOTHBC and serotonin hallucinogens, resulting in variations in states of consciousness (Roney-Dougal & Vogl, 1993).

Furthermore, increased geomagnetic activity has been linked to hallucinatory experiences (Randall 1991); during such times, increased accident incidences up to 20% has been observed within industrial and traffic settings (Ptitsyna, Villoresi, Tyasto, Iucci, & Dorman, 1995).

Cardiovascular system

The dependence of prevalence rates of blood diseases on geological and geophysical phenomena under study was found to have the highest correlation coefficient.

According to Stavitsky, blood diseases demonstrate the influence of environmental factors on human health (Stavitsky, 1999).

In St Petersburg, at times when a 70% decrease in myocardial infarctions was observed, a decrease of 1mHz to 10 Hz ambient fields within the nT to μ T was measured; this range of frequencies is linked to depression and fatigue. (Tyasto, et al., 1995)

Increased geomagnetic variations over 50 nT was also correlated with and cardiovascular with a 10% increase in systolic and diastolic blood pressure (Ghione, Mezzasalma, Del Seppia, & Papi, 1998), (Dimitrova, 2006)).

During days of geomagnetic storms, worsening of indices of capillary blood flow was observed in 72% of the patients with myocardial infarction (Gurfinkel, Lyubimov, Orayevskii, Parfenova, & Yur'ev, 1995), as well as 14-20% increase in stroke (Felgin, Nikitin, & Vinogradova, 1997).

Low geomagnetic activity has been linked with an increase in the heart's electrical instability (Stoupel E. , 1994).

The lunar semidiurnal tidal wave of force of gravity has been shown to induce changes in orthostatic reactions (Raibshtein, Kudryashev, Tarasov, & Chepasov, 1995) (Culver, Rotton, & Kelly, 1988), (Dubrov A. , 1996).

Many other heart conditions have also been associated with geophysical anomalies, such as heart rhythm disturbances and related sudden death, cerebrovascular accidents, cerebrovascular insufficiency and vascular thrombosis, including myocardial infarction (Stoupel E. , 1999).

Geomagnetic field detectors and human nervous system activity correlation can be reflected in heart rate variability (HRV). Research demonstrated that human physiological rhythms and collective behaviors are synchronized with geomagnetic activity, and field variations can induce unfavorable effects; other magnetic indices are correlated with improved HRV, mental and emotional states (McCraty, 2014). The coupling between the brain, cardiovascular and nervous systems and resonating geomagnetic frequencies can be the underlying mechanism.

Hormonal system

The hormonal system of the body is sensitive to environmental parameters, and changes in hormone levels can signal physical, emotional and mental health.

Suppression of melatonin production, due to desynchronized biological rhythms, appears to be a link between geomagnetic activity and human health. (Palmer, 2016)

Stoupel noted that geomagnetic distortions induce variations in some neurohormones and neurotransmitters, such as serotonin or endothelin; he noted these can result in morphological cardiovascular changes* and other complications as thrombosis and plaque instability, vasospasm, cardiac arrhythmia and arrest (Stoupel E. , 1999).

Melatonin is hormone that has effects on cancer slowing and electrical dampening. Geomagnetic fluctuations higher than 25 nT can result in nocturnal melatonin level reduction (Burch, Reif, & Yost, 1999).

Melatonin production is associated with an increase in risk for Alzheimer's disease; research shows that long-term exposure to extremely low frequency magnetic fields can increase brain amyloid beta levels, a risk factor for Alzheimer's disease (Carpenter, Sage, & David, 2012).

Immune system

Environmental levels of electromagnetic fields can induce large immunological changes in humans. Chronic exposure can increase allergic and inflammatory responses (Carpenter, Sage, & David, 2012).

Immunoglobulins have different functions; IgG represents 70% of the antibodies against viruses, toxins and bacteria, whereas IgM against antigens to gram negative bacteria. According to research, maximum fluctuations in solar and geomagnetic activity is correlated with reduced levels of IgG and IgM (Stoupel, Abramson, Gabbay, & Pick, 1995). Another research demonstrated that exposure to 8 Hz, 30 μ T field altered the dynamics of leukocyte activity (Martynuk, 1995). It is evident that geomagnetic activity can affect the population's vulnerability to epidemics.

According to Carpenter, electromagnetic field fluctuations can induce over-reaction of the immune system; morphological alterations of immune cells; presence of biological markers for inflammation that are sensitive to electromagnetic field exposure at non-thermal levels; changes in lymphocyte viability; decreased count of T-lymphocytes; suppressed or impaired immune function; and inflammatory responses which can ultimately result in cellular, tissue and organ damage. (Carpenter, Sage, & David, 2012)

DNA

The DNA, according to research, is antenna for electromagnetic fields, so it becomes evident that it can be effected from fluctuations in these fields (Blank & Goodman, 2011).

Stoupel (Stoupel, et al., 2005) demonstrated that genetic expression can be affected by changes in geomagnetic activity associated with the solar cycle.

According to research, gene and/or protein expression in certain types of cells can be altered by electromagnetic fields, even at low intensities lower (Carpenter, Sage, & David, 2012). Extremely-low frequency has also been correlated with DNA damage; in studies of genotoxicity and extremely-low frequency exposure, 66% showed DNA damage and 44% no significant effect (Carpenter, Sage, & David, 2012).

DNA activates the production of stress protein when exposed to extremely low frequency electromagnetic fields; the biochemical pathway that is activated is non-thermal (Carpenter, Sage, & David, 2012).

Changes in DNA electron transfer are an action mechanism resulting from non-thermal extremely low frequency electromagnetic fields; production of stress proteins due to electromagnetic field exposure can be activated by various frequencies of the spectrum. Environment levels of 0.5 to 1.0 μT are considered thresholds for extremely low frequencies triggering stress on biological systems; DNA damage, a cause of cancer, can take place at levels below these limits (Carpenter, Sage, & David, 2012).

Biorhythms

In an experiment for observation of the human biorhythms dependence on the geomagnetic field, two groups of people were placed in two underground rooms, one blocked from any time indication, and the other from the previous as well as from the geomagnetic field. A disturbance of the biorhythms occurred in both cases; when volunteers in the room blocked from the geomagnetic field were exposed in a 10 Hz frequency range (0.025 V/cm), similar to the natural field, the disorder was restored (Becker & Selden, 1998).

According to detailed studies, all vertebrates possess a magnetic instrument in the area of the ethmoid, which transmits biorhythmic time elements from the microarrays of the geomagnetic field to the pineal gland (Becker & Selden, 1998).

3.1.5 Biological effects and geophysical anomaly types

Tectonic zones

Within seismically active regions there are intensive variations of geomagnetic, geoelectric, gravity fields, geochemical anomalies and maximal gradients of tectonic stress fields (Committee, 1986). Population living in these areas is affected by these factors every day, and not just during strong earthquakes (Shitov A. , 2010).

Various studies demonstrate the relation between human health and seismic activity have focused on direct or medium term consequences earthquakes on health ((Takakura, et al., 1997); (Lai, et al., 2000); (Matsuoka, et al., 2000); (Parati, Antonicelli, Guazzarotti, Paciaroni, & Mancia, 2001); (Watson, Doherty, Dodrill, Farrell, & Miller, 2002); (Kario, McEwen, & Pickering, 2003); (Kamoi, Tanaka, Ikarashi, & Miyakoshi, 2006) (Kamoi, Tanaka, Ikarashi, & Miyakoshi, 2006b)).

Long term medical effects of active tectonics have been analyzed at in terms of gas emission in geothermal or volcanic areas ((Bates, Garret, Graham, & Read, 1998); (Annunziatellis, Ciotoli, Lombardi, & Nolasco, 2003); (Carapezza, Badalamenti, Cavarra, & Scalzo, 2003); (Durand & Wilson, 2006).

According to research, intrusions are strongly correlated with the rate of blood, nervous and musculoskeletal diseases, as well as with the population's total morbidity. Sub-alkaline and alkaline granite intrusions had the strongest effect on human health. The intrusions health impacts are linked with increased gamma radiation and magnetic anomalies (Shitov A. , 2010).

Analysis of long and medium term effect of earthquakes demonstrates that the gradual rise of morbidity began 3-4 years ahead of the earthquake. This is link to gradual change of dynamic stress field during earthquake preparation. Local ground compression occurs due to intrusion mass' cracking along existing faults and fractures, and this resulted in electromagnetic radiation increase and emission of Rn and gases. Distinct sensitivities to an earthquake as a stress factor are exhibited by different biological systems of the human body (Shitov A. , 2010).

During the pre-earthquake period, human health is affected via groundwater events, fluctuations of the geomagnetic field, microseismicity causing microvibration and infrasound (Shitov A. , 2010).

According to Persinger, long before seismic activity has increased in a region, transient and local epidemics of unusual behaviors take place, which are associated with tectonic strain (Persinger M. , 1987).

According to Freund, the effect of seismic zones on health during a non-seismic period can be attributed to a series of pre-earthquake phenomena: bulging of the earth's surface, changing well water levels, low frequency electromagnetic emission, earthquake lights, magnetic field anomalies, temperature variations, changes in the ionosphere plasma density (Freund, F. T., 2003).

Igneous and metamorphic rocks, contain electric charge carriers which are defect electrons. Normally these are inactive, but during pre-earthquake periods they get activated and make the rocks sparkle and glow. The reason is that the currents generated through the rocks lead to electromagnetic emission, positive surface potentials, corona discharges, positive ion emission, and mid-infrared radiation. (Freund, F. T., 2003)

Other parameters that can be responsible for the effect of seismic zones on health are the ground photon emissions even at 10000 km distance from from the earthquake epicentre have been observed in pre-seismic period, as well as other electromagnetic phenomena such as radio waves (Persinger, Lafreniere, & Dotta, 2012). Furthermore, ultra low frequency electromagnetic radiation is also emitted from seismic areas (Molchanov, 2011).

According to research, the majority of endemic disease areas is located within geodynamically active regions (Volfson, Wolfgang, & Pechenkin, 2010).

Magnetic anomaly

Magnetoreception in the human body, including transduction processes, can be mediated by: magnetite (Kirschvink & Gould, Biogenic magnetite as a basis for magnetic field detection in animals, 1981), photopigments (Leask, 1978), electromagnetic induction induction ((Kalmijn, 1978) (Rosenblum, Jungerman, & Longfellow, 1985), melanin (Leucht, 1987), biological free radicals (Schulten & Windemuth, 1986).

According to various research, magnetic field fluctuations influence biological systems in different ways (Kirschvink, Jones, & MacFadden, 1985), (Binhi, 2002)).

Weak, pulsing electromagnetic fields can affect biological processes; repetitive single pulse and the repetitive pulse train were tested in research and both increased the specific activity of messenger RNA (Goodman, Bassett, & Henderson, 1983).

in Sedona, USA, research concluded that there is close correlation between the magnetic anomalies and spontaneous brainwave changes in frequency and amplitude, which is additionally modulated by Schumann Resonance and can induce psychophysical and psychosensory phenomena. Sudden magnetic events can result in spontaneous geomagnetic brainwave synchronization (Miller, 2013).

A database of 343 trials demonstrated that geomagnetic fluctuations can induce extra-sensory perception in people; it was strongly correlated with the 0.2–0.5 Hz band (Ryan, 2008).

Geomagnetic distortions have been also correlated with increased anxiety, sleep disturbances, altered mood, and a higher incidence of psychiatric infections. (Persinger M. , 1987)

In another study, it was found that unexplained deaths maximized at sunrise were correlated with geomagnetic field fluctuations which peak just before sunrise (Persinger & Psych, 1995).

Geomagnetic reversal

Geomagnetic reversals have been shown to have strong correlations with species extinction ((Watkins & Goodell, 1967), (Hays, 1971)) (Kopper & Papamarinopoulos, 1978). During reversal period, the geomagnetic field intensity was drastically reduced (Vogt, Sinnhuber, & Kallenrode, 2009) and increased cosmic radiation caused enhanced mutation rates and mass extinctions ((Uffen, 1963), (Simpson, 1966)).

Valkovic hypothesized that the decline of geomagnetic intensity affects the intake and metabolism of essential trace elements in organisms (Valkovic, 1977). Kopper suggested during geomagnetic reversals the mutagenic effect of UVB radiation can be drastically increased (Kopper & Papamarinopoulos, 1978).

Several turning points of human evolution are correlated with geomagnetic reversals (Kuznetsov & Kuznetsova, 2004). Human brain expansion was preceded by two key mutations during the Gauss Matuyama reversal. This can be explained by a drastically enhanced cosmic radiation and the geomagnetic field being 10 times lower during reversals.

Ions

Telluric currents seem to have an effect on health, through their secondary effect: attracting airborne electrically charged particles of the opposite charge. The effects of breathing air ions have been shown in details in studies by Krueger (Krueger, 1972).

According to research (Rudnik & Melnikov, 2010), areas with enhanced crust permeability (such as faults) exhibit decreased negative ion numbers, which can adversely affect human health by causing immune system suppression (Tchijevsky, 1929)).

Geochemical anomalies

Natural geochemical anomalies can both adversely and positively affect human health influencing the balance of trace elements in the organism. (Melnikov, Rudnik, Musiychuk, & Rymarev, 1994) The trace elements in a location are modulated by climatic, landscape, geological, mineralogical, and geochemical characteristics, as well as by various geological processes (Volfson, Wolfgang, & Pechenkin, 2010).

According to Volfson (Volfson, Wolfgang, & Pechenkin, 2010), natural geochemical anomalies can both adversely and positively affect human health influencing the balance of trace elements in the organism. Various studies ((Vinogradov A. , 1983), (Avtsyn, 1972), Underwood 1979, (Låg, 1990), (Abrahams, 2002), (Komatina, 2004), (Selinus, et al., 2005), (Plumlee, Morman, & Ziegler, 2006), (Hough, 2007), (Skinner, 2007)) show correlations between human health and various geochemical parameters: element concentration in soils, hydro and geochemical characteristic of ground and surface waters, elemental, gaseous, mineral composition of the air, air dust and aerosols.

Geochemical anomalies can cause temporary dysfunctions and chronic diseases of various nosologies ((Persinger M. , 1987), (Melnikov, Rudnik, Musiychuk, & Rymarev, 1994)). Research demonstrates that the geological environment can affect the occurrence of congenital malformations (Aggett & Rose, 1987), occurrence of neoplasms (Peeters, 1987), cardiovascular diseases (Masironi, 1987), infections (Weinberg, 1987), mental diseases ((Persinger M. , 1987)).

Endemic diseases have been correlated with natural geochemical anomalies such as low or high concentration of chemical elements in soils, bedrocks, and groundwater (Tsarfis, 1985), (Parish & Lotti, 1996), (Koenig, 2005). Areas mostly affected by endemic diseases are located within geodynamically active regions with presence of active faulting, seismic, volcanic or geothermal activity. The formation of geochemical anomalies is caused mainly by fluid degassing through faults (Melnikov, Rudnik, Musiychuk, & Rymarev, 1994).

Regions located within active tectonic belts, exhibit negative health effects from the exposure to various toxic elements and compounds such as U, Se, As, Cd, Hg, Ch₄. Various factors provokes related to geofluid discharge zones - lignite exposure, aromatic hydrocarbons discharged via active faults- induce endemic diseases such as nephropathy, kidney cancer and heavy forms of urolithiasis (Volfson, Wolfgang, & Pechenkin, 2010).

A sharp increase in the number of atmospheric fungi can be observed in seismically active areas provoke, which can induce pulmonary diseases (Melnikov, Rudnik, Musiychuk, & Rymarev, 1994).

Geochemical anomalies can be important forces for speciation. Various biological effects can be induced by deficiency or excess of trace elements; irregular chemical elements concentration in soils and waters act as stress factors for organisms which can lead to mutations and progressively new species (Volfson, Wolfgang, & Pechenkin, 2010).

Research also suggests that radon dissolved in groundwater can cause mutations and affecting rate genes, resulting in physiological changes such increased brain size, reduction of body hair and others (Lenz, 1979).

3.2 Animals

Diverse animals use the earth's magnetic field for navigation, therefore geomagnetic anomalies can influence their functions (Lohmann, 1991).

According to Lochmann, the magnetic field of the earth influences the orientation of various organisms: bacteria molluses, arthropods, fish, amphibians, reptiles, birds and, mammals. (Lohmann, 1991)

Tombarkiewicz proved the effect of geomagnetic anomalies on cow's health. When they were moved in an anomaly location they developed health problems above a normally expected ratio, and also showed lower levels zinc, copper and iron. (Tombarkiewicz, 1996)

Yeagley (Yeagley, 1947) showed that pigeons have a magnetic sensation that allows them to use the geomagnetic field as a compass. Magnetic crystals have been found in almost all animals using the Earth's magnetic field for navigation, as salmon, pigeons and dolphins. (Long, 1991)

Worms can sense gamma radiation (Watson L. , 1974).

The marine mollusc *Tritonia diomedea* has a magnetic compass sense; four identifiable neurons, known as LPd5, RPd5, LPd6 and RPd6, reacted with increased electrical activity to earth-strength magnetic variations. Two other neurons, LPd7 and RPd7, are inhibited by magnetic stimuli (Wang, 2004) (Lohmann, 1991).

Abnormal morphogenesis has been observed in high gradient magnetic field exposure during at early stages of frogs embryonic development. A brief exposure was able to enough to induce significant alterations in the geometry at the eight-cell stage, which can result from the spindle reorientation at the four-cell stage ; the mitotic spindle seems to be a sensor of the geomagnetic field (Mo, Liu, Cooper, & He, 2011).

Research also shows destruction and degradation of mitochondria in cardiomyocytes of rabbits as well as drop in blood oxygenation during geomagnetic storms (Bardasano, Cos, & Picazo, 1989) (Breus, et al., 2002) (Chibisov, Breus, Levitin, & Drogova, 1995). Reduced heart rate variability in rabbits was observed after exposure to 50 nT magnetic field variation (Gmitrov & Gmitrova, 2004).

Strong correlation between geomagnetic activity and limbic seizures in rats has been also demonstrated (Bureau & Persinger, 1992), (Michon & Persinger, 1997)).

Rats exposed to a 4-7 Hz magnetic field of 300 nT showed significant improvement in memory. This frequencies (theta) when applied as electrical current facilitate long term potentiation in the hippocampus. (McKay & Persinger, 2005)

Variations in perinatal magnetic fields of rats resulted in clear alterations in neuronal numbers within the hypothalamus; exposure of 5-7 nT variation, 7 Hz or 0.5 Hz magnetic fields altered neuronal density within regions of the hypothalamus related to appetite, sexual reproduction and social dominance. (Mulligan & Persinger, 1998)

According to Persinger, the ambulatory behavior of rats prenatally exposed to 0.5 Hz rotating magnetic field (resonance value for Earth-Moon system) was correlated with lunar distance at the time of birth. (Persinger M. , 1971)

Nevertheless, there are other studies showing various healing effects from introducing various electromagnetic fields in animals.

According to research, pulsed electromagnetic fields (PEMFs) can positively affect wound healing. Full thickness skin wounds surgically inflicted in male rats; the group exposed to the pulsed electromagnetic fields exhibited a significant acceleration in healing, as well as qualitative improvement of the healing progress compared to the control group (Athanasίου, et al., 2007).

Application of resonant low intensity radiofrequency electromagnetic fields between 10 kHz to 120 kHz on rats with leiomyosarcoma tumors demonstrated a significant prolongation of the survival time and a lower tumor growth rate, in comparison to the control group (Avdikos, 2007).

Exposure to various types of electromagnetic fields can affect pain specificity and pain inhibition. Results demonstrated that exposure of rats to the electromagnetic frequencies derived from the nuclear magnetic resonance spectrum of morphine on animals can exhibit similar analgesic effects to morphine (Verginadis, 2012)

Using electromagnetic frequencies nuclear magnetic resonance spectra of other biologically active substances, such as an organometallic complex of Tin showed

anticancer effects on malignant cells and tumor-bearing animals (Evangelou et al., 2008, (Karkabounas et al., 2006; (Avdikos, 2007))). Such electromagnetic fields exhibit their effects on a non thermal way due to the low intensities and frequencies of the fields.

Reduced local static magnetic field to less than 1 μT compared to surrounding 50 μT can produce analgesia in mice comparable to 5 mg/kg of morphine (Prato, Robertson, Desjardins, Hensel, & Thomas, 2005).

3.3 Plants

Geopathic zones do not affect only humans, but all species of animals, plants, fungi and bacteria ((Dubrov A. P., 2008), (Gak & Gridin, 2008), (Hacker, Eder, Augner, & Pauser, 2008), (Von Pohl, 1983)).

Regarding plants, in a study done by (Boyarskikh & Shitov, 2010) it was shown that fruit plants located within geophysically anomalous areas exhibited production of smaller fruits and increased diversity of fruit (Fig. 5), as well as increase in the expression of the recessive trait (bitterness in the case of blue honeysuckle).

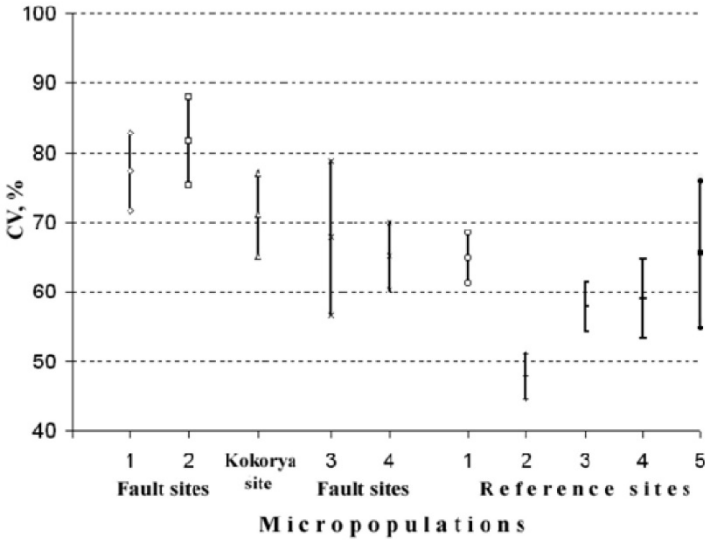


Figure 7. CV of the fruit shape at fault and neutral sites (Boyarskikh & Shitov, 2010)

The plant intrapopulation variability increase occurs in the least favorable environments according to Mamaev (Mamaev, 1973). It is shown that geophysical anomalies act as a stress parameter for plants, which can be associated with: a) mutagenicity due to chronic stress (Belyaev & Borodin, 1982), (Badyaev, 2005); b) mutagenicity due to direct influence of geochemical agents. (Boyarskikh & Shitov, 2010)

The size decrease, the shape variability and taste trait increase demonstrate effect of that fault zones on plants. Seismic regions are favorable to speciation as seismicity acts a stress factor for organisms ((Vorontsov & Lyapunova, 1984), (Trifonov & Karakhanian, 2004)). Furthermore, faults are fluid and gas channels; research shows that radon released through faults prior to earthquakes and dissolved in groundwater might act as a mutagenic agent (Lenz, 1979). Therefore active faults can induce natural selection and intraspecific variability.

The development of plants can be suppress by various geochemical and geophysical factors, especially by the increase in Ti, Cr, Mn, Sr, Mo, Ba, Mg, S (Boyarskikh & Shitov, 2010). It has been also shown that trace element content, such as Fe, Mn, As, Zr, Nb, in plants tissue growing within fault zones can be twice as large as those outside a fault zone (Lukina, et al., 1992).

In the studies of the blue honeysuckle, the flavonol content was 1.5 times higher in seismic areas than reference areas (Boyarskikh & Shitov, 2010). Flavonol accumulation is a plant's mechanism to manage environmental stress (Zaprometov, 1996).

It has also been observed that astragalus growing within a fault zone, the phenylalanine ammonia-lyase activity, which is an enzyme responsible for pathogen defense and stress response) was 2 times higher after a strong earthquake (Trifonov & Karakhanian, 2004).

Geochemical and geophysical anomalies may mutagenically affect plants; especially trees and shrubs living for years in the same place are the best record for effects of geophysical anomalies on biology. (Vinogradov B. , 1955) (Miroshnichenko, 1958). Changes in the plant cover over fault zones can be attributed to the increased rock fracturing creating conditions for groundwater discharge (Kasimov, Kovin, Proskuryakov, & Shmelkova, 1978) (Ringrose, Vanderpost, & Matheson, 1998).

Biophysical forest anomalies are a result biological, geochemical and geophysical parameters; it has been demonstrated that in these areas the fruit trees have worse development, including diseases as “witche’s-broom”, mistletoe damage, cancerous outgrowths (burl), marc, and other. Also in these areas grow some specific plants, poisonous and medicative herbs: hemlock (*Conium L*), foxglove (*Digitalis L*), meadow

saffron (*Colchicum autumnale* L), and bryony (*Bryonia* L), mullein (*Verbascum* L.), and others. Also the ants build their anthills exclusively on areas with the aforementioned anomalies. (Valdmanis, 2012). Since geochemical anomalies including toxic elements can affect living entities, deformed trees can occur with an increased frequency ((Melnikov, Rudnik, Musiychuk, & Rymarev, 1994), (Nash, Moore, & Sperry, 2003), (Trifonov & Karakhanian, 2004)).

Research of electric, magnetic, electromagnetic and radiative processes between living organisms and natural factors enabled potato productivity improvements and decrease of pathogenic microorganisms. (Kalde, 2004)

Fruit shrubs and vegetable plants are highly responsive to geological heterogeneities: they can have reduced growth, yield and germination, and produce a lot of misshapen fruits (Melnikov, Rudnik, Musiychuk, & Rymarev, 1994).

Faults and fractures can induce vegetation stress; the release of geochemical gases through them can create damage such as changes in chlorophyll (Nash, Moore, & Sperry, 2003), and even mortality ((Cook, Hainsworth, Sorey, Evans, & Southon, 2001), (Farrar, et al., 2002)). Research indicates that geophysical anomalies are areas exhibiting one of the highest plants diversity (Vavilov, 1926) (Vavilov, 1992). The 7 centers with the greatest diversity were located within the geodynamically active regions (Trifonov & Karakhanian, 2004), along faults or in their vicinity, which contributes to plant speciation ((Heads, 1998), (Heads, 2008)).

A study showed that tree morphoses in zones of enhanced crust permeability were 2.5-5 times higher than outside; 20-60% of trees had forked trunks at zone intersections (Trifonov & Karakhanian, 2004).

In a study made by Wheaton, electric fields were applied on corn and soybeans. Increasing the electric field intensity caused a 50 percent increase in the germination time. (Wheaton, 1968)

Important experiments were done by Mamirova, demonstrated strong correlation between geonomalies in the form of effect of electrical charges and electromagnetic fields and the development of apricot plants (Mamirova N. , 2010).

Growth stimulation, disturbances in growth and development of trunks and branches, and a larger number of dry branches was noted in the plants in the area of geonomaly 1 with predominating negative charges, compared to the geonomaly 2.

Within the area of geonomaly 2 with predominating positive charges, inhibition of growth of branches, less leaves than in reference area and large number of crooked

branches was observed. The length of plantlets were also much smaller. There was no abnormal growth and development of crooked or dry branches and trunks in neutral zone. These data show that geonomalies have effect on growth and development of trees.

| No. | Test 1, cm | Test 2, cm | Reference, cm |
|-----|------------|------------|---------------|
| 1 | 2 | 3 | 4 |
| 1 | 60 (6) | 30 (3) | 47 (4.7) |
| 2 | 55 (5.5) | 28 (2.8) | 45 (4.5) |
| 3 | 63 (6.3) | 32 (3.2) | 48 (4.8) |
| 4 | 58 (5.8) | 35 (3.5) | 50 (5) |
| 5 | 52 (5.2) | 27 (2.7) | 43 (4.3) |

Table No.2. Length of common apricot (*Armeniaca vulgaris*) plantlets as of October 30, 2004. (Mamirova N. , 2010)

| Description | Test 1 | Test 2 | Reference |
|--|------------------------------|-----------------------------|------------------------------|
| 1 | 2 | 3 | 4 |
| Height of trunk | 120cm | 60cm | 95cm |
| Number of branches | 25 | 16 | 20 |
| Number of crooked branches | 21 | 14 | 0 |
| Number of dry branches | 9 | 5 | 0 |
| Length of branches | 20cm, 22cm, 23cm, 21cm, 20cm | 6.5cm, 8.2cm, 7cm, 8cm, 6cm | 16cm, 18cm, 15cm, 12cm, 15cm |
| Number of leaves on a 10cm long branches | 13, 12, 14, 12 | 6, 5, 4, 5 | 10, 9, 9, 10 |
| Number of dry leaves on 10cm long branches | 7, 6, 5 | 4, 3, 4 | 1, 0, 0 |

Table No.3. Effect of negative charge geonomaly (1st test), predominating positive charge geonomaly (2nd test) and neutral zone (reference) on growth and development of common apricot (*Armeniaca vulgaris*) as of October 30, 2005 (Mamirova N. , 2010)

In another test within the same research, 100 seeds were sprouted within neutral and geophysical anomaly zone with positive charge; results of experiment confirm the correlation of geoanomalies with dry seed metabolism and show suppression of germinative capacity of seeds within geoanomaly zone with positive charges. (Mamirova N. , 2010)

| Reference | | | Geological Anomaly | | |
|--|------------------------|------------------------|--|------------------------|------------------------|
| M±m, n = 10 | | | M±m, n = 10 | | |
| 1 | 2 | 3 | 4 | 5 | 6 |
| 3 rd day, % | 4 th day, % | 5 th day, % | 3 rd day, % | 4 th day, % | 5 th day, % |
| 30±1.4 | 48±1.4 | 91±1.5 | 20±1.6 | 31±1.4 | 74±1.5 |
| 32±1.5 | 52±1.5 | 89±1.4 | 16±1.5 | 28±1.6 | 80±1.4 |
| 31±1.2 | 58±1.4 | 85±1.5 | 22±1.4 | 32±1.5 | 72±1.7 |
| 34±1.4 | 55±1.3 | 90±1.6 | 19±1.3 | 36±1.6 | 68±1.3 |
| 33±1.5 | 60±1.6 | 93±1.3 | 18±1.7 | 34±1.4 | 61±1.2 |
| Bn.z.=6.6; Cn.z.=3.3; m _{n.z.} =1.5 | | | Bg.=4.2; Cg.=3.6; m _{g.} =1.6 | | |
| p<0.01; md=2.1; t _{st} =4% | | | | | |

Table 4. Germinative capacity of barley (*Hordeum distichum*) seeds of "Nutans-187" brand in percentage points on 3rd – 5th day after exposure in neutral zone and zone of positive charge geological anomaly effect (Mamirova N. , 2010)

In another experiment, the correlation between remarkable vintage years of Bordeaux wines and intensity of solar radiations corresponding with variations of intensity in: sunspots, magnetic perturbations, and aurora borealis was shown. (Lakhovsky, 1935)

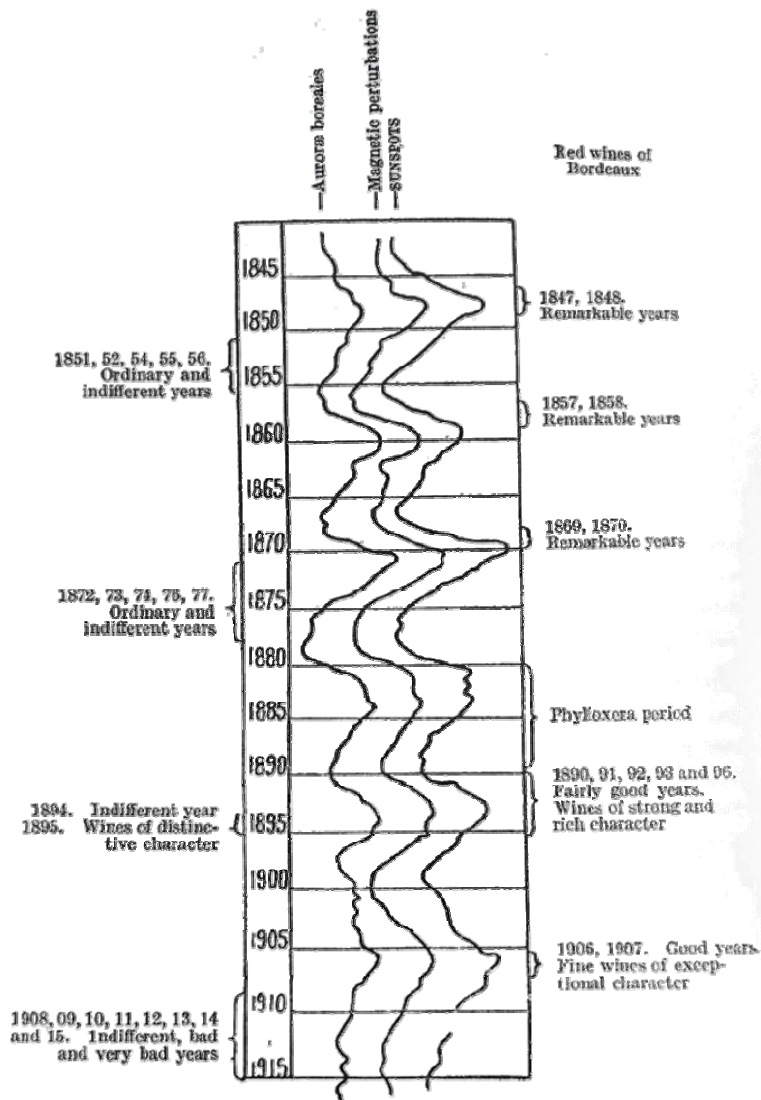


Figure 8. Bordeaux wines; maximal intensities correspond with good vintage years, while minimal intensities are associated with poor vintage years. (Lakhovsky, 1935)

4. Buildings

There are many factors related to buildings and architectural design, especially nowadays, that are responsible for inducing disease and health decline. These can include toxic material use, poor indoor air quality, artificial radiation, unhealthy lighting.

Unfortunately, the factor of earth field anomalies has been omitted from modern architectural design. In ancient times, the method for choosing a residence location was noticing the presence of shrub, land color, presence of water systems and tree growth. Also, another method used was housing animals in the proposed area and observing their behavior and health for a certain period of time (Bradna, 2002). Thus it is obvious the effect of earth radiation anomalies on plants and animals was known since many thousand years.

Today guidance for habitation place selection has degraded with a parallel increase of cancer, leukemia, sclerosis in some locations more than others.

Unfavorable habitation areas can act as a stressor for humans and that can lead to disease; biological discomfort can be created by geological distortions and geophysical anomalies (Rudnik, 2010). As seen in the previous chapter, organisms can be affected by distortions in soil and groundwater trace elements such as F, I, Hg, As, Sr. Other types of natural areas of biological discomfort can also be caused as previously seen by zones of enhanced permeability of the crust including active faults, fault intersections or junctions, buried paleovalleys, underground watercourses, increased rock fracturing and subterranean cavities. These zone can have adverse effects in the urban environment, and are considered as zones of geological risk ((Osipov, 1994), (Kostryukova & Kostryukov, 2002)).

Various geophysical and geochemical anomalies are a result of enhanced crust permeability. Human health can be negatively affected by gas emanation, such as Rn, CH₄, H₂S, Co₂ through fault zones ((Henshaw, Eatough, & Richardson, 1990) (Bates, Garret, Graham, & Read, 1998), (Gilman & Knox, 1998), (Baxter, Baubron, & Coutinho, 1999), (Bølviken, Celius, Nilsen, & Strand, 2003), (Durand & Wilson, 2006),

A tectonically stressed junction in St Petersburg was analyzed and found with intense geomagnetic and gravity anomalies, geological heterogeneities and radioactivity anomalies. Data in cancer rates from 330.358 people was analyzed and correlated with the map of zones of enhanced crust permeability. There were zero cancer rates in 60% of buildings outside the zones, in 20% of buildings within the zones and only in 10% of buildings at zones intersections. The cancer incidence was 3% outside zones, 21% within zones and 46% at their intersection (Melnikov & Rudnik, 2010).

Environmental pollution has a secondary effect compared to zones of enhanced crust permeability. The cancer rate was 1.3/1.5 higher at moderate and high pollution areas than at low pollution areas. (Melnikov E. , 2003) The combination of pollution and ones of enhanced crust permeability gave synergistically higher results, as combined effects of radiation and other mutagenic agents may be larger than a simple sum of the individual effects (UNSCEAR, 2000).

Drinking water quality does not influence cancer incidence as all buildings analyzed share the same water supply. Also radon is not a factor; being heavy gas it concentrates mainly in basements and ground floor apartments, but the correlation of cancer incidence rates and zones of enhanced crust permeability is valid for all floors (up to 15th floor) (Melnikov E. , 2003). The study shows that cancer rates depend mostly on zones of enhanced crust permeability density rather than other natural factors or soil pollution.

In another study, it was demonstrated that within zones of enhanced crust permeability, cancers, ischemic cardiac disease, hypertensive disease were 3.5, 2 and 1.5 times higher than outside them; within ZEPC total mortality in the settlements was 2 times than outside (Melnikov, Musiychuk, Potiforov, Rudnik, & Rymarev, 1993).

The effects of zones of enhanced crust permeability on human health can be attributed to at least 3 geophysical factors:

1. Magnetic anomalies, which as seen in previous chapter can affect various systems of the human organism ((Persinger, Ludwig, & Ossenkopp, 1973), (Dubrov A. , 1978), (Binhi, 2002)). These anomalies are usually associated with magnetized rocks (Gunn & Dentith, 1997) often observed with zones of enhanced crust permeability where igneous intrusions and fluid penetration can take place due to intensive rock fracturing conditions.

2. Air ion anomalies, which occur especially in buildings located over zones of enhanced crust permeability; decreased number of ions, especially negative ones, has been observed within these zones, with values of 80-210/cm³ when the optimal concentration is 3000-5000/cm³ (Rudnik V. , 2002) (Melnikov & Rudnik, 1998). This decrease can be attributed to the interaction between negative air ions and proton gas appearing in fault zones (Rudnik V. , 2002). Negative air ion can decrease adversely affect human health, especially affecting the immune system ((Tchijevsky, 1929), (Krueger, 1972)).

3. Geochemical anomalies, where intense gas emission occurs via active faults. In St Petersburg, it is shown that atmochemical halos were created above faults areas, due to increased emission of gases such as CH₄, Co₂, Vo, which can be potentially harmful, and of heavy metals (Melnikov & Rudnik, 1998).

Other results of the zones of enhanced crust permeability within the built environment is 30-300% higher traffic accidents. This can be attributed to the effect of geomagnetic anomalies on human behavior where drivers cross these zones (Rocard, 1964).

In another study (Orbera, 2003) regarding health care, education and pharmaceutical centers it was found that natural telluric currents can cause stress, circulatory problems, lack of concentration and others, as well as excessive fatigue and difficulty in diagnosing and applying therapies in the case of therapists.

Apart from the location itself which determines the various geophysical anomalies, other building factors can modulate the earth's fields; one of them is the materials used in construction. It can be obvious that metallic elements, such as steel used in concrete reinforcements in columns and floors, in beds, working desks or other furniture can distort the geomagnetic field and amplify electromagnetic fields as it becomes a channel due to its high conductivity. Also the use of radioactive material in building construction can also interact with the earth's electromagnetic fields and create further distortions.

Another factor that can create local changes of earth's electromagnetic field is architectural forms, a subject that has not been much analyzed in modern science and definitely demands more in-depth research.

In a research done using various geometrical forms such as the cube, parallelepiped, pyramid, prism (Miroshnik, 2013), it was discovered that architectural forms can influence the earth's fields, either amplifying or reducing it. Correlation was also found with N-S orientation and coordinates of forms, as well as with location of the Sun and the Moon in the sky.

It can be concluded that zones of enhanced crust permeability can have significant adverse effects on human health, with technogenic pollution having a secondary role. Therefore it is critical that geophysical mapping should be carried out in habitation areas, especially in cities where the population density is much higher per location. The various areas could be classified according to health risk: zones of enhanced crust permeability intersections that pose the highest risk, zones with medium risk where activities of short term exposure can be located, and neutral zones where habitation, schools, hospitals and other uses can be safely planned. Furthermore, with regards to new master planning a geophysical preliminary survey can be used as a guideline for designing of roadways, railways, as well as town planning and other infrastructural development.

5. Hormesis

General

It has been shown that low levels of stress in short exposure time can be extremely healing; a beneficial response can be a result of low doses to a stressor agent.

Various electromagnetic therapies, low radiation treatments, hot-cold exposure, are all based on this principle. Short term low dose stress can increase the number of mitochondria per cell, whereas long term stress of the same source can be extremely damaging and induce chronic disease (Burke & Halberg, 2005).

This phenomenon is called hormesis: the same external agent can cause low-dose stimulation and high dose suppression of a living organism. Calabrese has done extensive research on the application of hormesis on pharmacology with very consistent results amongst a wide spectrum of substances and diseases. (Calabrese E. , 1994). A chemical may be seen to display an enhancement of longevity at low doses but decreasing longevity at higher doses. (Calabrese E. J., 2009)

Hormesis is the most fundamental dose-response relationship based on the results of several comparisons with the classical dose-response models; its appearance is reproducible in numerous biomedical publications ((Calabrese & Baldwin, 2003), (Calabrese & Baldwin, 2001). Throughout the last century the hormetic dose-response model had been almost completely dismissed; the dose-response relationship is a central principle in toxicology and pharmacology (Mattson & Calabrese, 2010).

Antitumor drugs at high concentrations, inhibit cell proliferation of tumor cell lines and other types of cells, whereas at lower concentrations these agents often display a stimulatory effect consistent with the hormetic dose response. Antibiotics, antifungal agents, and antiviral drugs exhibit the same response (Calabrese & Baldwin, 2003). According to research, medical treatments that are targeted for the toxicity zone of the dose-response relationship will eventually achieve a concentration within the hormetic or performance zone for a variable period of time due to pharmacokinetic factors (Mattson & Calabrese, 2010).

The effect of hormesis has been observed in other areas such as beneficial responses from low to moderate levels of exercise with hormetic mechanisms ((Ji, Dickman, Kang, & Koenig, 2010), (Radak, Chung, & Goto, 2005), (Radak, Chung, Koltai, Taylor, & Goto, 2008)) the benefits of caloric restriction ((Gomez-Pinilla, 2008) (Turturro, Hass, & Hart, 1998)) or certain fasting regimes (Mattson & Wan, 2005).

Radiation hormesis

Luckey (Luckey, 1991) developed the concept of radiation hormesis, according to which only high doses of radiation - higher than five times the natural background radiation- can cause a biological damage, and on the other hand, low doses of natural ionizing radiation are necessary for biota, since they activate various functions of the human body and especially the immune system. (Safwat, 2008).

Research shows that gamma radiation can negatively affect human health ((UNSCEAR, 2001), (UNSCEAR, 2008), but also low doses of gamma radiation can activate enzyme activity and growth; experiments showed that an artificially depleted environment of natural radiation can suppress of vital functions ((Croute, Soleilhavoup, Vidal, Dupouy, & Planel, 1982), (Conter, Dupouy, & Planel, 1983), 1986, (Planel H. , et al., 1987)).

Low dose radiation can induce beneficial effects, and the mechanisms could include stimulation of DNA repair, detoxification of free radicals, production of stress proteins, activation of membrane receptors, release of growth factors, and compensatory cell proliferation (Feindegenen, 2005), (Macklis & Beresford, 1999)). For example, radon, has well known cancerogenic effects (Cothorn & Smith, 1987) as well as healing effects as a bath treatment (Erickson, 2007).

Looking at hormesis linked to other fields, Zwaardemaker (Zwaardemaker, 1924) explains that “the energy of bio-radioactivity may have a decisive influence on the living system. Applied in heavy doses radium destroys the tissues, but applied in micro doses radioactivity may cause revival.”

Also, according to Olson (Olson & Lewis, 1928) and Babcock (Babcock & Collins, 1929), natural terrestrial radiation is one of the factors responsible for speciation and biological evolution.

According to epidemiological research, areas with increased levels of terrestrial radiation experience decreased rates of cancer morbidity (Nambi & Soman, 1987), (Haynes, 1988), (Mifune, et al., 1992), (Cohen B. , 1995).

Other studies showed the influence of decreasing intensity of background radiation on Protozoa (Planel H. , Soleilhavoup, Cottin, Tixador, & Richoilley, 1969).

Epidemiological research testified that various territories with an enhanced level of natural terrestrial radiation are marked by decreased rates of cancer morbidity ((Nambi & Soman, 1987), Hanes, 1988, (Mifune, et al., 1992), Lohen 1995).

Neruchev showed examples of flora and fauna modifications in during periods of high natural radioactivity in the environment (Neruchev, 1976) (Neruchev, 2007).

The energy absorbed from natural background radiation by the cells is very low, so it is unlikely that its effects on biota have an energetic nature; rather it is suggested that they are mediated through information transfer processes. In the case of ionizing radiation, there is radio-adaptation, resulting in augmentation of radio-resistance after irradiation at low doses. (Neruchev, 1976),

SPECIFIC PART

6. Ancient monuments

6.1 Monuments: geophysical location parameters

Nowadays, despite of all the technological evolution and tools in our hands, there are still so many unanswered questions regarding the complete use and purpose of ancient temples and megalithic monuments.

Heri (Heri, 2008) mentions that “the entire topography and geomorphology of land features are results of standing waves in the earth. The artificial monuments are built around significant naturally occurring geomorphologies”.

Trifonov argues that active tectonic zones seeded the earliest centers of Neolithic settlements (Trifonov & Karakhanian, 2004).

According to research, space distribution cities correlated with fault intersections, probably because of increased geophysical activity ((Skvortsov, 1991), (Zhidkov, Likhacheva, & Trifonov, 1999)) which can provoke systematic and progressive changes in human group behavior.

Religious places and mystical experience

Research regarding the location of 104 monasteries demonstrated that almost all of them were located along faults of various ranges or at their intersections, most are placed within earthquake intensity zones of VII-VIII degrees as well as within regions with decreased geomagnetic intensity (Fig.10) (Florinsky I. , 2010).

Various geological and geophysical factors seem to be basic characteristics of a sacred place: regional and local active faults, local magnetic anomalies, regional and local lithospheric stresses, and regional seismic activity (Florinsky I. , 2008). Along faults and at their intersections, the crust exhibits increased permeability, which due to ore concentrations and magmatic bodies generates magnetic anomalies; these anomalies are modulated by geomagnetic storms.

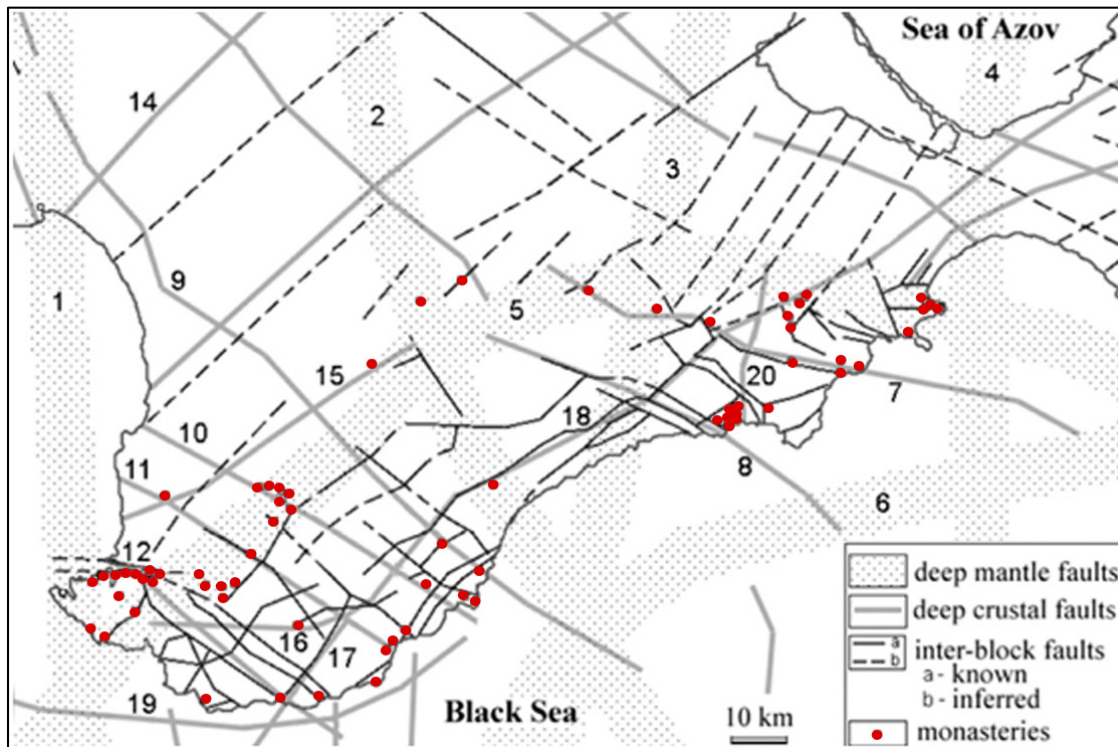


Figure 9. The Crimea: faults and monasteries redrawn data from (Florinsky I. , 2010)

In medieval complexes in the Altai Mountains, it was found that builders used ore bearing rocks, which generated magnetic micro-anomalies which were recorded in magnetometric survey (Drachev & Shitov, 2007); vegetative nervous system and emotional state disturbances were noted during visits to these sites (Voronkov, Shitov, Velilyaeva, & Voronkova, 2006).

Other examples include: the pillar, on which Saint Simeon the Stylite lived for about 40 years, as well as the St. Simeon Monastery in Syria, both located on one of the seismically active branches of the St. Simeon fault (Karakhanian, et al., 2008); Russian Orthodox monasteries are also commonly located on transregional faults at a continental scale (Fedorov, 2004) (Fedorov, 2007).

Great Tibetan monasteries have been also noted to be located in areas with higher than normal radioactivity, usually on granite. (Florinsky I. , 2008).

A correlation was also found between rock art symbols and radioactivity anomalies in 5 prehistoric Native American sites; peak radioactivity reading were located close to the symbols (Adams, 1997).

According to the study, prolonged exposure to areas with a certain radioactive materials could induce various symptoms, such as hypoxia, displacement of oxygen due to radon, fatigue, infections, mutation generated by radiation.

Mounds Megaliths and Stone Circles

Many prehistoric mounds were constructed from alternating organic and inorganic layers, similar to Reich's energy accumulators, according to Mitchel (Mitchel, 2001). He explains that the top of the chambers was covered with stone, then with a layer of turf, and then consecutive layers of clay and sod, whereas the whole structure was buried under a great mound of earth. As seen in his experiments, the base of mounds has a magnetic field; the top is the concentrator of electromagnetic energy.

Burke drew geomagnetic maps at several Native American monuments, and noticed that they were placed with great exactitude on negative (Fig. 10 left) or positive magnetic anomalies (Fig. 10 right) (Burke & Halberg, 2005).

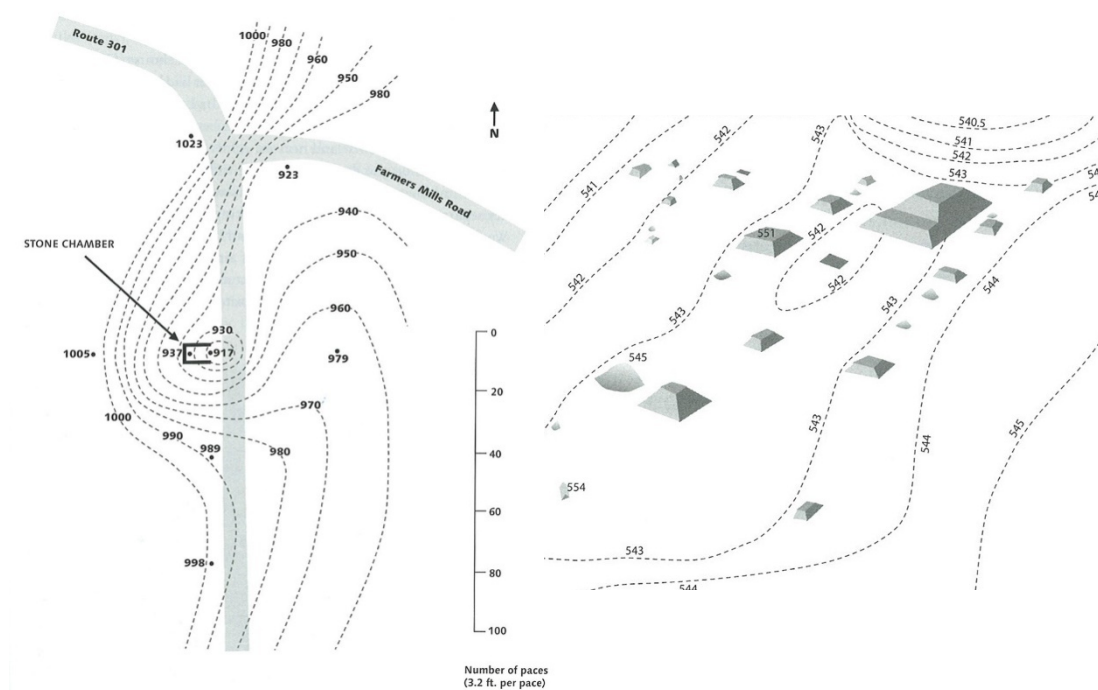


Figure 10. Left: Geomagnetic map of a Native American rock chamber in Kent Cliffs, NY
Right: Geomagnetic map of a Native American Great Mound Chamber complex in Cahokia, Illinois.
(Burke & Halberg, 2005)

Megaliths also seem to be located close to geological faults (Devereux P. , Places of Power: Measuring the Secret Energy of Ancient Sites, 1999). The highest levels of radon in Britain is in Cornwall, which also has the highest concentration of megaliths in Britain. (Fig.11)

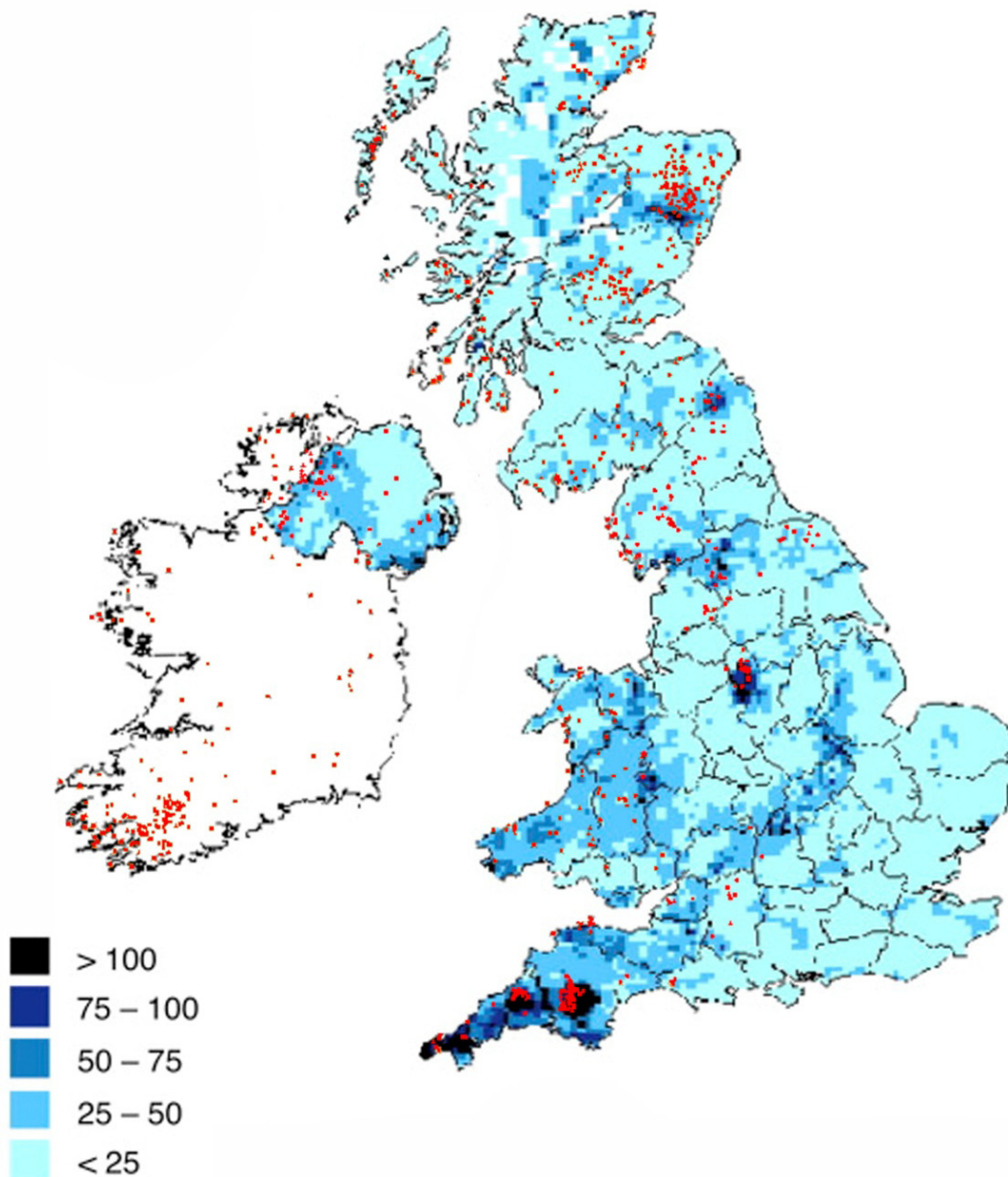
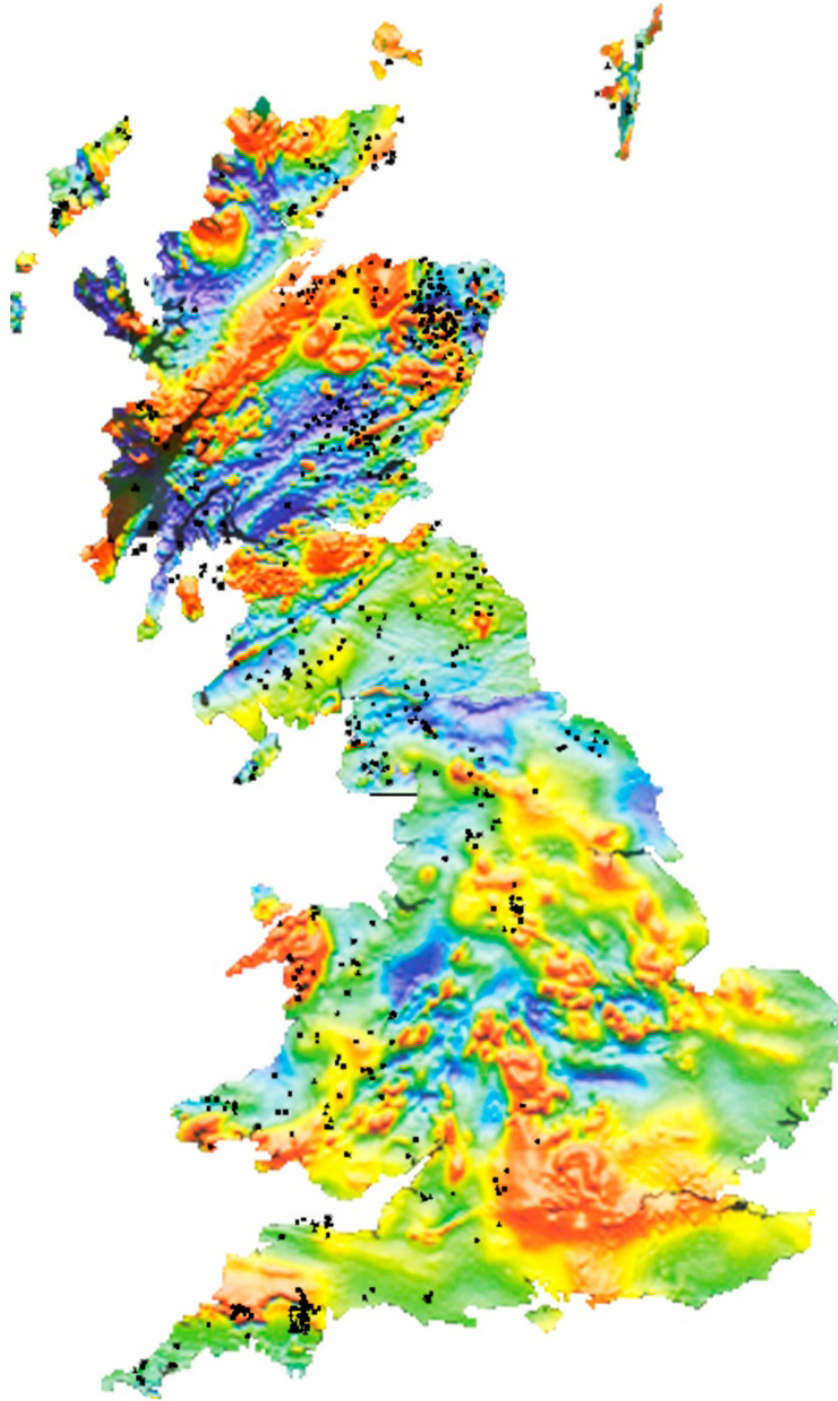


Figure 11.: Radon map of UK, with the location of megalithic monuments in red. (Source of data, British Geological Survey)



*Figure 12.: Magnetic map of UK, with the location of megalithic monuments in black. Red: highest values
Blue: lowest values (Source of data, British Geological Survey)*

Looking at the magnetic map of UK, with regards to the location of the megalithic monuments, we can observe that the vast majority are situated on magnetic anomalies, either positive or negative.

Furthermore the placement of the monuments and their relation to the gravity field shows monuments are situated on stronger or milder gravity anomalies, as well as they are located on the areas with medium or high intensity of the gravity field.

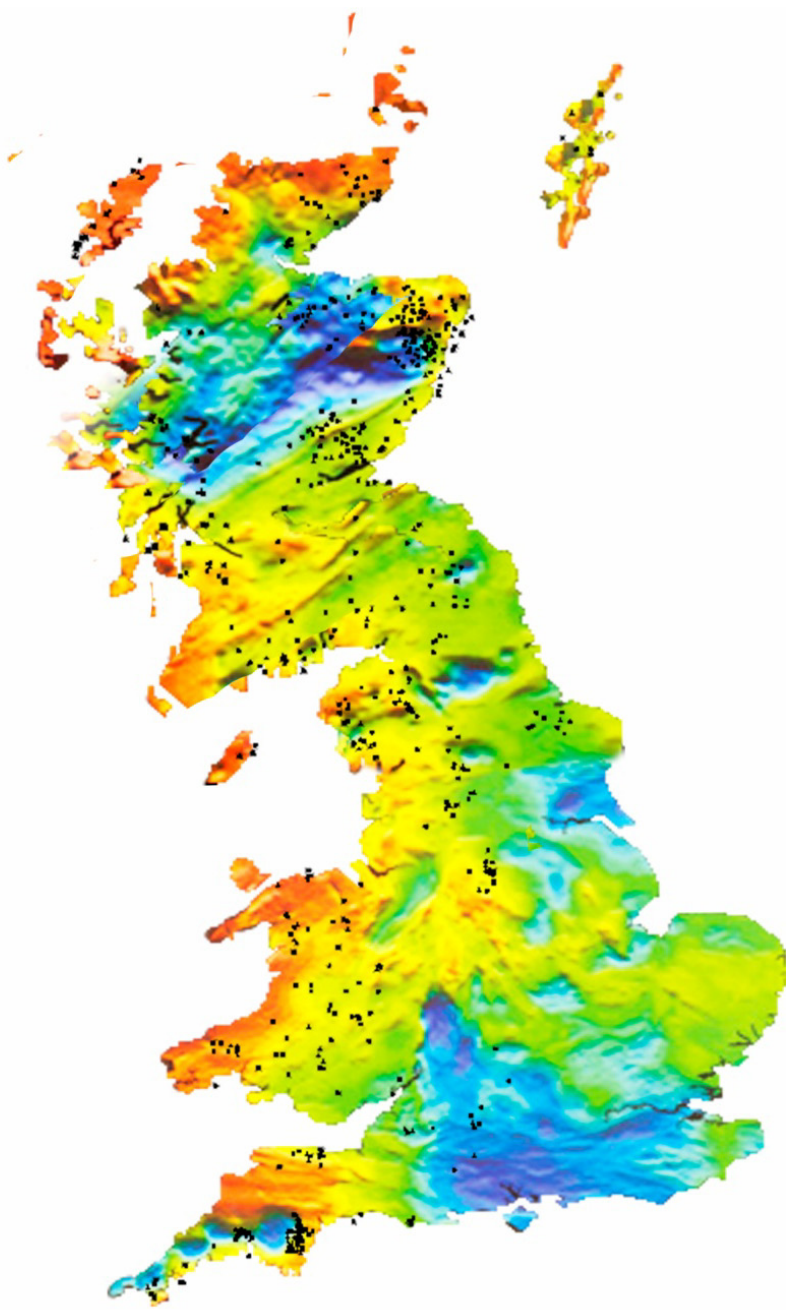


Figure 13.: Gravity map of UK, with the location of megalithic monuments in black. Red: highest values Blue: lowest values (Source of data, British Geological Survey)

Moreover, looking at the geological map of UK, we can see that a majority of megaliths are located on igneous rocks, intrusive or volcanic.

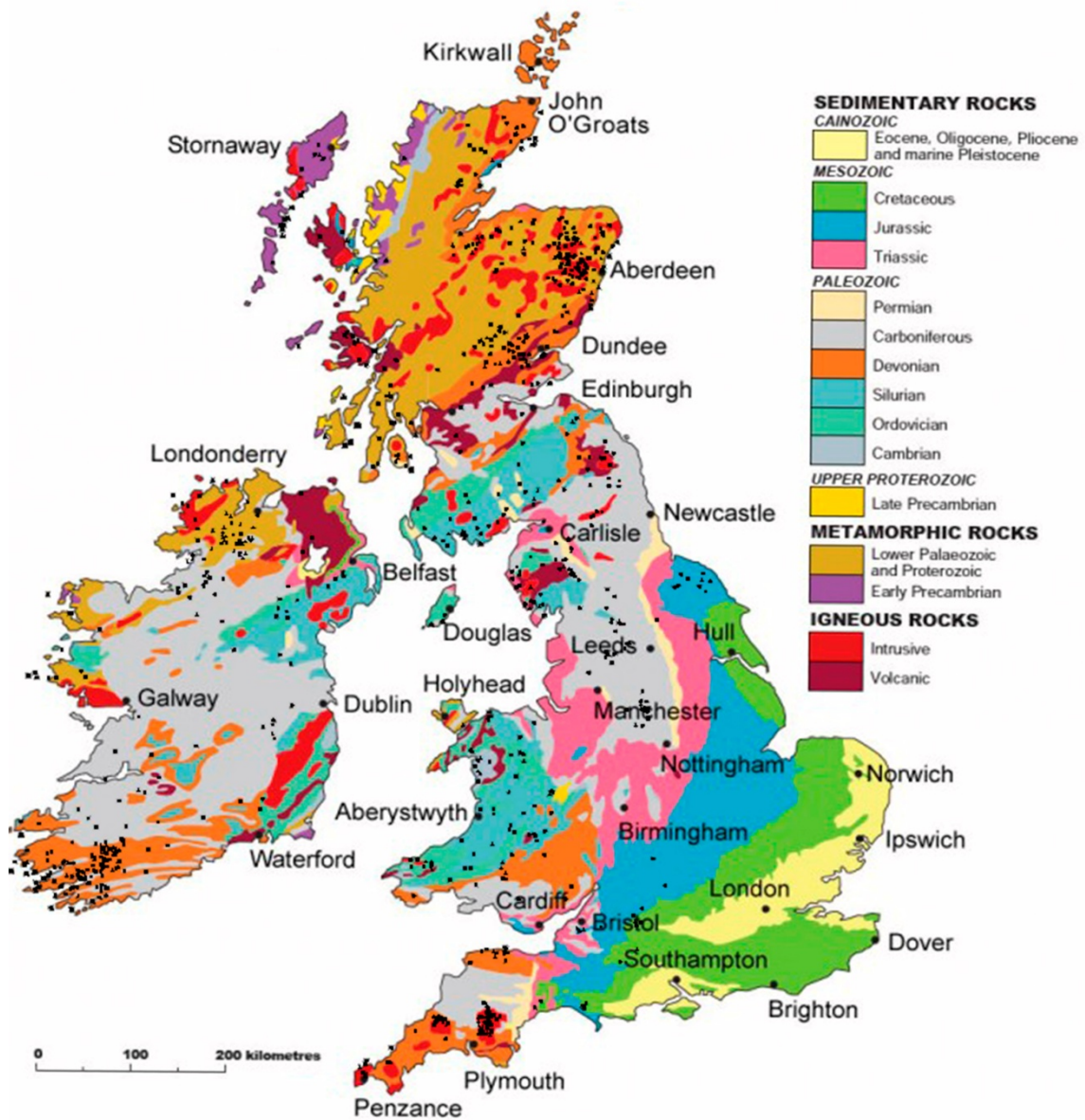


Figure 14.: Geological map of UK, with the location of megalithic monuments in black. (Source of data, British Geological Survey)

The areas of France with the highest megalithic density correspond with uranium rich zones, as well as areas high in radon, as seen in Fig. 15-16.

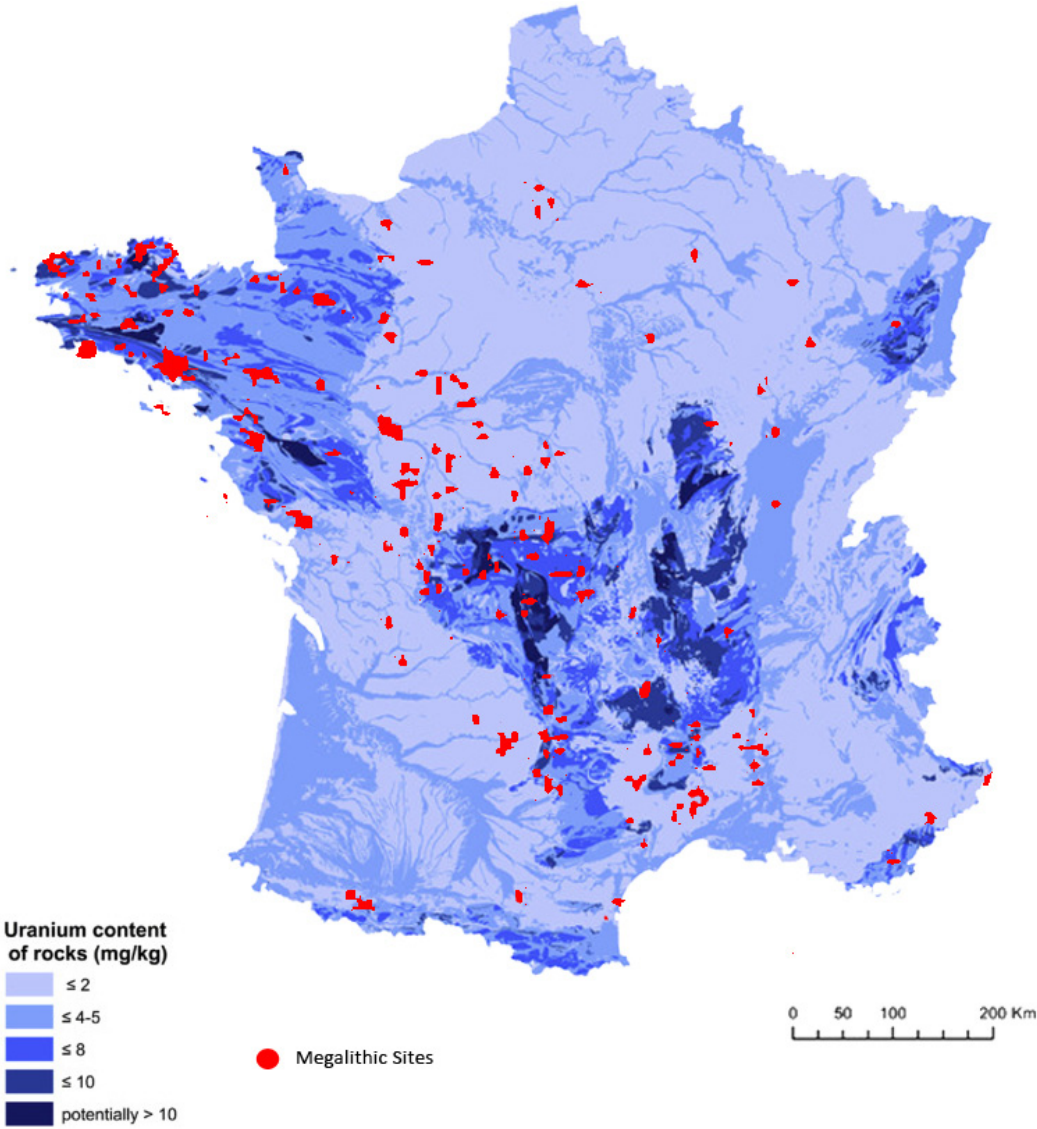


Figure 15.: Uranium content of rocks in France, with the location of megalithic monuments in red. (Source of data, Institut de Radioprotection et Surete Nucleraire)

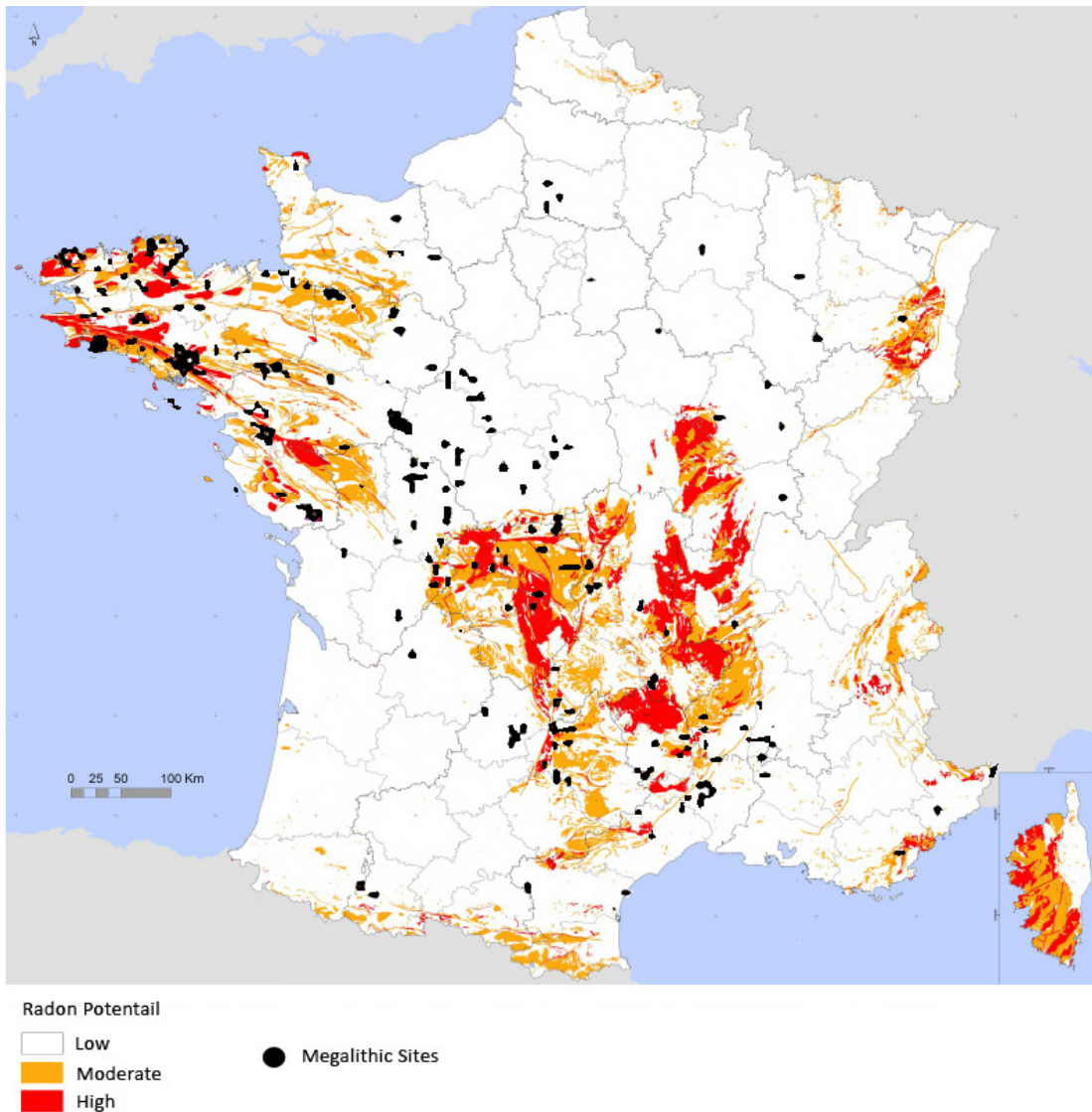


Figure 16.: Radon levels in France, with the location of megalithic monuments in black. (Source of data, Institut de Radioprotection et Surete Nucleraire)

In France, there is also a high correlation of the location of megalithic monuments and of acid intrusive (granite) or metamorphic rocks - mainly gneiss. (Fig.17)

In Spain, there a correlation of megalithic locations and high levels of gamma radiation as seen in Fig.18. Also their locations is strongly correlated with magnetic anomalies, as seen in Fig.19, and with igneous rocks, as seen in Fig.20. Most of them are also situated in locations with geological discontinuities.

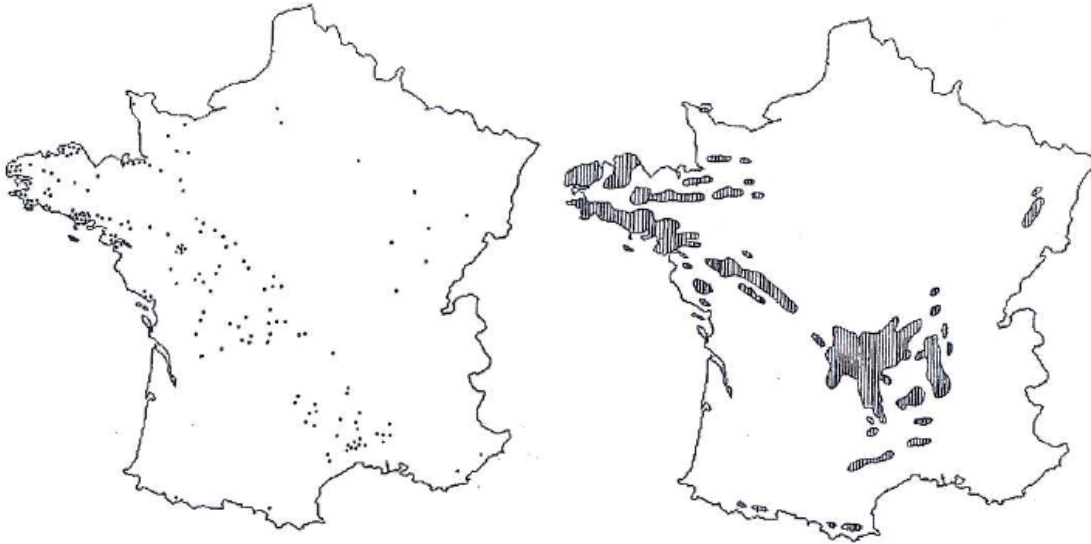


Figure 17.: Distribution of megalithic monuments (left) and location of acid intrusive (granite) or metamorphic rocks - mainly gneiss (right) in France (Kostov, 2008).

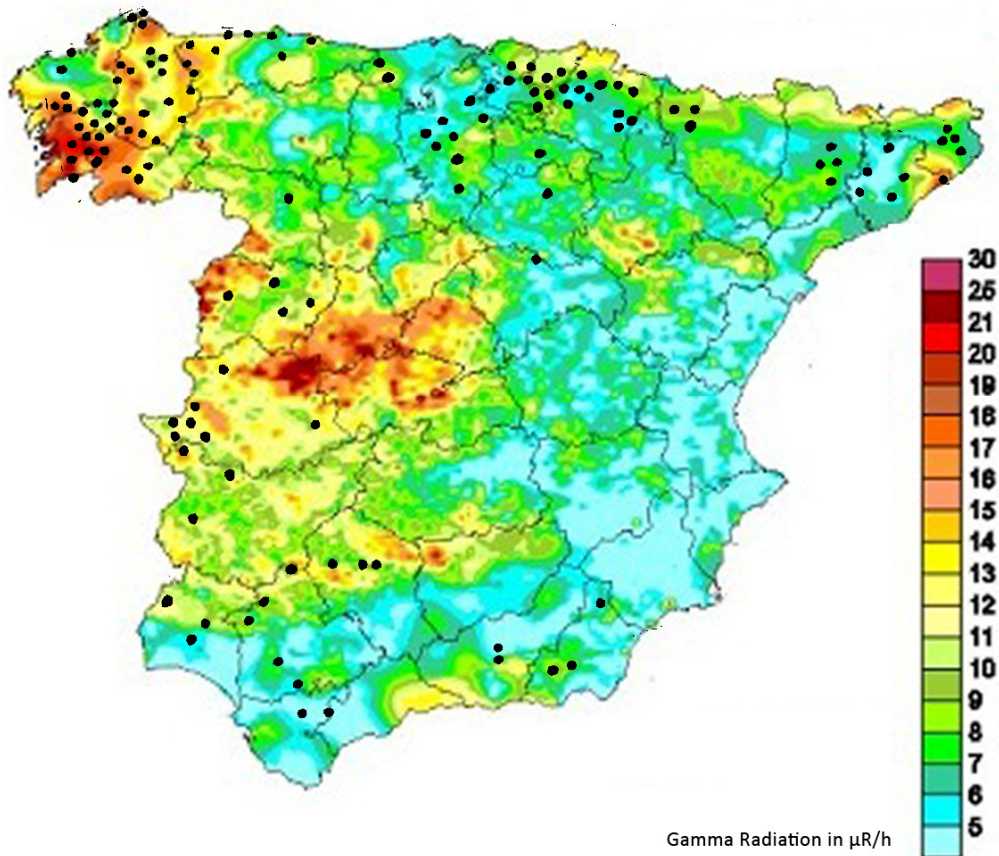


Figure 18.: Gamma radiation levels in Spain, with the location of megalithic monuments in black. (Quindós, et al., 2004).

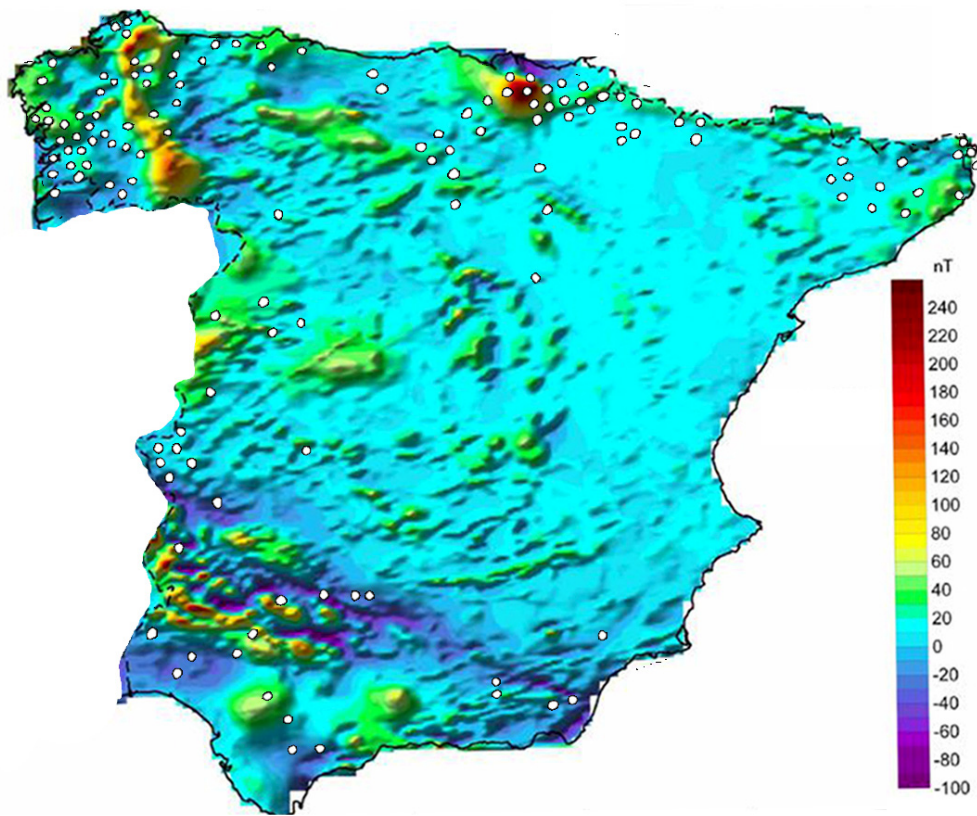


Figure 19.: Magnetic map of Spain, with the location of megalithic monuments in white (Martínez, 2012).

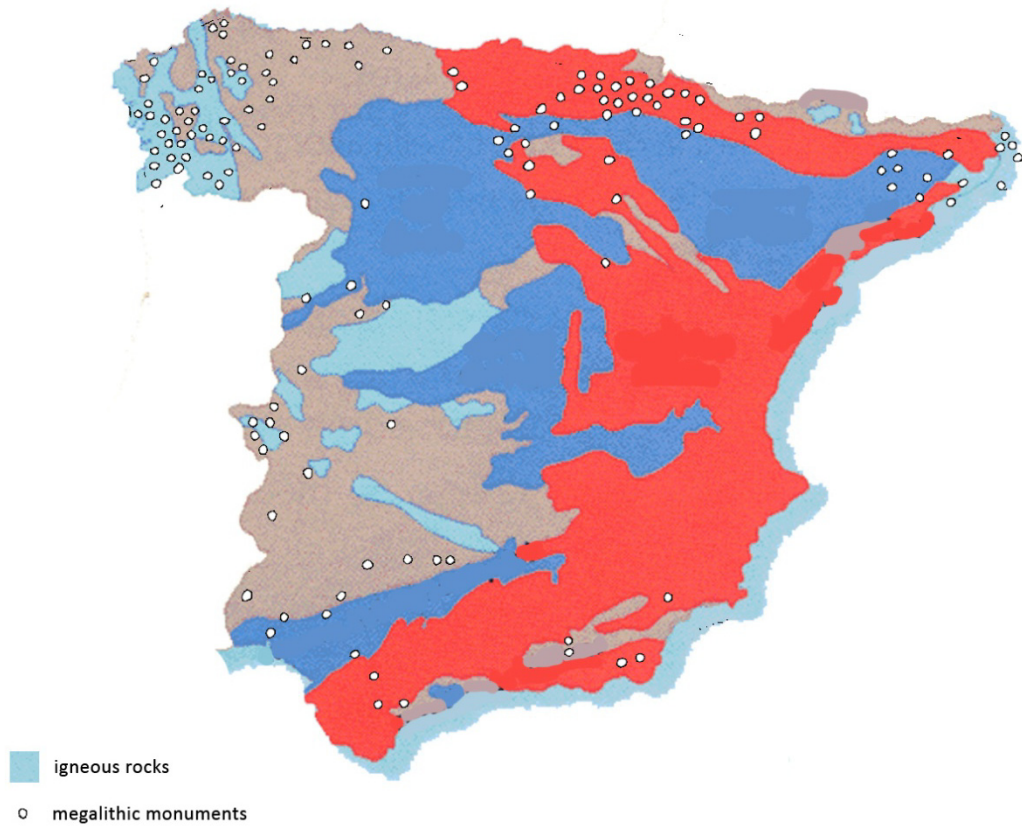


Figure 20.: Geological map of Spain, with the location of megalithic monuments in white. (Source: *Historia Geológica de España*.)

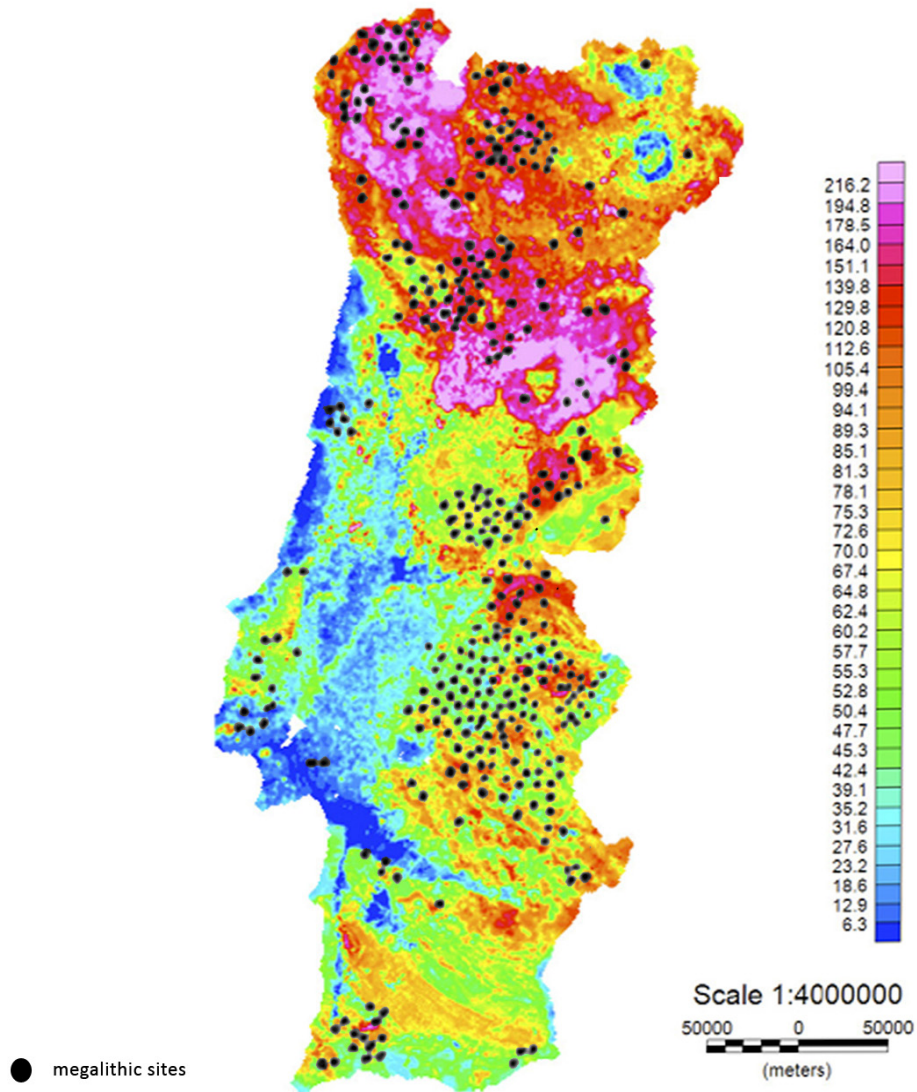


Figure 21.: Radon map of Portugal, with the location of megalithic monuments in black. (Source: Geological Survey of Portugal)

In Portugal, there is also a very high correlation of the location of megalithic monuments and the highest radon levels (Fig.21), as well as with localization of acid igneous intrusive (granite, granodiorite, tonalite) and volcanic rocks (Fig.22).



Figure 22.: *Distribution of megalithic monuments (left) and localization of acid igneous intrusive (granite, granodiorite, tonalite) and volcanic rocks (right) in Portugal (Kostov, 2008)*

The Dragon Project, carrying out various measurements in ancient monuments in the UK, found noteworthy anomalies in radioactivity, magnetism, infra red radiation, ultrasounds and light phenomena. (Devereux P. , 1999)

Ultrasound measurements in various megaliths in UK showed no readings inside the stone circles; the most active ultrasonic recording was at full or new moon periods. In Rollright Stones the pulsing effect would start 8-10 minutes before sunrise at new moon and 25-35 minutes at full moon and would last for 2-3 hours. There was no pulse recording later in the day, as well as in the summer. Recordings at sunset also showed very weak levels. It was also found that peaks of ultrasound intensity coincided with troughs in sunspot activity. Radiation levels were noted to be higher within the circle than outside (Devereux P. , 1999).

Ultrasound measurements were also taken in Rollright stones, a megalithic stone circle in the UK, (Robins, 1985); the stones were found to have various anomalies and emit a specific pulse (Fig.23).

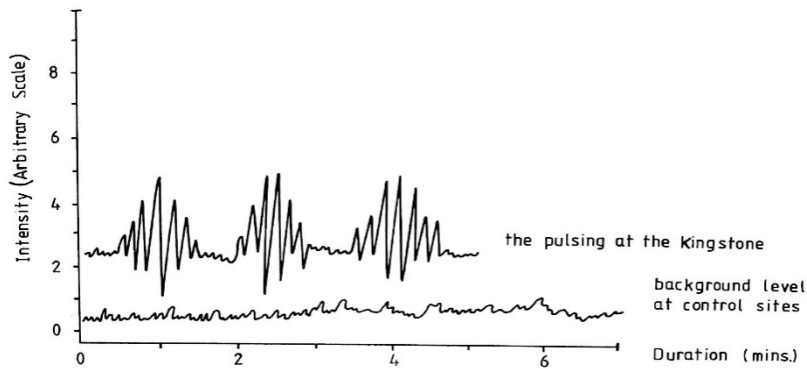


Figure 23: Ultrasound measurements in Rollright Stones, UK (Robins, 1985)

Magnetic field measurements at Rollright Stones (Brooker, 1983) and showed that the field within the circle was significantly lower than outside, as well as that the field had bands of relatively higher or lower magnetic intensity within the circle in a form of a spiral. The results from Rollright stones were published by English Heritage 1987 for archaeological purposes.

In Machrie Moor Stone Circle, radiation measurements were 33% higher than background; furthermore it is built on a fault line. Baildon Moor Stone Circle is also located on the edge of fault lines; Moelty Uchaf had radiation reading 53% higher than background. Dystryrn Ardudny circle is located directly on the Mochras fault; Chun Quoit has 123% higher radiation inside the circle than outside; Stamon Circle had zero reading inside the circle. Boskednan Circle had 50% lower radiation than background. The measurements resume to normal outside the circles. (Devereux P. , 1999)

Henges were ancient stone monuments with a U shape ditch, where the open part of the ditch is not cut natural ground. According to Burke, these were constructed to concentrate ground electromagnetic fields (Burke & Halberg, 2005). He explains that earth currents flow close to the surface in the top 60 cm; creating a 90 cm deep ditch in the ground tends to block that flow.

Therefore when ground current is attempting to flow across a henge it will be blocked by the ditch, so it will flow around it following the path of least resistance which is the unbroken ground in the middle of the U. Consequently all the ground currents will concentrate here in order to enter inside the area enclosed by the henge ditch.

Silbury, a prehistoric artificial chalk mound, has a ditch with two paths of least resistance for ground currents, which had the peak electric measurement.

| Position of bottom electrode from summit | Reading in millivolts | Extrapolated to mV/km |
|---|------------------------------|------------------------------|
| Due north | -15.8 mV | -308 mV/km |
| Northeast | -21.9 mV | -289 mV/km |
| Due south | -11.2 mV | -148 mV/km |
| Southwest | -17.0 mV | -224 mV/km |
| 240 degrees west | -47.8 mV | -630 mV/km |

Table 3. Readings of electrical ground charge at different positions at Silbury Hill, England (Burke & Halberg, 2005)

Aerial surveys of airborne electrostatic fields demonstrated that over artificial mounds the readings had a maximum value (Harisson, Heckscher, & Lewis, 1971).

According to Burke, hedges were mostly built on soils rich in chalk, above underground water bodies (Burke & Halberg, 2005). According to his research, megalith builders would scrape the soil until chalk was exposed directly to the air, so that the negatively charged rock would attract the positive atmospheric ions.

As mentioned in previous chapter, underground water running through chalk has positive electric charge whereas the chalk has negative. Positive ground current flows from the water to the chalk, attracting the beneficial airborne negative ions along with it. A small powerful magnet can conduct airborne ions on a selected path.

Stonehenge is made by Preseli bluestone, a highly magnetic stone due to dolomite content, as well as by softer volcanic and calcareous ash stones, such as rhyolite. Dolomite is a type of limestone with high conductivity and a high magnesium content (Burke & Halberg, 2005).

Measurements made in Stonehenge (David & Payne, 1997) show clearly an intense geomagnetic anomaly in its location (Fig.24). Furthermore, the ground resistivity survey showed clearly a path of least resistance, The currents ability to travel is determined by how many free or easily displaced electrons are in the molecules of the soil; higher number of free electrons signifies higher conductivity. The ground resistivity survey at Stonehenge shows a path of least resistivity (Fig.25); the ditches block the telluric currents from dispersing and conduct it along with the air ions along the Avenue (Cleal, Walker, & Montague, 1995).

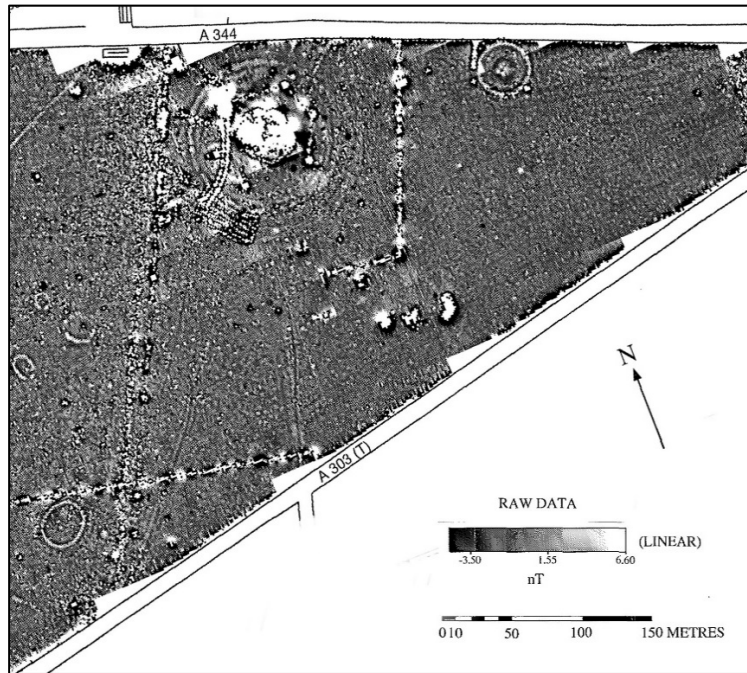


Figure 24: Geomagnetic field intensity in Stonehenge (David & Payne, 1997)

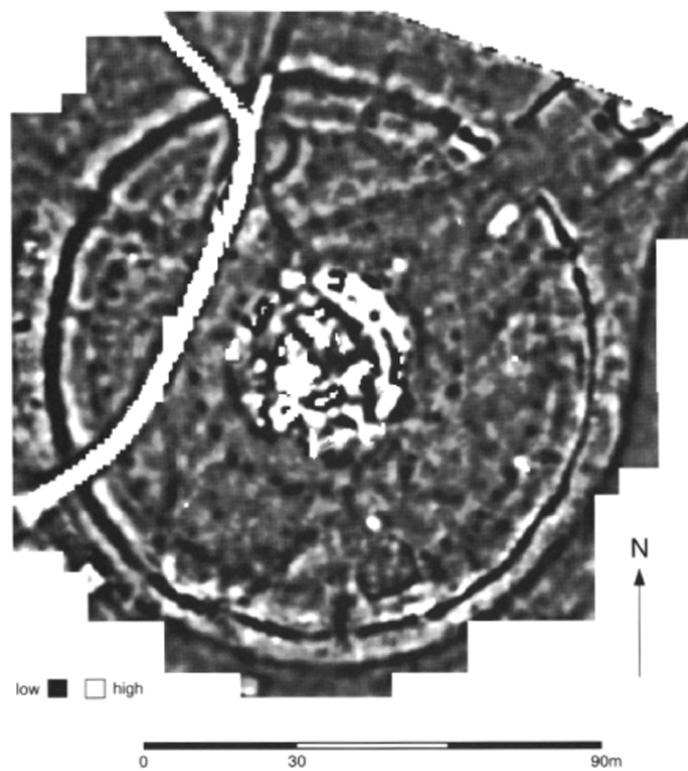


Figure 25: Ground resistivity in Stonehenge (David & Payne, 1997)

Avebury Circle is made by stones which contain black magnetite -100nT and each stone is a weak but large magnet oriented with the south pole pointing north, in a clockwise direction. Only the two stones at the two intact causeways -undisturbed by the ditch

ground- were in 90 degrees difference direction from the rest. Replicated in the laboratory, Burke and Halberg demonstrated that the aligned magnets conduct airborne ions in one direction. As they mention, the same principle of moving ions in one direction by making the magnets stringer as they move around the ring is used in cyclotrons or colliders (Burke & Halberg, 2005).

Therefore they concluded that the stones have the proper design and structure to conduct airborne ions between them into the central circle. The stones' magnetic orientation in the circle would then contain the ions by circling them around like the supercollider in lower speed. They noted that the stone rows ending in stone circles connect the circles to underground water.

Devereux noticed that many times people got electric shocks when touching the stones, which is a sign of their electromagnetic charge (Devereux, Steel, & Kubrin, 1989).

Robbins (Robins, 1985) suggested that microwave energy from the rising sun energizes electrons within stones' atomic lattice; microwave energy has been shown experimentally to be able to transduce through the lattice structure to emerge as a pressure wave (Devereux P. , 1999).

Burke (Burke & Halberg, 2005), carrying out measurements in various megalithic monuments and temples in America, found that all of them where situated on magnetic or gravitational anomalies and exhibited various anomalous geophysical readings (Fig.26).

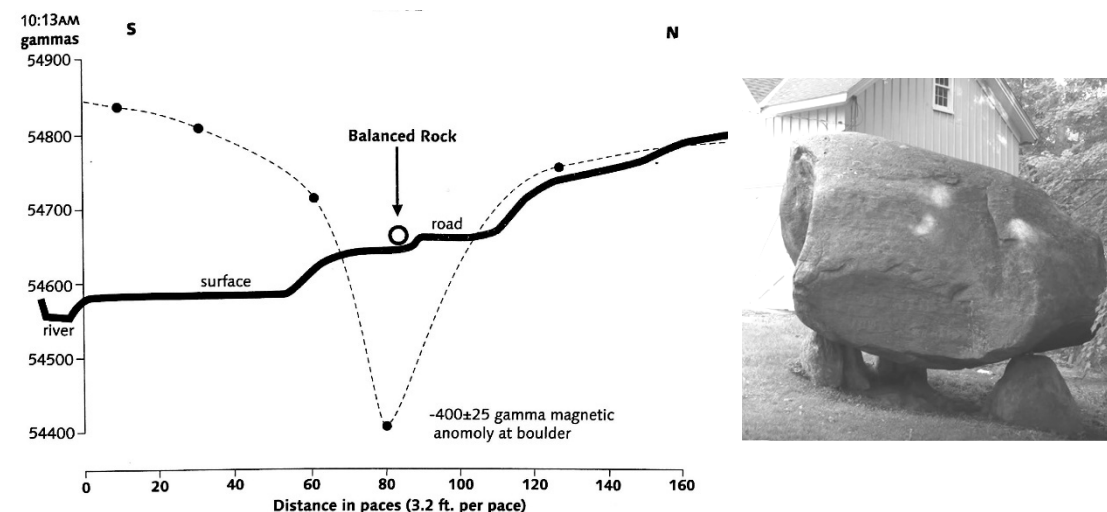


Figure 26: Geomagnetic field intensity on the location of Balanced Rock (Burke & Halberg, 2005)

One of the largest megalithic site in Europe is Carnac in France; Carnac is located in the Morbihan peninsula, where there are 11000 stone rows in total; the ground has high chalk content which is appropriate for natural electrical current generation.

Also the peninsula is the most seismically active region of France, surrounded by thirty-one faults; seismic stresses can generate electrical currents in the ground as previously seen.

Mereaux found that four major megaliths are located straight along a fault line, as seen in Fig.27 (Mereaux, 1992).

He used magnetic gradiometer and ground electrodes to perform measurements and found anomalies in Carnac megaliths from -400 to + 1,100 nT.

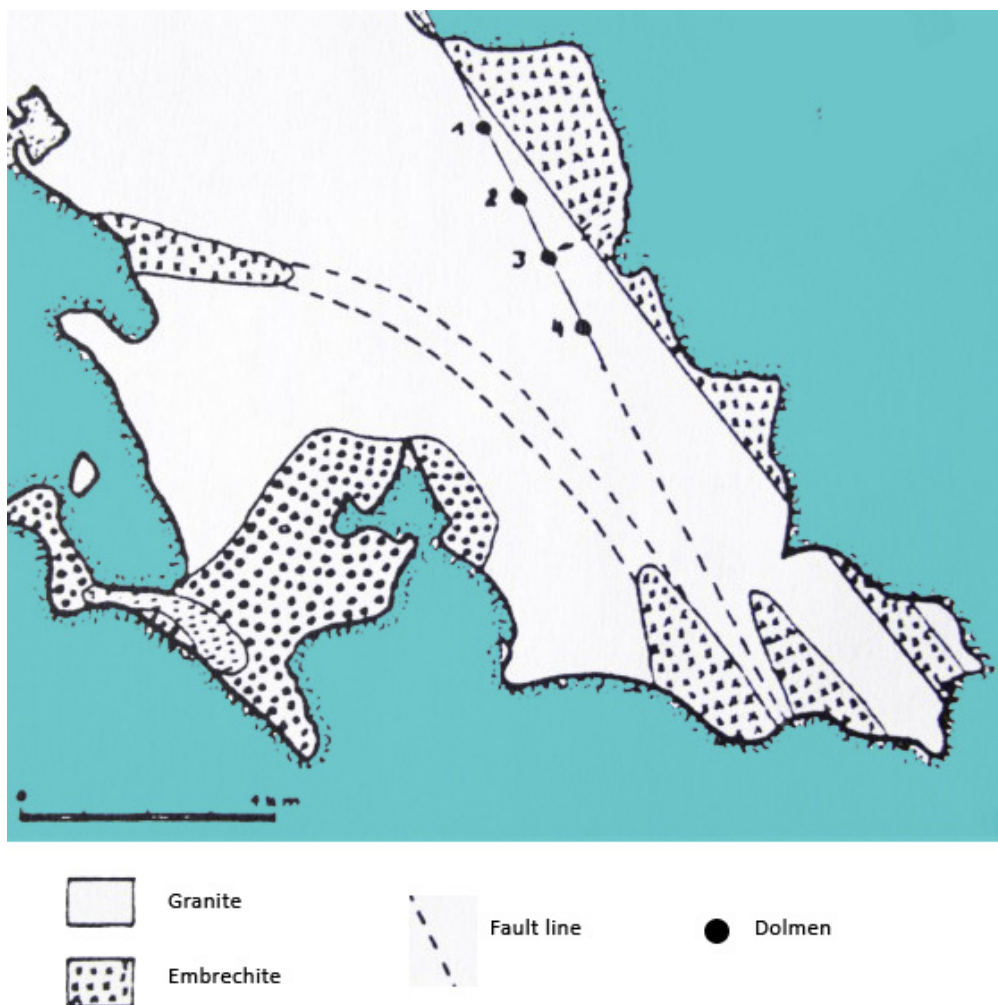


Figure 27: Megaliths in Carnac built directly in line above a fault (redrawn after Mereaux, 1992)

Doing research in other megalithic sites, he concluded that the ancient stone rows that were built on the edges of magnetically, seismically and gravitationally zones (Mereaux, 1992). He also noted that the stones attract lighting, as they have negatively charged currents at their base.

According to another study, there is a high correlation between megalithic sites in Bulgaria and locations with quartz-bearing igneous (granites) or metamorphic (gneisses) rocks (Kostov, 2008). The geology of these areas is related mainly to regions of distribution of volcanic or sedimentary rocks.

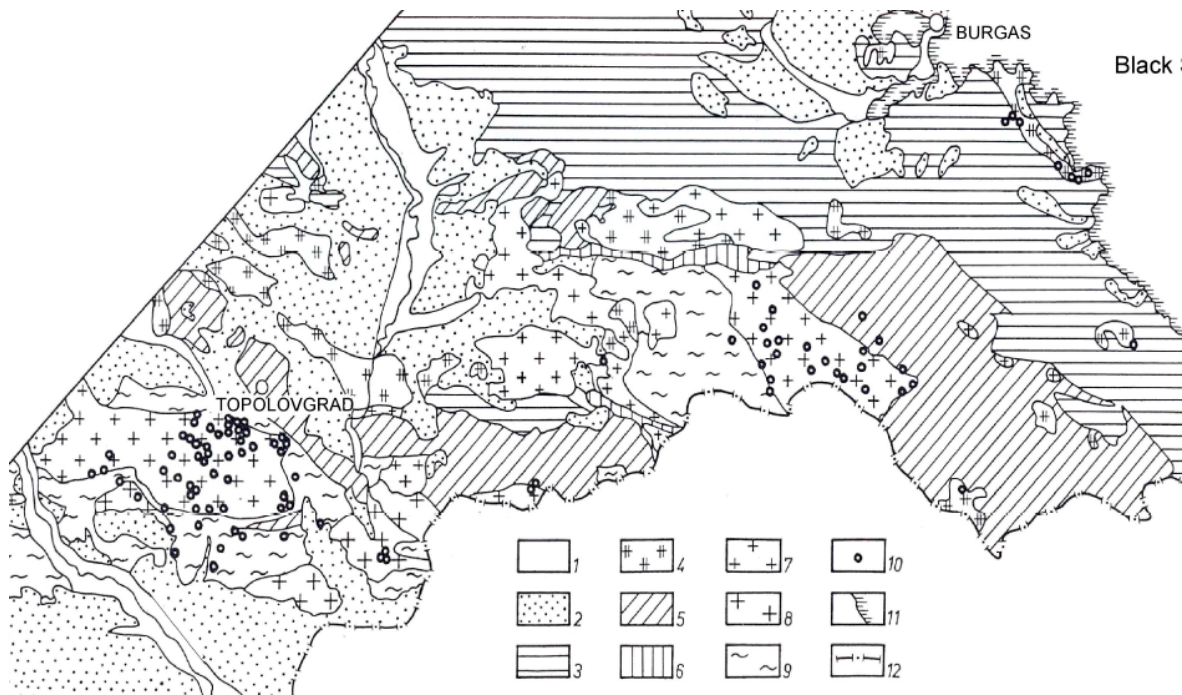


Figure 28: Geological map and location of megalithic sites in SE Bulgaria (Kostov 2008)

1. Quaternary, alluvial sediments; 2. Neogene and Paleogene, sedimentary rocks; 3. Upper Cretaceous, sedimentary rocks; 4. Upper Cretaceous, igneous rocks; 5. Jurassic and Triassic, sedimentary rocks; 6. Paleozoic, sedimentary rocks; 7. Paleozoic, granites; 8. Precambrian, metamorphosed granites; 9. Precambrian, gneisses, schists, amphibolites and quartzites; 10 – one or more megalithic sites; 11. Black Sea; 12. border with Turkey

Pyramids

According to research, protrusions such as artificial hills or mountains on the earth's surface can attract at their top atmospheric positive electric fields, as negative charge from the ground area is concentrated in the highest point (Burke & Halberg, 2005).

Pyramids, are such protrusions, which when built on electrically active locations such as conductivity discontinuities, can amplify natural electromagnetic energy. Pyramids can concentrate the ground electric charge at the top as well as gather the atmospheric electric field lines at the top. Their height and width proportions play an important role for that capacity; a larger pyramid base can concentrate more ground current at the top.

Research shows that electric charge concentrates at sharp edges (Markson & Nelson, 1970), according to which the electric charges at the Mexican volcano Popocatepetl are in the range of thousands of volts per meter (Markson & Nelson, 1970).

According to research, rainwater flowing through underground channels in volcanic rock can generate electrical charge and magnetic fields, concentrated at the highest points in La Fournaise of Madagascar (Zlotnicki & Le Mouel, 1990).

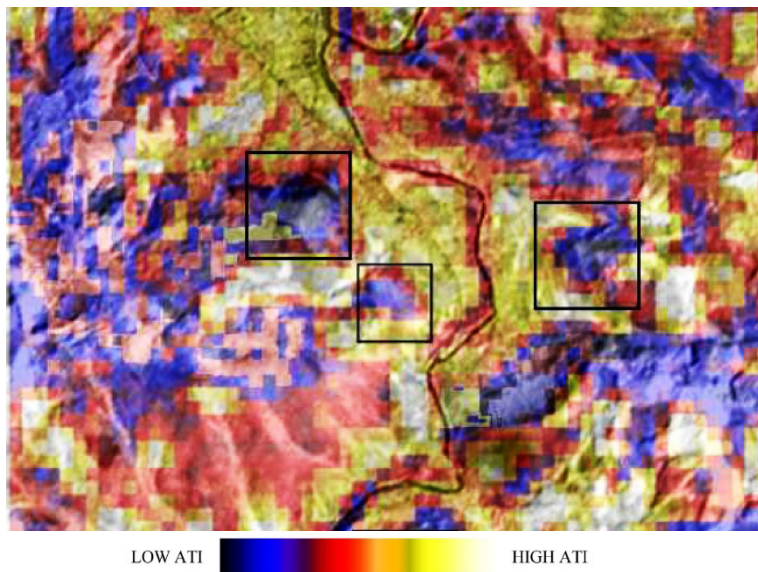


Figure 29: Thermal survey in Visoko Pyramids, Bosnia showing the location of the two main pyramids (Smailbegovic, 2006)

Similar measurements exhibited anomalous thermal readings in Visoko pyramids (Smailbegovic, 2006) (Fig.29).

Bear Butte is a natural pyramid shape, with a height of 1400 m, formed by igneous rock; it is a sacred site for the Lakota tribes. A very strong magnetic anomaly was measured at the top of 900 nT (Burke & Halberg, 2005).

Akapana is an artificial pyramid in Bolivia built on top of an underground water vein, in the village of Tiwanaku, a location full of seismically active faults and rich in basalt and andesite which are highly magnetic. Its foundation is made of andesite, followed by consecutive layers of clay, which is electrically conductive, and from lake pebbles high in copper, the most electrically conductive mineral after gold. A special drain system was built in the interior, made of andesite and sandstone, including closed channels inside and open channels outside, creating small waterfalls and finally cascading to the andesite foundation five stories below. According to archaeologist Arthur Posnansky, the stone buildings atop Akapana were made of andesite (Burke & Halberg, 2005).

Measurements in the lost World Pyramid in Guatemala had a very strong ground electrical current of -600 mV/km; at the top of the pyramid the airborne measurement was 1100-1720 V (Burke & Halberg, 2005). As the ground and atmosphere have opposite charges, it is expected that the airborne readings will increase with height; the difference is normally 90V but in such an electrically active location it was 540-900 V. The measurement on the corners of the pyramid demonstrated a 45-60 V/inch higher value.

San Lorenzo plateau in Mexico is comprised of over two hundred small mounds, built with basalt from the Tuxtla volcano; fourteen springs at the base of the hill are linked to twenty artificial lakes atop the hill, lined with bentonite, highly magnetic stone. Water coursing through basalt creates veins for electric current, so the whole plateau is highly electrically active (Burke & Halberg, 2005).

Recent studies also link pyramids in Latin America with underground water faults or manmade tunnels. (Chavez, Tejero, Cifuentes, Argote, & Hernandez, 2015), found that the main pyramid in Chichen Itza is directly located on top of an extensive underground water body (a cenote), through the use of geoelectric tomography (Fig. 30).

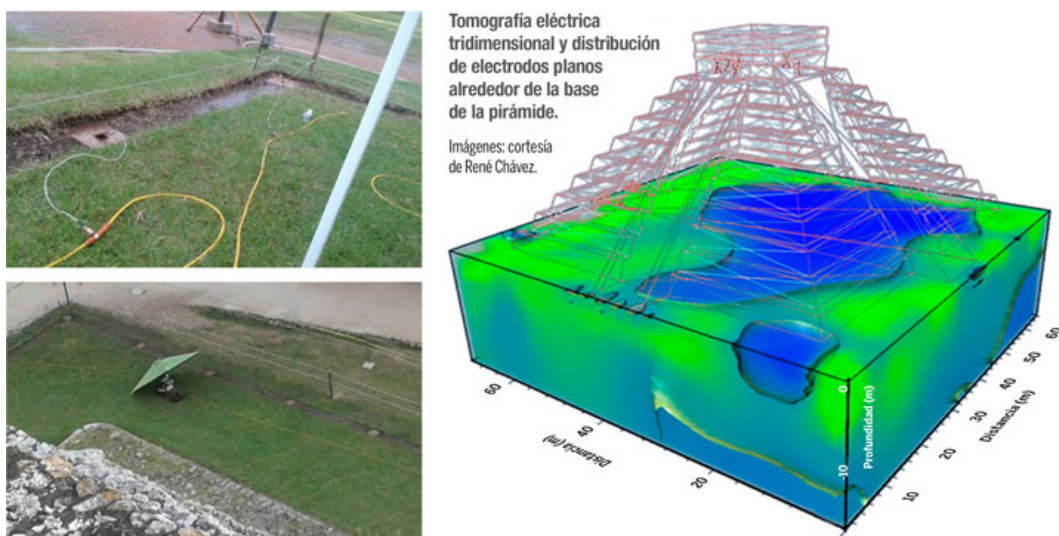


Figure 30: Electric tomography carried out at the pyramid of Chichen Itza showing the presence of underground water underneath it (Chavez et al, 2015)

The pyramids in Egypt are built with high magnesium content limestone, which gives them an electrically conductive core. The Red pyramid's core is built with red limestone, high in iron content, whereas the outer casing is made by white Ture limestone, an insulator that prevents the loss of the core's electrical charge into the air. So the top of the pyramid would be the only area that electrical charge could be exposed, which was possibly made of iron (Burke & Halberg, 2005).

The Pyramids in Egypt are built on limestone, on top of the Nile Valley aquifer. The water flow in aquifers generates electrical currents, as seen previously. The Giza plateau is located on the intersection of two major limestone layers, and the three pyramids are situated on top of multiple aquifer layers meet.

Positive charge from the hot wind and negative charge generated from the water flow through limestone can cause the top of the pyramid to glow (Burke & Halberg, 2005). When a pointed structure is charged enough to glow, ions get conducted downwind (Markson & Nelson, 1970).

According to Chizevskii "When a metal needle is subjected to a strong negative charge, electrons begin to escape rapidly from its sharp point, ie an avalanche of electrons of high kinetic energy is caused. This process is enhanced by molecules of atmospheric oxygen owing to the property of oxygen atoms to extract electrons from metals. This phenomenon is known as electron or electrostatic emission. We used sharp needles because the quantity of electricity is directly proportional to the square root of the surface curvature" (Chizevskii, 1968).

As a result, pyramids built on geophysical anomalies can function as accumulators and emitters of electromagnetic energy.

Ancient Greek Temples

According to (Stewart & Piccardi, Seismic faults and sacred sanctuaries in Aegean antiquity, 2017), archaeological and geological investigation for sites in Ancient Greece suggest an intimate relationship between seismic faults and the sacred sanctuaries. He mentions, "Carving, reliefs and inscriptions on fault surfaces suggest important sacred sanctuaries, particularly those with oracular functions, may have been deliberately built astride active fault traces".

In Ancient Greece, The Asklepieia temples were created with the scope of healing. Peloponnese is an area of Greece with the highest density of Asklepieia. According to the research of (Farmaki, 2013) on this area, the vast majority of the temples were located on a fault, or very near one (Fig.31).

Furthermore, looking at the geological map of Peloponnesus, the most important temples are located on geological discontinuities. (Fig.32)

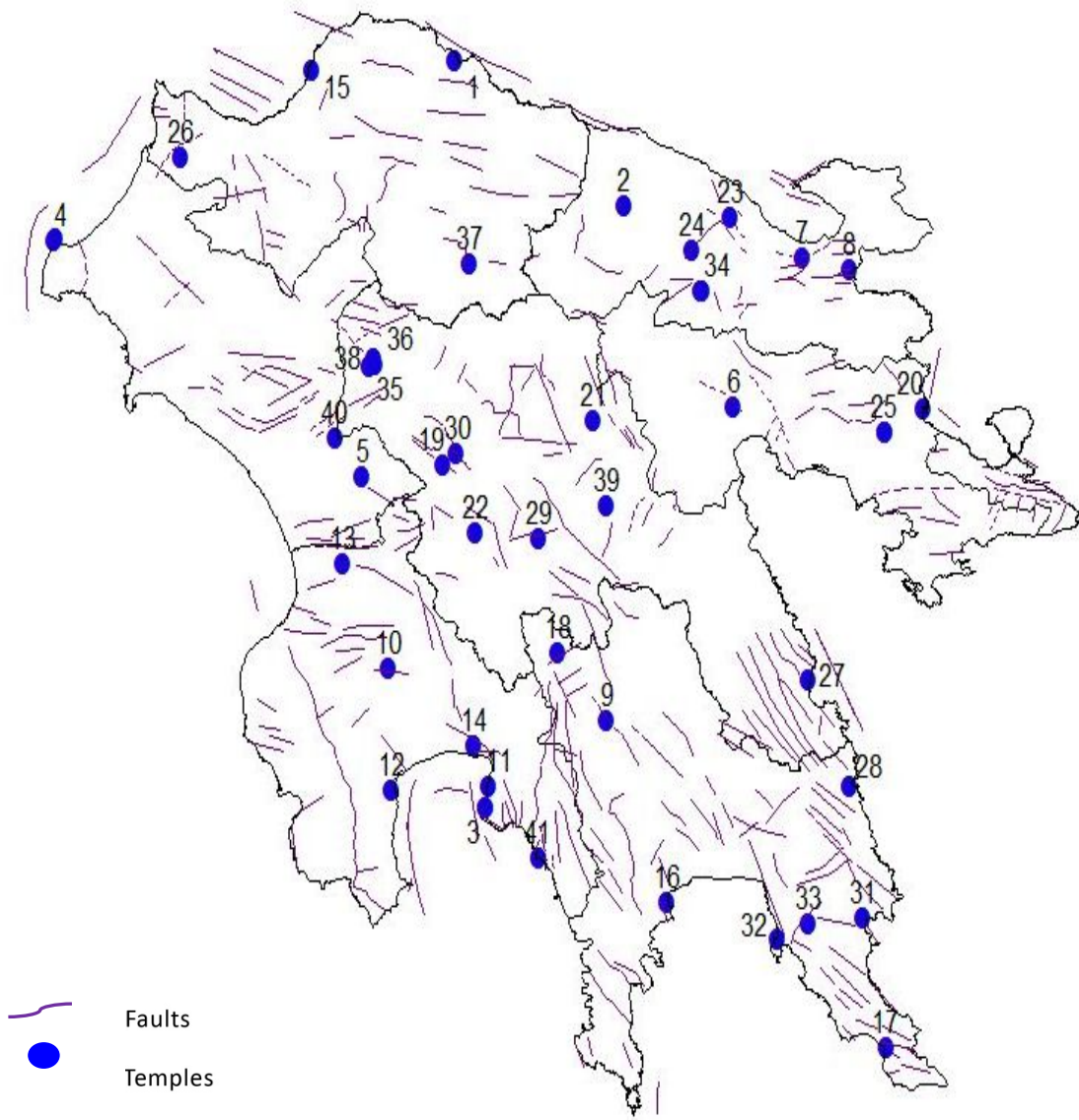


Figure 31: Map of Peloponnese, Greece, indicating locations of Temples of Asklepios and fault lines (Farmaki, 2013)

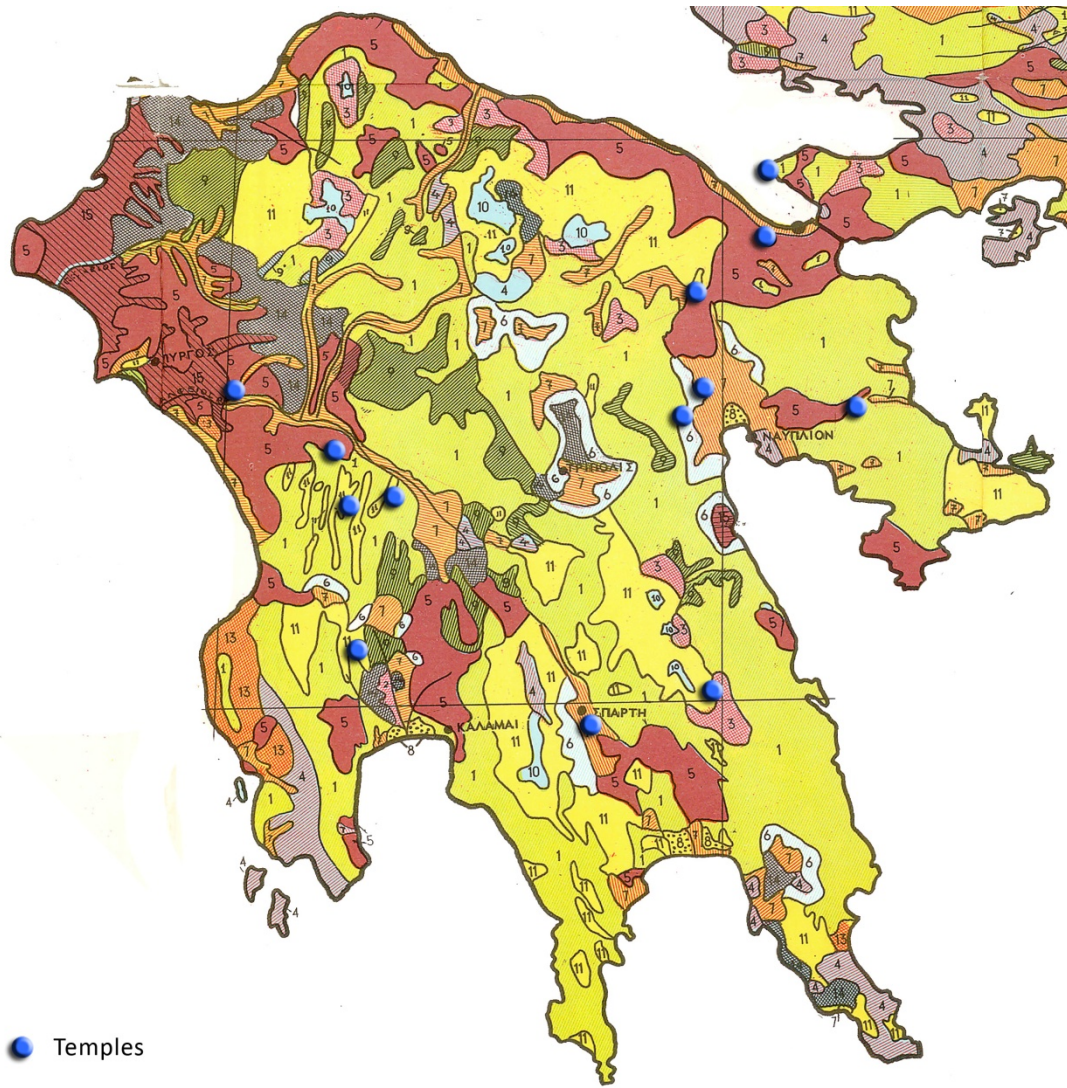


Figure 32: Geological Map of Peloponese and locations of most important Temples, Greece (Source of data: G.K. Georgalas, Grand Encyclopedia of Greece)

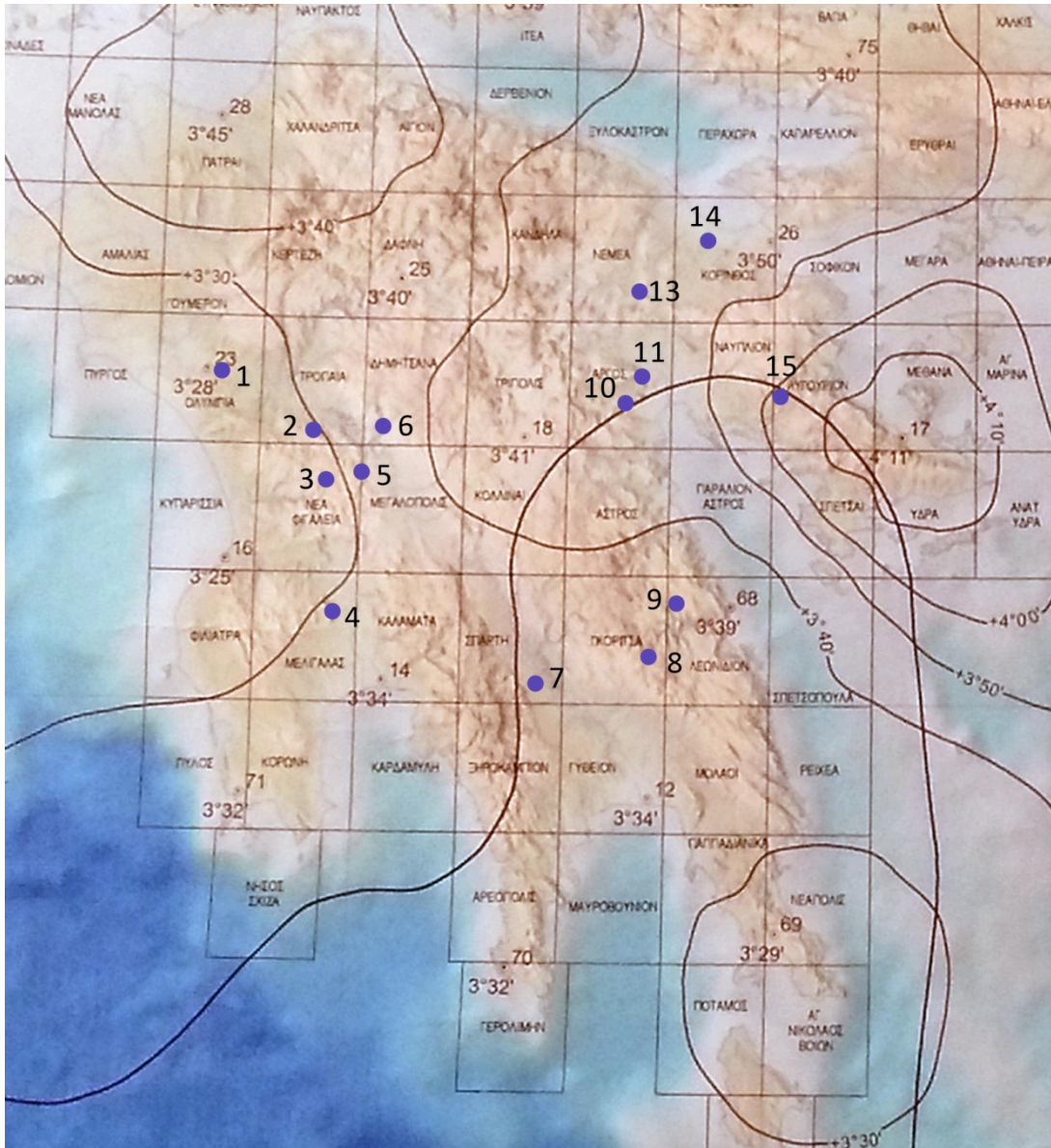


Figure 33: Magnetic Map of Peloponnese and locations of most important Temples (data from Geographic Survey of the Greek Army)

1. Temple of Hera, Olympia
- 2 Temple of Asklipios, Alifeira
3. Temple of Epicurius Apollo
4. Temple of Asklipios, Messini
5. Temple of Lykaios Zeus
6. Temple of Asklipios, Gortyna
7. Temple of Apollo Amycles
8. Temple of Apollo Maleatas
9. Temple of Apollo Tyritas
10. Temple of Asklipios, Argos
11. Temple of Apollo Deiradiotis
13. Temple of Zeus, Nemea
14. Temple of Asklipios and Temple of Apollo, Corinth
15. Temple of Asklipios, Eepidauros

Furthermore, the majority of the most important temples in Peloponnese are correlated with magnetic anomalies, as seen in Figure 33.

In Crete, Greece, there also seems to be a correlation between major fault sites and the most important temple locations, including four Temples of Apollo, the Temples of Asklepeios in Corinth and Epidaurus, the Temple of Zeus, the Temple of Hera. (figure)

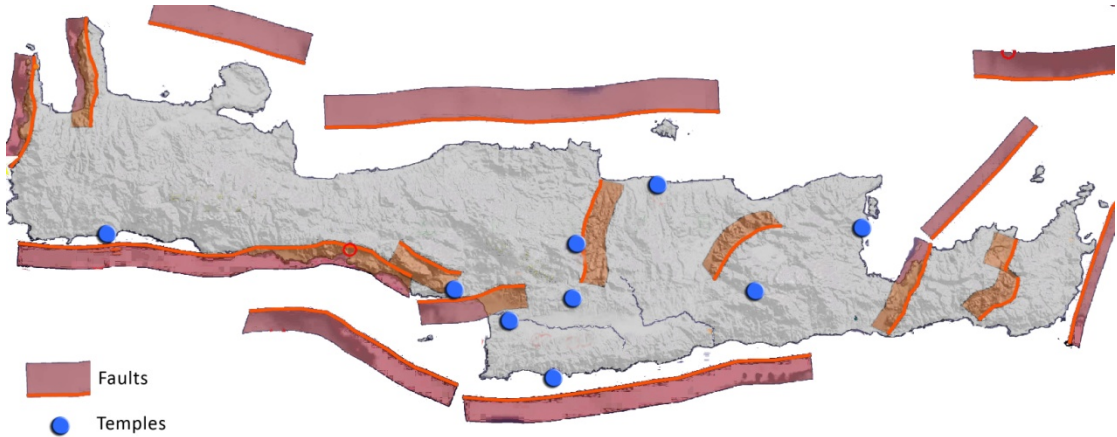


Figure 34: Faults map and locations of temples in Crete, Greece (Source of data: Greek Database of Seismogenic Sources)

Also, looking into the geological map of Crete, all the temples fall on discontinuities, which as seen in previous chapters are responsible for generation of ground electrical currents and various geophysical anomalies.

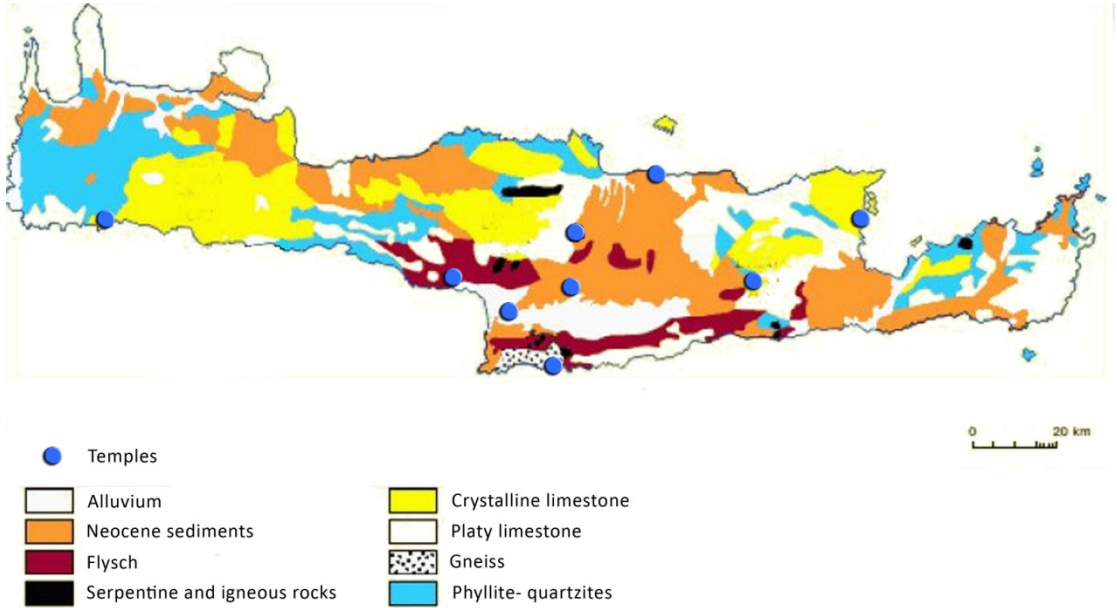


Figure 35: Geological map and locations of temples in Crete, Greece (data redrawn from Zulauf et al, 2018)

In mainland of Greece, the most important temples, including the Delphoi Oracle, the Oracle of Dodoni, the Necromaneion of Aherontas fall on major fault zones. (Fig.36)

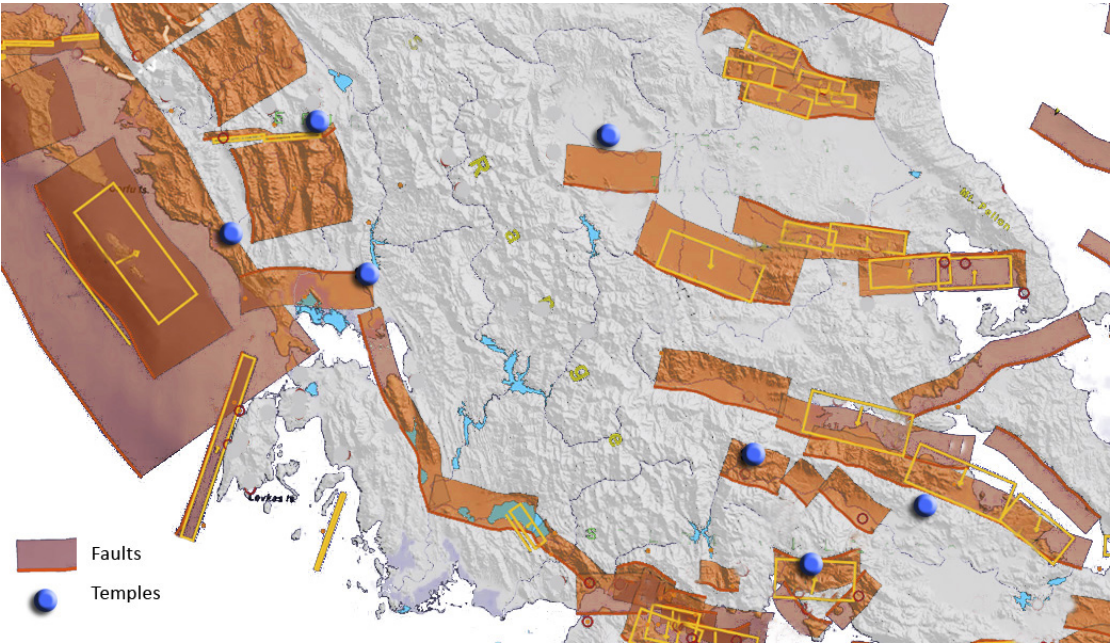


Figure 36: Faults map and locations of temples in mainland, Greece (Source of data: Greek Database of Seismogenic Sources)

Also, looking into the geological map the temples are located on discontinuities.

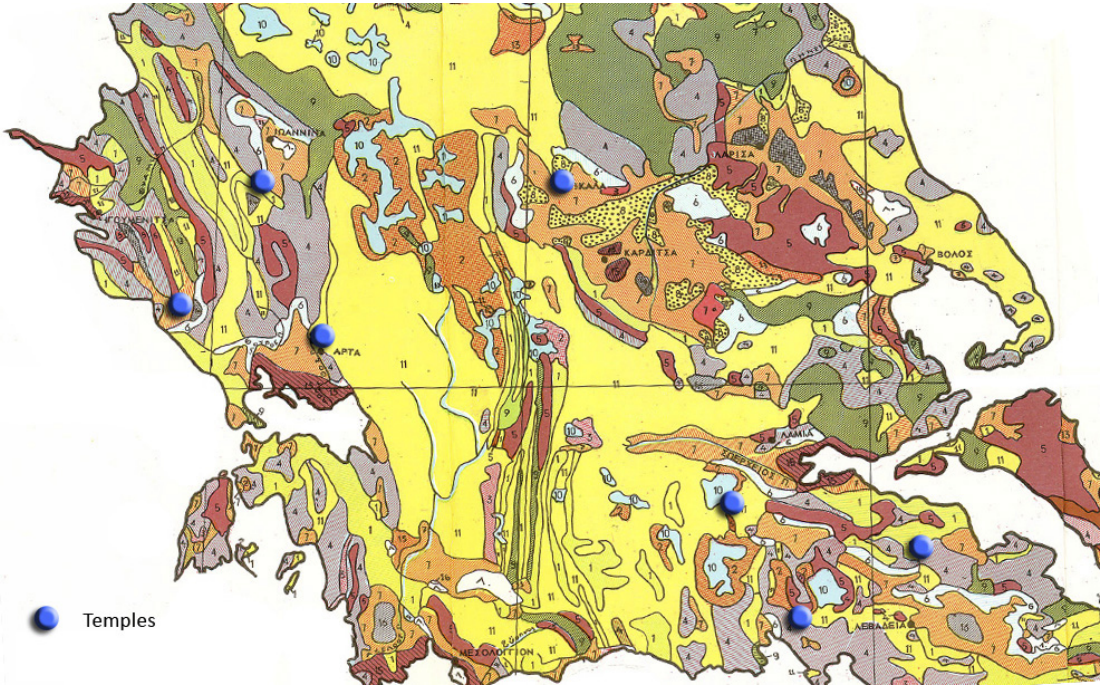


Figure 37: Geological map and locations of temples mainland Greece (Source of data: G.K. Geogalakis, Grand Encyclopedia of Greece)

Delphi, a principal oracular centre of antiquity, is located on a geological discontinuity, as seen in the following figure.

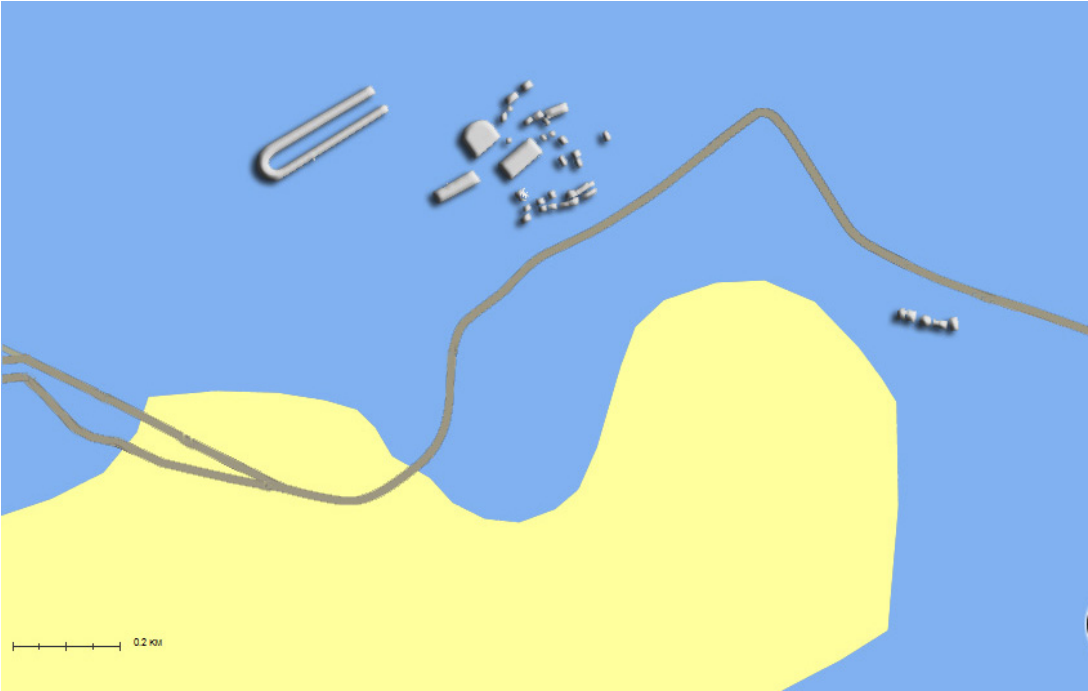


Figure 38: Geological map of Delphi temple area (redrawn data from IGME)

The sanctuary of Apollo in the upper terrace is cut by several NW-SE faults, inferred mainly from spring lines, and passes through the main temple itself (De Boer, Hale, & Chanton, 2001). The underground water currents can be seen in figure.



Figure 39: Hydrogeological map of the Delphi temple area (redrawn data from IGME)

Moreover, there is a major E-W trending active normal fault zone in the lower terrace. The temple of Athena, originally a sanctuary of Gaia, was relocated but still standing on the fault (Piccardi, 2000).

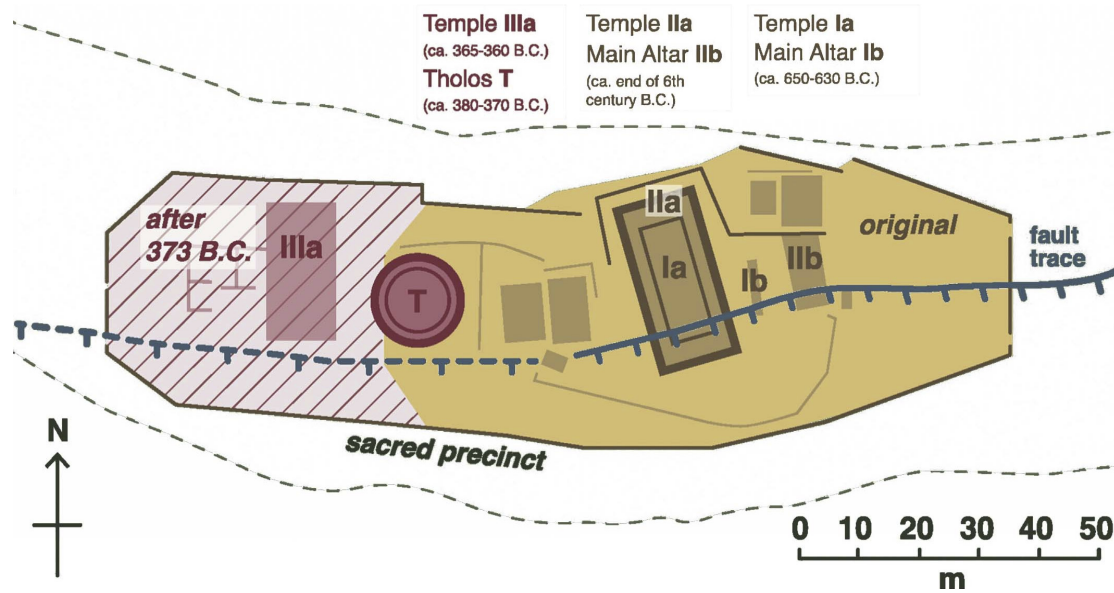


Figure 40: Map of the lower sanctuary of Delphi, central Greece, where a recent fault break cuts through the oldest temples and altars inside the shrine of Athena. (Stewart & Piccardi, 2017)

Epidaurus was also a very important center for healing, including a temple of Asklepios and a Temple of Apollo. As seen previously in figure, it is located on a fault zone. The site sits on a conductivity discontinuity, as well as on various underground streams, as it can be seen in the figures.



Figure 41: Geological map of Epidaurus temple area (redrawn data from IGME)



Figure 42: Hydrogeological map of the Epidaurus temple area (data from IGME)

Similar conclusions can be seen in the most ancient Oracle center in Greece, in Dodona, which as seen in figure sits on the edge of a fault zone: the temple complex and theatre is sitting on a conductivity discontinuity, and there is an underground stream in close proximity. (figure)

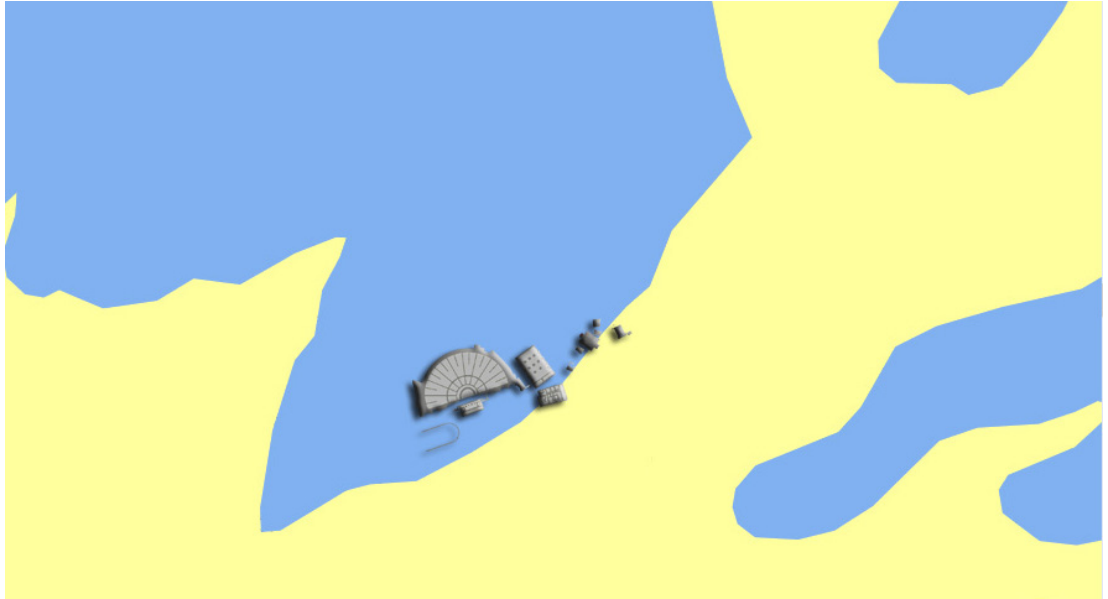


Figure 43: Geological map of Dodona temple area (redrawn data from IGME)

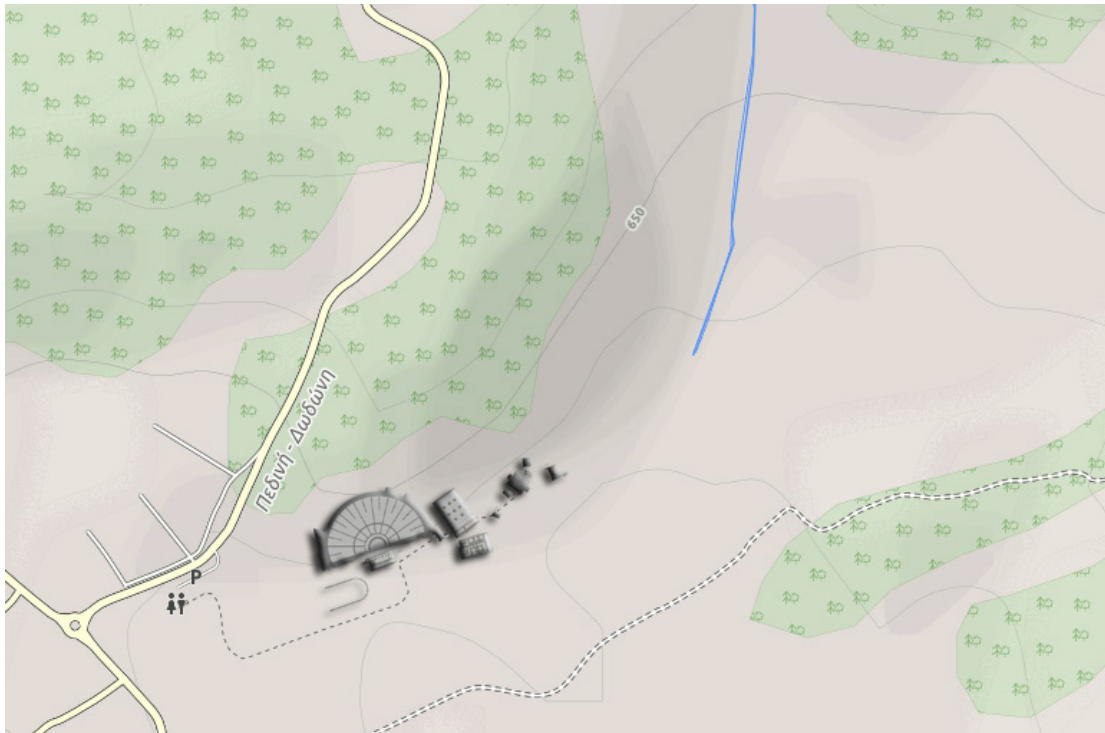


Figure 44: Hydrogeological map of the Dodona temple area (data from IGME)

The Necromanteion of Aheron was also a very important site, used as an oracular center where the prophecies would come from diseased souls. The site is located in the estuary of the river Acheron, as well as on underground streams, as seen in figure.

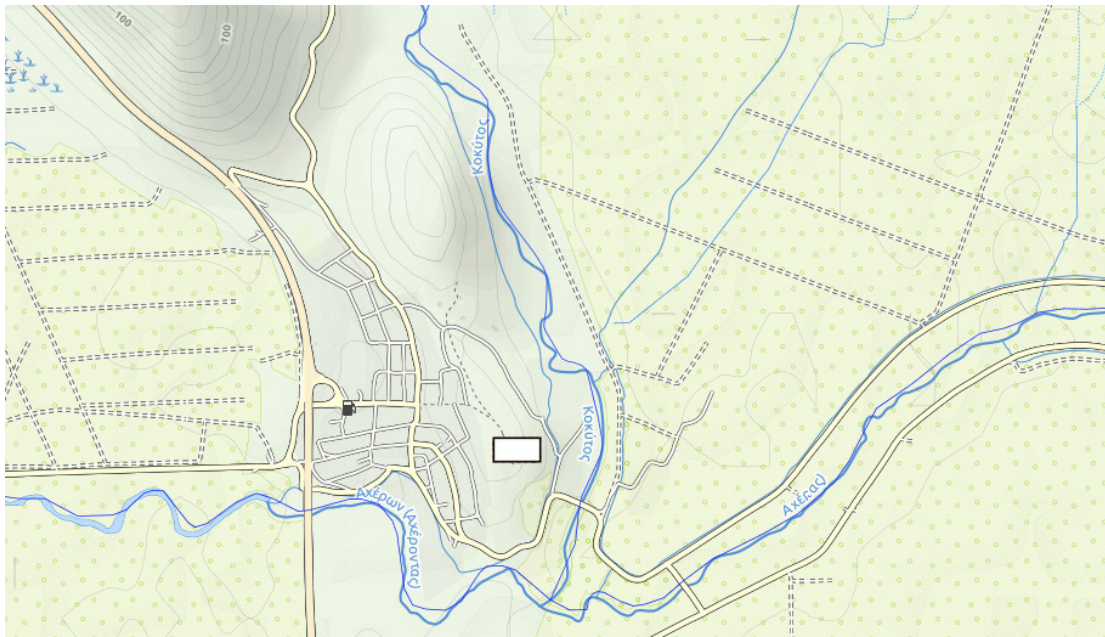


Figure 45: Hydrogeological map of the Necromanteion of Aheron temple area (data from IGME)

Also the site is located on a geological discontinuity, as seen in figure.

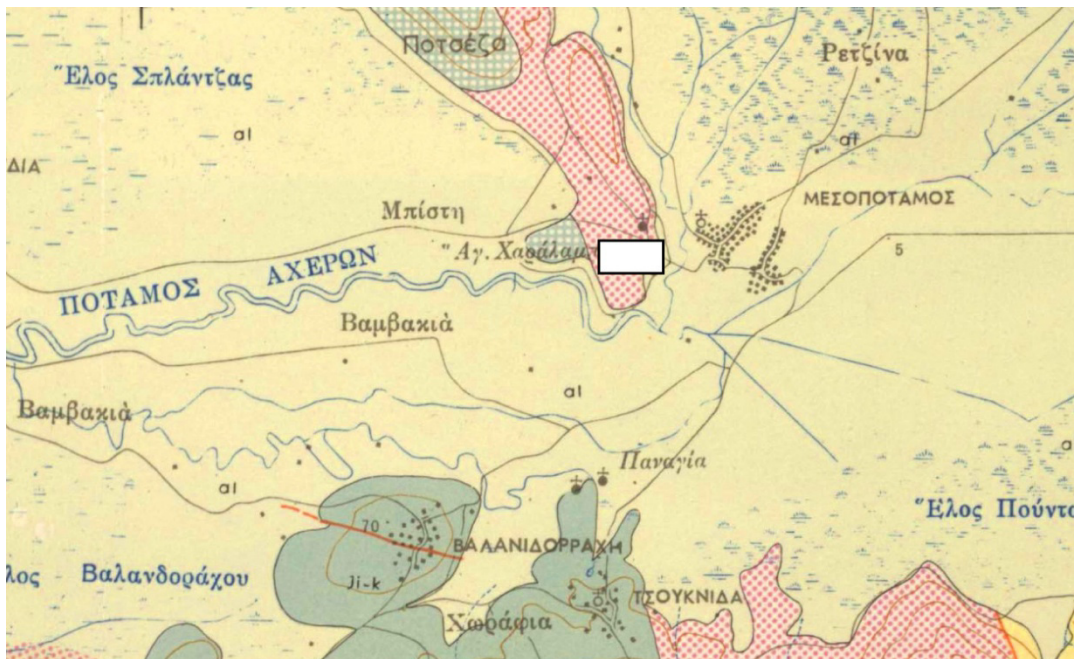


Figure 46: Geological map of Necromanteion of Aheron temple area (data from IGME)

The acoustics of the underground chambers are particularly remarkable. The study which lasted 12 years (Karampatzakis & Zafranias, 2009) showed that There is absolute peace in the basement and the measured reverberation times are considered remarkably low, even at very low frequencies (63, 80, 100 Hz). The observation of the arcs, combined with the very low values of the reverberation time and the background noise, led the researchers to conclude that the space was consciously constructed to create intense psychoacoustic phenomena. The chambers' acoustic values are close to the acousticity in modern anechoic acoustics chamber laboratories.

The temple of Hera in Perachora is located in a fault bounded promontory (Stewart & Piccardi, 2017), where the steep E-W striking, S-dipping normal fault scarp forms the sheer backwall of the archaeological sanctuary. In close proximity there is also underground stream, as seen in the figure.

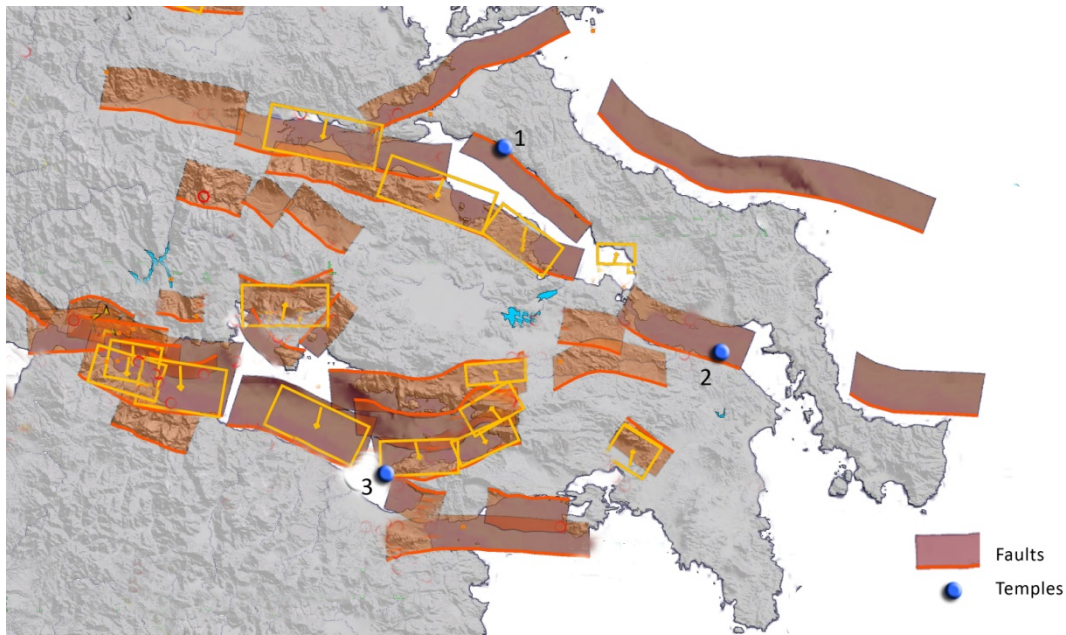


Figure 47: Faults map and locations of temples in mainland, Greece. 1. Oracle of Apollo, Oroviai 2. Oracle of Amphiaraus, Oropos 3. Temple of Hera, Perahora (Source of data: Greek Database of Seismogenic Sources)



Figure 48: Hydrogeological map of the Iraion of Perahora temple area (data from IGME)

Also the temple of Amphiaraus, a very important oracular center of antiquity, that was mostly used for healing purposes, lies on a prominent active fault (Mariolakos, Nikolopoulos, Bantekas, & Palyvos, 2010). It is located along a river and the surrounding underground streams.



Figure 49: Hydrogeological map of the Amphiaraus temple area (data from IGME)

Mariolakos directly links the seismically active and fractured terrain, and copious thermal spring activity with proliferation of oracular sites in Evia (Mariolakos, Nikolopoulos, Bantekas, & Palyvos, 2010). An example is the Oracle of Apollo in Oroviai, which is located on an active normal fault on the north side of Evia Gulf.

Moreover, the temple is located on an area with plenty of underground streams, as well as sitting directly on a conductivity discontinuity. (Fig.50)



Figure 50: Hydrogeological map of the Oracle of Apollo temple area in Evia (data from IGME)

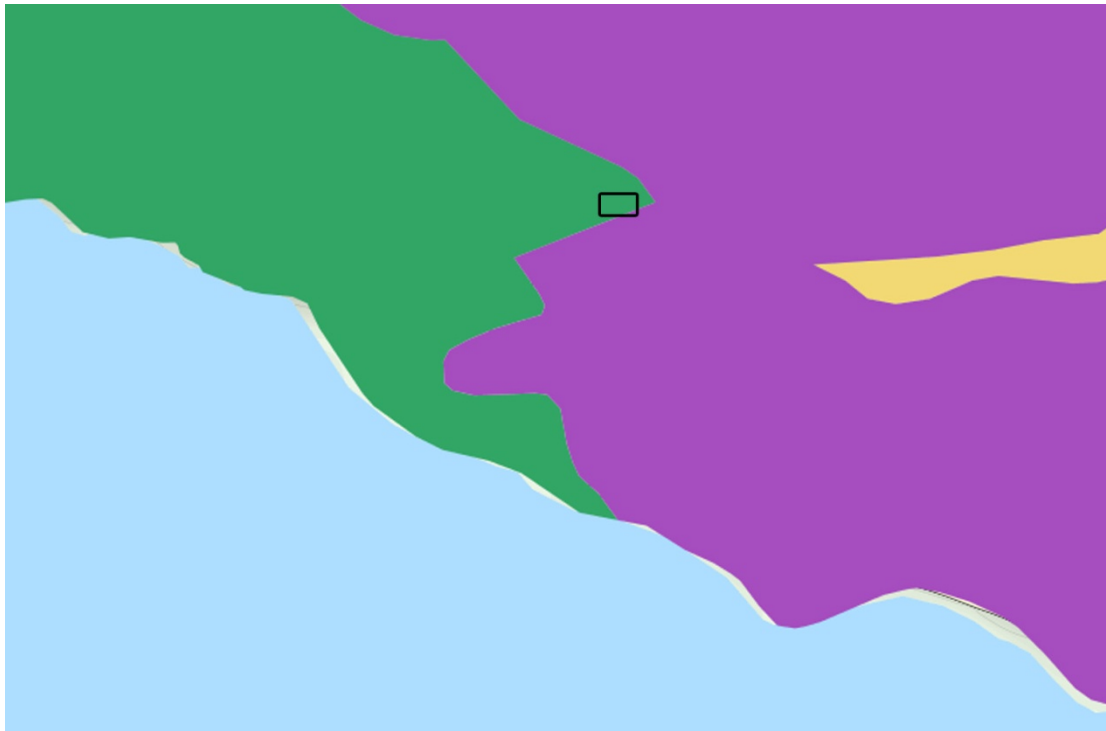


Figure 51: Geological map of the Oracle of Apollo temple area in Evia (data from IGME)

Mycenae temple complex is also based on an active fault, according to (Zangger, 1993). It is also sitting on a conductivity discontinuity and next to a network of underground streams. (figure)



Figure 52: Geological map of the Mycenae area (data from IGME)



Figure 53: Hydrogeological map of the of the Mycenae area (data from IGME)

In Turkey, there are also temples of ancient Greek architecture that follow the same geological properties. In Priene, a narrow corridor of seismic damage goes through the sacred stoa, in the Athena temple complex, showing the existence of a fault (Altunel, 1998), (Altunel, 1999). In Sagalassos, the active fault cuts the temple of Apollo complex at the centre of the city (Sintubin, et al., 2003). In Ephesus, believed to have served as an Apolline oracular sanctuary (Scherrer, 2000), a fissure is located centrally in the temple plan. In Cnidus, the temple of Demeter and Kore are located in a limestone fault plane with rock-cut niches (Stewart & Piccardi, 2017).

In Hierapolis, the temple of Apollo and sanctuary of Hades and Kore are built directly upon a strand of the Hierapolis fault (Fig. 54). Both the temple and chamber are cut several times by the fault, clear in topographic profiles (Piccardi, 2007). Geophysical imaging confirms that one of these fault splays passes directly beneath the chamber itself (Negri & Leucci, 2006).

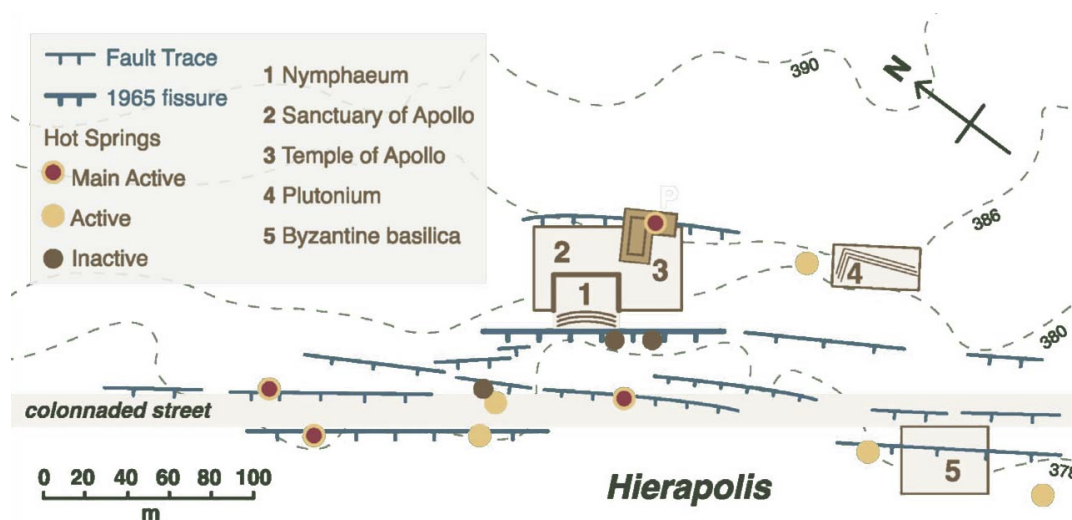


Figure 54: Map of Hierapolis showing the trace of the active fault strands cutting through the Temple of Apollo and the Plutonium. (Stewart & Piccardi, 2017)

6.2 Possible function

Synthesizing all the aforementioned, three possible function of ancient monuments can be suggested:

1. Mystical experience/ altered states
2. Healing
3. Seed growth enhancement

Mystical experience

According to research, temples can induce mystical experiences in people, which are a result of natural neurophysiological processes during spontaneous or induced micro-seizures in deep structures of the right temporal lobe, such as amygdala and hippocampus (Persinger M. , 1983b), and (Booth, Koren, & Persinger, 2005). These microseizures lead to the very short (20-200 ms) activation of interhemispheric neuron pathways through the corpus callosum and hippocampal commeasure. (Florinsky I. , 2010)

Local fluctuations of the geomagnetic field and pulsating magnetic effect the brain and can lead to a mystical experience (Florinsky I. , 2010). Variations in the brain's electrical activity has been noted during geomagnetic storms (Raevskaya, 1988), (Doronin, et al., 1998)) including unstable states (Belisheva, et al., 1995), acute attacks of mental illness ((Friedman, Becker, & Bachman, 1963), (Rudakov, et al., 1984), (Persinger M. , 1987)) and epilepsy (Wool, 1976) (Persinger & Psych, 1995). The probability and intensity of a

mystical experience increase if the high frequency geomagnetic fluctuations increase by 10-40 nT ((Persinger M. , 1988) (Booth, Koren, & Persinger, 2005). The effects depend on the intensity, exposure time, and dose of short period fluctuations (Belisheva, et al., 1995).

There is no correlation between magnetic anomalies and the frequency of mental illness (Travkin & Kolesnikov, 1972); neurosis incidences and the probability of mystical experiences rather are increased by exposure to pulsed magnetic field at local magnetic anomalies ((Suess & Persinger, 2001) (Persinger M. , 2001)).

Dr. Debertolis, who studies the field of archaeo-acoustics, observed that there are specific frequencies detected in ancient monuments, and concluded that these are in the range of 90-120 Hz in Europe's Neolithic monuments (e.g. England, Ireland, Italy, Malta). A group of volunteers was exposed at these frequencies, while examining them simultaneously with EGG electroencephalogram, and it was found that there was predominance and intense activity in the frontal or occipital lobe without the prevalence of a cerebral hemisphere in the duration of exposure (Debertolis P. T., 2014).

Cook, a physician, also found the link between location, architecture and impact on biology. In various archaeo-astronomical investigations of prehistoric and megalithic structures he detected acoustic resonances at frequencies of 95-120 Hz, especially near 110-12 Hz, representing the human vocal range. In a pilot program, 30 healthy adults were exposed to 90, 100, 110, 120, and 130 Hz, while brain activity was monitored by electroencephalography (EEG). Activity in the left temporal region was found to be significantly lower at 110 Hz than at other frequencies. In addition, the pattern of asymmetric activity above the prefrontal cortex was shifted, from higher activity in the left hemisphere at most frequencies, to right-hemisphere dominance at 110 Hz. These findings are consistent with the relative deactivation of language centers and a shift to pre-frontal activity that may be related to emotional processing. These interesting pilot findings suggest that the frequencies of ancient structures can affect human brain function (Cook, Pajot, & Leuchter, 2008).

Biofeedback experiments with EEG in Rollright stones demonstrated that deep-theta and delta waves were induced in people close to some stones in the circle. (Devereux P. , 1999)

Rock art in America is considered to be the work of shamans, illustrating their hallucinations during altered states of consciousness. This theory has been confirmed across the world in many other ancient cultures as well. (Lewis-Williams & Clottes, 2007).

The largest amount of rock art in the U.S. is located in Petroglyphs National Monument, which according to research has been measured to have powerful electrical ground currents; these also generate changing magnetic fields, which in turn can alter consciousness. Shamans maybe sought out these energies to alter their consciousness. The Black Hills of South Dakota, a sacred site for the Sioux is one of the nation's leading conductivity discontinuities (Burke & Halberg, 2005).

The same can be hypothesized for Oracular centers in Ancient Greece, which seem to be located on faults, conductivity discontinuities and underground streams. The generated magnetic fields, as well as the geochemical gas emissions through the enhanced crust permeability may have played a role in inducing altered states of consciousness in the people receiving the prophecies.

Apart from the temples themselves, the oracular caves of Bura and Aigeira are both located on the Corinth fault ((Soter, 1993) (Stewart & Vita-Finzi, 1996), (Stewart, 1996)) leading to the same conclusions.

Healing

Natural and artificial magnetic fields influence all functional systems of the human organism ((Persinger, Ludwig, & Ossenkopp, 1973), (Dubrov A. , 1978), (Zhadin, 2001), (Palmer, 2016)). Magnetic fields manifest their biotropic properties in narrow frequency and amplitude ranges (Adey, 1980), (Raevskaya, 1988)). The effect of magnetic fields can be both positive and negative, depending on intensity, frequency, exposure time, radiation, source location, and individual health condition ((Persinger, Ludwig, & Ossenkopp, 1973), (Andronova T. D., 1982), (Markov, 2007)).

Nowdays, electromagnetic fields are used with the scope of healing in various medical applications. Especially the use of low-intensity extremely low frequency electromagnetic fields has been shown to be very effective in clinical applications (Carpenter, Sage, & David, 2012). They have been shown to be effective in treating conditions of disease at very low energy levels. (Carpenter, Sage, & David, 2012)

Modern medicine uses pulsed low frequency magnetic fields to treat bones fractures. The hippocampus is sensitive to electromagnetic fields; its neural activity increases with electrical stimulation. (Becker & Seldon, *The body electric*, , 1985).

Studies show that extremely low frequency magnetic fields can inhibit tumor growth and other neoplastic diseases in mice (Tofani, et al., 2001) (Tofani, et al., 2002).

Pulsed electromagnetic fields can alter the cell membrane structure, and induce diversification of ion channel permeability and of the cell membrane potential, important phenomena for cellular functions.

According to research, (Athanasidou, et al., 2007) short duration electromagnetic pulses protect the biological targets from the development of increased temperatures, which is also in accordance with hormesis. In the same study it was shown that these pulses, with a frequency of 3 Hz, a statistically significant acceleration of wound healing was induced. Other research (Ottani, et al., 1988) showed that extremely-low-frequency magnetic field can significantly increase in the ratio of wound contraction.

There seems to be a healing aspect in sacred sites, as pilgrims spend a short time in them, which is in resonance with the effects of hormesis.

Many ancient temples, including the temples of Asklepios as well as Oracular centers had a main function to be the hospitals of the time, where people would follow fasting, use of herbs, magnet applications as well as have therapeutic sleep, to ask that their cure would appear in their dreams. In that aspect, it makes sense that these temples were strategically placed on geophysical anomalies.

Therapeutic sleep had a very significant role in the healing protocol that took place in the temples of Asklepios in Ancient Greece. Experiments showed that nocturnal exposure of extremely low frequency pulsed weak magnetic fields (7 Hz, 25-50 nT) for several consequent nights can suppress a hyperactive immune system ((Cook & Persinger, 2000), (Cook C. , 2004)). The exposure time and dose of the pulsed magnetic fields are responsible for positive or negative health results of visits to sacred sites, based on the concept of hormesis; both low dose stimulation and high dose suppression can occur by the same external agent ((Calabrese E. , 1994), (Calabrese E. , 2008)).

As seen previously, along faults and their intersections there are fluids and gas emanations and geochemical anomalies (Kasimov, Kavin, Proskuryakov, & Shmelkova, 1978), (Trifonov & Karakhanian, 2004), (King, Zhang, & Zhang, 2006)). Geological products related to active faults and anomalies can also be sources of healing- the use of mineral waters and muds. These temples are very often found to be located in proximity to thermal springs, which were also used for healing.

Therefore, based on the concept of hormesis, various agents such as magnetic fluctuations, ground electrical currents, background radiation anomalies as well as geochemical gas emissions can act therapeutically on humans, which gives temples being built on them the same properties.

Seed growth enhancement

A lightning, which is a strong electromagnetic event, is an airborne fertilizer. The atmosphere is rich in nitrogen, but in a form that plants cannot use. An electrical discharge ionizes the nitrogen molecules of the air, turning them into nitrates which are easily usable by plant (Burke & Halberg, 2005). A lightning striking can leave behind free nitrogen equivalent to 1-2 years worth of fertilizer. There seems to be a connection between electromagnetism and plant fertility.

Burke carried out several experiments placing seeds for a small amount of time in pyramids and other ancient temples in Latin America, and found that they produced much higher yield (Burke & Halberg, 2005). When he placed them for longer time, the plants would have lower yield than controls, showing the effects of hormesis.

For example, corn seeds placed shortly inside a Native American rock chamber had 100% faster growth than controls, produced three times corn by weight (Burke & Halberg, 2005).

The same principle was replicated by Levensgood in the laboratory to pre-treat seeds with short-term electromagnetic stress, and have as a result much faster germination, faster seedling stage growth, faster maturation in the field, more resistant to stress and producing with higher yield (Burke & Halberg, 2005).

According to other research, (White, 1999) treatments of low-energy electrons using high voltage, very low amps, and DC current with a trace of AC current on sweet corn showed improved early plant growth as indicated by taller plants with greater fresh and dry weights over plants grown from untreated seed, and a yield increase of 25% on the treated seeds.

The presence of negative ions found in areas with geophysical anomalies significantly increases plant growth and yield (Kruger & Yamaguchi, 1983).

According to Devereux, planted bulbs near large granite boulders flower early. (Devereux P. , 1999)

In another experiment with treating seeds with electromagnetic fields, it was noticed that seeds left in the chambers had much lower number of free radicals than the control seeds when tested by bio-electrode analysis (Levensgood, 1988).

Other research also demonstrated that negative ions dramatically boost growth and yield of plants. (Krueger & Yamagucchi, 1983).

Various hedges, pyramids, mounds, and other megalithic monuments seem to be placed on geophysical anomalies, and their fluctuations were amplified through the structures built there. Seeds placed in these sites for optimal amount of time show increased growth rate and yield, which could give an additional function to these ancient monuments.

Conclusion

In chapter one of the thesis set the scene for contextualizing the significance of geophysical anomalies and identities on the formation and configuration that take place in the parameters of various fields of knowledge, such as the natural magnetic, gravitational and electric fields. The literature was reviewed, the research questions outlined and the role of the theoretical case study methodology as the method adopted for exploring the general and specific categories of this phenomena were discussed.

Chapter two outlined the conceptual foundation of bioelectromagnetism and the analytical framework adopted throughout the research and constructed a conceptual vocabulary for understanding the dynamics of the positive and negative magnetic fields. It contextualized the boundary work and exchanges that take place in this field. It dealt with how important was the influence of magnetism in biology, the structural attributes of transactions and exchanges of energy and information with the boundary work taking place here.

Chapter three set the base for understanding the interaction of geophysical anomalies with biology and establish the detail mechanisms of how the human body is a resonance cavity in which electromagnetic fields of information takes place. In this chapter were applied the correlation experiments and analytical framework of the effects on different systems of the human biology such as its psychology, brain, cardiovascular system, hormonal system, immune system, DNA and biorhythms. Furthermore, were studied the biological effects and the different geophysical anomaly types according to its nature: tectonic zones, magnetic anomaly, geomagnetic reversal, ions and geochemical anomalies. This posed the question of how a theoretical understanding of the dynamics of humans and geophysical anomalies also correlate with animals and its behavior and plants and their rate of growth.

Chapter four has dealt with those research questions that were designed to explore the relation of buildings and architectural design for inducing disease or promoting health through magnetic anomalies, air ion anomalies and geochemical anomalies. It provided an overview and introduction to the analytical framework developed throughout the rest of chapter five. The contextual embeddedness of the hormesis process shows that low levels of stress in short exposure time can be extremely healing even the concept of radiation hormesis that states that higher than five times the natural background radiation can cause biological damage.

Chapter six considered the classification and categorization of ancient monuments and its geophysical location parameters, with the religious places and mystical experiences. Anomalies such as the distinction between Mounds Megaliths and Stone Circles in different countries in Europe shows a high correlation between megalithic sites and geological and geophysical influence. The act of categorizing and classifying geomagnetic maps, radon maps, magnetic maps, gravity maps, geological maps, uranium content maps, granite maps, gamma radiation level maps, acid igneous intrusive (granite, granodiorite, tonalite) and volcanic rocks maps, fault maps, thermal survey maps, underground water maps, hydrogeological maps and ultrasound measurements was contested and legitimating overlapping sites and buildings was ongoing. The research question addressed in Chapter six were focused on what could be the possible functions of ancient monuments, in particular the role of anomalies in mystical experiences, healing and seed growth enhancement.

Discussion

Tesla (1905) wrote, “the earth is found to be alive with electrical vibrations”. The Radcliffe tower he created, was an energy generator that would not function if it did not “grip the earth”.

The placement of these monuments appears not to be random, but researched and located with precision, where the following take place: an intense change in the magnetic and/or gravity field, the change in radioactivity levels, a conductivity discontinuity of the ground material, the presence of fault and/or underground water. The aforementioned parameters morph these areas into stress zones.

Whenever there is a fluctuation in the above fields, it results in the generation of telluric DC electric currents, which are measurable. It seems like most basic characteristic of ancient monuments and temples is the concentration of natural geomagnetic and electric fluctuations.

The earth field’s fluctuations create electric fields not only in the earth, but in any material that can conduct electricity. The induced currents can be conducted in the grounds as well as in the building according to its material properties. Their strength will depend on the materials’ conductivity. Ground and building material with higher mineral contact will usually have stronger currents.

With regards to the human body, the brain is especially great electrical conductor, so these fluctuations can create DC electric fields in our brain, which can have intense mental effects.

This research has presented a theoretical and conceptual account of the geophysical anomalies and how they can affect biology and the way they are related to ancient monument architecture through the hormesis process. Within that context, a study of geophysical anomalies through their specific and general categories and the analysis of the interaction with biology through the lenses of bioelectromagnetism and heliobiology was theorised.

The structure and dynamics of exchanges through the hormesis process at the interface and associated boundary were explored contextually and in terms of their embeddedness in wider contexts as the implications in humans, animals and plants. Particular attention was paid to the processes of short term exposure and how it can activate healing mechanisms and promote evolution of species under certain circumstances.

The lack of an existing body of theory with which to situate the context, process and dynamics of how this relation happens has been a significant weakness in developing theory that can support why some people are more affected by geophysical anomalies. This research has made a contribution to filling that gap.

The separate sector legacies from geobiology and bioelectromagnetism that exist as a body of knowledge, and the increasing structural diversification of the interaction with biology in tectonic zones, magnetic anomalies, geomagnetic reversal, ions, geochemical anomalies in the context of its wider implications in the human body, were shown to be leading to a way of provision for the location properties of ancient monuments.

The research investigated the processes of the influence of ancient monuments under certain conditions of geobiological location and heliobiological connection duality through the interaction of specific functions of theoretical case study methodology as shown in the map correlations of temples and geophysical anomalies. This allows a detailed investigation of the possible function of ancient monuments for biology both as context and process. In doing so, the research drew upon a range of materials from separate disciplinary traditions that hitherto had not been used in one analytical framework for studying such implications.

This inter-disciplinary approach was adopted with the intention of generating novel concepts and new analytical insights for understanding how this possible functions has been configured and operates in biology. In the past the fragmented nature of research into this field, and the lack of a distinct disciplinary tradition that focused on it as an important topic, has been a block on understanding the complexities of the workings of the interface of monuments and temples with human beings. Three possible functions arose as mystical experiences or altered state of consciousness, healing purposes and seed growth enhancement.

A further goal of the research was to conceptualize the links between geophysical anomalies, bioelectromagnetism and heliobiology. Connecting these fields of knowledge to the wider structure of the hormesis process and its associated architectural environment through an examination of the processes of interaction with biology cannot be theorized in terms of simple dichotomies. For example distinctions between different map analysis and the location of temples all around the globe are limited in what they can reveal about the dynamics of the biological interface. For that reason a holistic and relational approach has been adopted throughout the thesis.

The analytical framework has synthesised a number of hitherto discrete disciplinary traditions under one model: the effect of location and its geophysical properties on biology. These include: Soil and air conductivity, DC Magnetic fields, Rotating electromagnetic fields, Air ion intensity, Soil temperature, Ground and air humidity, Seismic activity, Infra- and Ultrasounds, Radioactivity, Existence of groundwater, Existence of faults, Gravity intensity, Geoneutrons, Scalar waves, Existence of quartz or magnetite in the subsoil as part of the analysis that was considered.

The conceptual and theoretical insights they provided were further combined with contributions from bioelectromagnetism. The concepts of piezoelectric or piezomagnetic effect, radioactivity, Geochemical gas emission, Ion flow, Strong magnetic, electrical or electromagnetic anomaly, Strong gravity anomaly, Tectonic faults, Non-dipolar magnetic field, Ground electric potential anomalies and Geoneutrons were also derived from these disciplines to explore boundary work in further biological implications.

Future Work

Given the ambition and scope of the thesis there remain areas of difficulty, complexity and perplexity in the work. The relative paucity of theoretical and conceptual materials on the interface between biology and temples and the lack of a developed disciplinary tradition for studying this relation conceptually, make the analytical framework developed here highly provisional. There are also potential problems in ensuring that the different roots of the inter-disciplinary areas drawn upon are commensurate and consistent in their underpinning premises.

However, the framework adopted here deals with processes rather than causes and does not seek to confirm or refute a pre-existing hypothesis or theory. In other words, the processes evaluating various parameters that constitute a geophysical anomaly (intense change in the magnetic and/or gravity field, change in radiation or radioactivity levels, conductivity discontinuity of the ground material, presence of fault and/or subterranean water) becomes the foundation of this relation.

This is an approach that can be applied across disciplines in order to develop synergies and novel concepts for understanding the effect of these anomalies on human health and how can be explained through the presence of magnetite, iron, water and also its own electromagnetic fields (brain, heart, neural network).

Both concepts of hormesis and radiation hormesis that are the cornerstones of this analysis and the contributions of high/low doses and exposure time of a parameters show contradictive results. A parameter that has long-term negative effects can have positive effects on health in short-term exposure. These emphasized the embeddedness of how temples seem to be located on various geophysical anomalies and their properties conduct and amplify the resulting fields of these anomalies and this affect biology in human animal and plant level.

Consequently, there are a number of areas in which the research could be taken further. These data in combination with the fact that hormesis also applies to radiation, can lead us to the idea that temples might have been built for short term exposure of people to these amplified anomalies with the scope of healing. Polimenakos (Polimenakos, 1996) states there is "possibility that seismic faults may have constituted the fulcrum of major sanctuaries", and that suggests that architects and scientists ought to devote more consideration to the parameters that accompany immediate environments of active faults.

The thesis has set the theoretical and conceptual model developed here for understanding the relation of geophysical anomalies and the various features of the

subsoil, its morphology and its composition that may create beneficial or adverse effects on humans, flora and fauna. It is a provisional attempt to highlight gaps in the 'field' of study and the lack of a coherent disciplinary tradition that addresses theoretical and conceptual facets of understanding how ancient sites were built on geophysical anomalies. While arguably eclectic, it claims that the maturity of a disciplinary field is reflected in the elegance and simplicity of its theoretical tools. The thesis has attempted to develop a set of analytical tools and clear away some of the conceptual undergrowth in order to begin a more substantial theoretical explanation of the dynamics of geophysical anomalies and its effects on biology.

Summary in Greek

1.0 Γενικά

Η επιστήμη της Γεωβιολογίας αφορά την εξέταση της επίδρασης της τοποθεσίας και των διαφορετικών χαρακτηριστικών της, στην ανάπτυξη της βιόσφαιρας.

Ο Ιπποκράτης, πατέρας της Ιατρικής, στο Περί Διαίτης έργο, αναφέρει : « Η επιτυχία της σωστής διαγνώσεως έγκειται στο ότι ο ιατρός πρέπει να γνωρίζει την φύση του ανθρώπου στο σύνολο της. Η δε υγεία του ανθρώπου, για να επιτευχθεί και να διατηρηθεί, χρειάζεται σωστή διατροφή σε αναλογία με το φύλο, την ηλικία, την εργασία, τις εποχές του έτους, τις αλλαγές του κλίματος, σε συγχρονισμό με την γεωγραφική θέση του τόπου που ζει και τις συνθήκες που επικρατούν, τη τυπολογία του εδάφους και τέλος τις επιρροές του ηλίου, της σελήνης και του σύμπαντος στην ζωή μας». (Ιπποκράτης, Περί Διαίτης, Παρ. 2)

Δεῖ δὲ, ὡς ἔοικε, τῶν πόνων διαγινώσκειν τὴν δύναμιν καὶ τῶν κατὰ φύσιν καὶ τῶν διὰ βίης γινομένων, καὶ τινες αὐτῶν ἐς αὐξήσιν παρασκευάζουσι σάρκας καὶ τινες ἐς ἔλλειψιν, καὶ οὐ μόνον ταῦτα, ἀλλὰ καὶ τὰς ζυμετρίας τῶν πόνων πρὸς τὸ πλῆθος τῶν σιτίων καὶ τὴν φύσιν τοῦ ἀνθρώπου καὶ τὰς ηλικίας τῶν σωμάτων, καὶ πρὸς τὰς ὥρας τοῦ ἡμερησίου καὶ πρὸς τὰς μεταβολὰς τῶν πνευμάτων, καὶ πρὸς τὰς θέσεις τῶν χωρίων ἐν οἷσι διαίτεονται, πρὸς τε τὴν κατάστασιν τοῦ ἡμερησίου. Ἄστρον τε ἐπιτολὰς καὶ δύσιας γινώσκειν δεῖ, ὅπως ἐπίστηται τὰς μεταβολὰς καὶ ὑπερβολὰς φυλάσσειν καὶ σίτων καὶ ποτῶν καὶ πνευμάτων καὶ τοῦ ὅλου κόσμου, ἐξ ὧν περ ἂν νοῦσοι τοῖσιν ἀνθρώποισι φύονται.

Έχει παρατηρηθεί ότι τα διάφορα χαρακτηριστικά του υπεδάφους, η μορφολογία και η σύσταση του δύνανται να δημιουργήσουν ευμενείς ή δυσμενείς επιδράσεις στον άνθρωπο, στη χλωρίδα και την πανίδα.

Η Αρχιτεκτονική όπως εφαρμόζεται σήμερα δεν λαμβάνει υπόψιν την πιθανή επίδραση του εδάφους από την σκοπιά των γεωφυσικών ανωμαλιών, οι οποίες δημιουργούνται από διάφορα γεωλογικά αίτια.

2.0 Φαινόμενα

Ως περιοχές γεωφυσικών ανωμαλιών εννοούνται ζώνες στις οποίες παρουσιάζονται μεταβολές στα πάσης φύσεως, μαγνητικά, βαρυτικά και άλλα γήινα πεδία, τα οποία τοπικώς παραμορφώνονται λόγω ποικίλων υποκρυπτόμενων γεωλογικών αιτίων. Οι ανωμαλίες αυτές είναι μετρήσιμες. Η ύπαρξη κάποιας τοπικής διαφοροποίησης στο υπέδαφος μπορεί να αναλυθεί επιστημονικά και να δοθεί εξήγηση στα αποτελέσματα. Υπάρχουν συγκεκριμένα φαινόμενα, που συνδέονται με τη γεωβιολογία, και είναι τα εξής:

- *Πιεζοηλεκτρικό ή πιεζομαγνητικό φαινόμενο*

Αφορά το ηλεκτρικό φορτίο που συσσωρεύεται σε ορισμένα στερεά υλικά (όπως οι κρύσταλλοι, ορισμένα κεραμικά και βιολογική ύλη όπως τα οστά, το DNA και διάφορες πρωτεΐνες) ως αντίδραση όταν εφαρμοστεί μηχανική καταπόνηση, (Freund,2003, Hacker et al, 2011 Adler et al,1999)

- *Υδρογεωφυσικό φαινόμενο*

Αφορά το χαμηλής έντασης ηλεκτρικό ρεύμα, και ως εκ τούτου μαγνητικό πεδίο, που δημιουργείται από την τριβή των υπογείων υδάτων στο πορώδες ασβεστολιθικών πετρωμάτων, (Burke Halberg,2005, Yang et al 2003, Atler et al, 1999)

- *Ραδιενεργά πετρώματα*

Η ύπαρξη ραδιενεργών πετρωμάτων όπως ο γρανίτης, και άλλων δημιουργεί συνθήκες εκπομπής ραδιενέργειας από αυτά. (United Nations Scientific Committee, 1993)

- *Γεωχημικά αέρια*

Η έκλυση γεωχημικών αερίων προκαλείται από ποικίλες περίπλοκες γεωλογικές συνθήκες σε έντονο σεισμογενές περιβάλλον, ραδόνιο. (United Nations Scientific Committee, 1993)

- *Ροή ιόντων*

Αφορά ροή θετικών ή αρνητικών ιόντων από γεωλογικούς σχηματισμούς προς τα άνω. (Burk, Halberg,2005)

- *Ισχυρή μαγνητική, ηλεκτρική ή ηλεκτρομαγνητική ανωμαλία*

Αφορά την έντονη τοπικώς διαφορά στις μαγνητικές, ηλεκτρικές ή ηλεκτρομαγνητικές ιδιότητες των υποκειμένων γειτονικών γεωλογικών δομών, οι οποίες διαφέρουν στην μαγνητική επιδεκτικότητα, την ηλεκτρική αντίσταση ή την ηλεκτρική αγωγιμότητα αντιστοίχως. (Florinsky 2010, Burke Halberg,2005, Persinger, 1987)

- *Ισχυρή βαρυτική ανωμαλία*

Αφορά την απότομη τοπικώς μεταβολή της έντασης του βαρυτικού πεδίου της γης, και σχετίζεται με τη μεταβολή πυκνότητας γειτονικών υποκειμένων γεωλογικών δομών. (Gak Gridin, 2008, Florinsky, 2010)

- *Σεισμογενή ρήγματα*

Αφορά τη δημιουργία ηλεκτρομαγνητικού πεδίου σε προσεισμική περίοδο. (Persinger 1987, Florinsky,2010, Shitov, 2006)

- *Μη διπολικό μαγνητικό πεδίο*

Αφορά την ροή μη διπολικού μαγνητικού πεδίου (Lonetree 2013)

- *Ανωμαλίες φυσικού ηλεκτρικού δυναμικού*

Αφορά τη δημιουργία ηλεκτρικού δυναμικού σε επαφές γεωλογικών δομών με διαφορετικές ηλεκτρικές ιδιότητες. (Burke Halberg,2005)

- *Γεωπλάσμα*

Αφορά δημιουργία γεωπλάσματος που σχετίζεται με γεωανωμαλίες από ανομοιομορφία στη δομή των γεωφυσικών πεδίων. (Mamirova 2010)

- *Γεωνετρόνια*

Αφορά την ροή γεωνετρονίων από το έδαφος (Langer, 1997,2008)

Σύνδεση και ανάλυση των φαινομένων

Το ηλεκτρομαγνητικό πεδίο της Γης είναι σε μεγάλο βαθμό αποτέλεσμα της αλληλεπίδρασης μεταξύ του μαγνητικού πεδίου, που προέρχεται από το λειωμένο πυρήνα σιδήρου-νικελίου του πλανήτη, και τα φορτισμένα αέρια της ιονόσφαιρας. Υπάρχουν ημερήσιες διακυμάνσεις στο γεωμαγνητικό πεδίο της γης, οι οποίες εξαρτώνται από την ημερήσια ηλιακή κίνηση από τους ηλιακούς ανέμους. Ποικίλλει ανάλογα με τη σεληνιακή ημέρα και το μήνα, και υπάρχει επίσης μια ετήσια μεταβολή καθώς περιστρέφονται γύρω από τον ήλιο.

Η επιφάνεια της Γης και η ιονόσφαιρα δημιουργούν μια ηλεκτροδυναμική κοιλότητα που παράγει μικροπαλμούς στο μαγνητικό πεδίο σε εξαιρετικά χαμηλές συχνότητες, από περίπου 25 Hz έως 10 Hz. Το μεγαλύτερο μέρος της ενέργειας μικροπαλμών συγκεντρώνεται στα περίπου 10 Hz. Οι ηλιακές εκλάμψεις διασπείρουν φορτισμένα σωματίδια στο πεδίο της γης, προκαλώντας μαγνητικές καταιγίδες. Τα σωματίδια αυτά που έχουν ήδη ενταχθεί στα εξωτερικά όρια του πεδίου (οι ζώνες Van Allen), το οποίο μας προστατεύει από την απορρόφηση αυτών και άλλων κοσμικών ακτίνων υψηλής ενέργειας. (Becker, 1998)

Το φαινόμενο της επαγωγής αφορά την αλλαγή στην ένταση του μαγνητικού πεδίου, η οποία θα παράγει ηλεκτρικό ρεύμα σε οτιδήποτε αγώγιμο βρίσκεται παρόν. Συνεπώς, οι ημερήσιες διακυμάνσεις στην ένταση του γεωμαγνητικού πεδίου παράγουν τελλουρικά ρεύματα που διατρέχουν το έδαφος κοντά στην επιφάνεια.

Αυτά τα τελλουρικά ρεύματα παράγουν το δικό τους μαγνητικό πεδίο το οποίο θα ενδυναμώσει ή θα αποδυναμώσει το γεωμαγνητικό πεδίο ανάλογα με την πόλωση του. Η μεταβολή στο μαγνητικό πεδίο είναι ανάλογη της μεταβολής στο τελλουρικό ρεύμα, ακολουθώντας μία αναλογία γνωστή στην επιστήμη. (Hessler, Wescott, 1959)

Όταν δυο διαφορετικά είδη γεωλογικού υπεδάφους βρίσκονται σε επαφή τότε δημιουργείται μία ασυνέχεια αγωγιμότητας, η οποία δύναται να αποδυναμώσει ή να ενδυναμώσει τις ημερήσιες μαγνητικές διακυμάνσεις, κάποιες φορές επί κάποιες εκατοντάδες τοις εκατό. (Rikitake, Honkura, 1986)

Αυτή η αλλαγή στο μαγνητικό πεδίο δημιουργεί περειαίρω ηλεκτρικά φορτία, και έτσι σε αυτές τις περιοχές τα ηλεκτρικά ρεύματα του εδάφους είναι πολύ υψηλότερα σε σχέση με τη γύρω περιοχή. Τα εδαφικά ηλεκτρικά ρεύματα ελκύουν ηλεκτρισμένα μόρια αέρα του αντίθετου φορτίου.

Πετρώματα όπως ο βασάλτης, η ηφαιστειακή λάβα, ο ασβεστόλιθος, ο γρανίτης και άλλα με υψηλή περιεκτικότητα σε άργιλο, μαγνητίτη, σίδηρο, μαγνήσιο ή άλλα μέταλλα έχουν υψηλή ηλεκτρική αγωγιμότητα επομένως γίνονται κανάλια για οποιοδήποτε ηλεκτρικό ρεύμα, πχ αυτό παραγόμενο από την διέλευση νερού. Ειδικότερα ο γρανίτης εκπέμπει πάντοτε ραδόνιο και ακτινοβολημένα νετρόνια. Το ραδόνιο και η ακτινοβολία δημιουργούν ιόντα. (Burke, Halberg, 2005)

Πετρώματα πλούσια σε χαλκό είναι ιδιαιτέρως αγωγίμα, καθώς ο χαλκός είναι το δεύτερο πιο αγωγίμο ηλεκτρικά μέταλλο μετά τον καθαρό χρυσό. Πετρώματα πλούσια σε χαλαζία δημιουργούν το πιεζοηλεκτρικό φαινόμενο, καθώς έχουν τη δυνατότητα να αποθηκεύουν ηλεκτρικό φορτίο όπως κανένα άλλο ορυκτό, γι αυτό και χρησιμοποιούνται στα ρολόγια. Επίσης η ικανότητα του εδάφους να άγει ηλεκτρισμό είναι ανάλογη της περιεκτικότητας του σε νερό. (Burke, Halberg, 2005)

Η παρουσία ασβεστόλιθου έχει ισχυρή αλληλεπίδραση με την διέλευση νερού, καθώς η γεωλογία του είναι τέλεια για την παραγωγή φυσικού ηλεκτρικού ρεύματος. Ηλεκτρόνια αφαιρούνται από το νερό της βροχής καθώς διέρχεται μέσα από το πορώδες του πετρώματος, κατά μία διεργασία που ονομάζεται προσρόφηση. (Mizutani et al, 1976)

Συνεπώς, τα μόρια νερού τώρα έχουν θετικό φορτίο και έχουν αφήσει αρνητικό φορτίο στην κιμωλία. Το φαινόμενο ενδυναμώνεται διπλά, καθώς το νερό διαλύεται στην κιμωλία. Τα μόρια του ανθρακικού ασβεστίου θα διασπαστούν, προκαλώντας την απομάκρυνση μέσα στο νερό ενός μορίου ασβεστίου με διπλά θετικό φορτίο (ιόν), αφήνοντας διπλά αρνητικό φορτίο στο πέτρωμα.

Το συνολικό αποτέλεσμα είναι η κιμωλία να έχει σημαντικά αρνητικό φορτίο και το διερχόμενο νερό θετικό. Καθώς γνωρίζουμε, τα αντίθετα έλκονται και έτσι δημιουργείται ηλεκτρικό φορτίο στο έδαφος. Η κίνηση του νερού από μόνη της θα δημιουργήσει ένα μαγνητικό πεδίο, του οποίου η μεταβολή εξαρτάται από το πορώδες του πετρώματος, και η κιμωλία είναι εξαιρετικά πορώδης. (Martin et al, 1982)

“Οι τρέχουσες πυκνότητες $2,5 * 10^{-4}$ amp / m² μπορούν να δημιουργηθούν από τη συνεχή μετακίνηση των υπόγειων υδάτων σε αρτεσιανό υδροφόρο ορίζονται. Αυτά τα συνεχή ρεύματα (DC) είναι αρκετά για να δημιουργήσουν μαγνητικές ανωμαλίες που υπερβαίνουν τα 200 nT τόσο στην Menindee Trough (Αυστραλία) και τη Karoo Basin (Νότια Αφρική). Τα τελλουρικά ρεύματα που συνδέονται με την δραστηριότητα της ιονόσφαιρας μπορούν να ανιχνευθούν από τις διακυμάνσεις στη μαγνητική επαγωγή, αλλά οι συνεχείς αντισταθμίσεις που συνδέονται με τις δυνατότητες ροής και γεωχημικής δραστηριότητας (ανωμαλίες SP) επισκιάζονται από το θόρυβο. Κατά συνέπεια, ορισμένες περιφερειακές μαγνητικές ανωμαλίες μπορούν να αποδοθούν εσφαλμένα στις διακυμάνσεις της μαγνητικής επιδεκτικότητας με υπολείμματα που εξηγούνται από παραμένοντα μαγνητισμό.” (Cull, Tucker, 1986)

Επιστήμονες έχουν μελετήσει στο ηφαίστειο La Fournaise κοντά στη Μαδαγασκάρη, πως η ροή νερού υπογείως μέσα από ηφαιστειακά πετρώματα μπορεί να παράγει ηλεκτρικό ρεύμα. (Adler et al, 1999)

Επίσης μια ομάδα επιστημόνων, κάνοντας μετρήσεις στο Ρορο, ένα μεξικάνικο ηφαίστειο, παρατήρησαν παρόμοια αποτελέσματα, μετρώντας πολύ υψηλά μεγέθη ηλεκτρικών φορτίων στη συγκεκριμένη τοποθεσία, προερχόμενων από το γεωλογικό υπόβαθρο. (Markson, Nelson, 1970).

Η δυνατότητα του νερού να παράγει ηλεκτρικό φορτίο μπορεί να φανεί με ένα Kelvin water dropper (Thompson, 1872).

Πολλές φορές πάνω από ισχυρές γεωανωμαλίες παρουσιάζονται περίεργες φωτεινές σφαίρες, οι οποίες βασικά είναι ένδειξη και απόρροια ύπαρξης ηλεκτρικού ρεύματος. Όπως και εξηγεί ο Dr. Levengood, τα ήδη ηλεκτρισμένα μόρια του αέρα απορροφούν την επιπρόσθετη ενέργεια από τα φωτόνια του φλας της φωτογραφικής μηχανής, και οδηγούνται σε ακόμα υψηλότερη ενεργειακή κατάσταση. Ο Dr. Bruce Cornet, ένα γεωλόγος, χαρτογράφησε τις τοποθεσίες διαφόρων τέτοιων φωτεινών εκδηλώσεων και παρατήρησε ότι συγκεντρώνονταν πάνω σε μια γραμμή ισχυρής αρνητικής μαγνητικής ανωμαλίας. (Burke, Halberg, 2005)

Επίσης, οι φωτεινές εκδηλώσεις έχουν παρατηρηθεί να διέρχονται από το έδαφος σε προσεισμικές περιόδους, λόγω της πίεσης των σύνθλιβόμενων πετρωμάτων, που εκπέμπουν ηλεκτρομαγνητικά σήματα. (Kerr, 1995). Στο εργαστήριο, αυτή η σύνθλιψη προκάλεσε παρόμοιες φωτεινές σφαίρες, ακόμα και σε μη χαλαζιακά πετρώματα. (Brady, Rowell, 1986)

Ειδικοί σε εμφάνιση φωτεινών σφαιρών έχουν υπολογίσει ότι 5kV/inch ηλεκτρικά πεδία συνεχούς ρεύματος είναι αρκετά για να παράγουν μία λαμπερή σφαίρα από ιονισμένο αέρα. (American Scientist, 1970)

Οι πιο δυνατές επιδράσεις σε ότι αφορά ηλεκτρομαγνητικές δυνάμεις συμβαίνουν στο όριο μιας διαταραγμένης ζώνης, και όχι στο κέντρο της. Σε αυτό το όριο τέτοιων ασυνεχειών σε ηλεκτρική αγωγιμότητα, παρατηρούνται ακραίες αστάθειες στην κατακόρυφη συνιστώσα του γεωμαγνητικού πεδίου. (Rikitake, Honkura, 1985) Το φαινόμενο της έντασης αυτών των φαινομένων ενδυναμώνεται σε τοποθεσίες όπου διασταυρώνονται τα όρια μαγνητικών, σεισμικών και βαρυτικών ζωνών. (Bukre, Halberg, 2005)

Ο μηχανικός Lonetree περιγράφει το φαινόμενο του μη διπολικού πεδίου «Καθώς ο εξωτερικός πυρήνας περιστρέφεται, ένας μαγνητικός βόρειος και νότιος πόλο δημιουργούνται. Κατά τη διάρκεια αυτής της διαδικασίας μια άλλη μορφή του μαγνητισμού παράγεται, μη-διπόλικης στη φύση. Αυτός ο μαγνητισμός που δεν έχει βορρά ή νότο. Είναι απλά καθαρή μαγνητική ενέργεια. Μεγαλύτερο μέρος αυτής της ελεύθερης ενέργειας απορροφάται από το πρωτεύον δίπολο, (Βορρά / Νότου) τομέα, αλλά ένα τμήμα του μπορεί να φτάσει και να διαπεράσει την επιφάνεια του πλανήτη μας. Μέσα στη γη, ο μη-διπόλικος μαγνητισμός παίρνει τη μορφή μίας «δίνης σαν" (σπирάλ ή κυκλικό) σχήμα, που εμφανίζει επάνω και προς τα κάτω κίνηση.» (Lonetree, Miller, 2013)

3.0 Παράμετροι

Οι παράμετροι που έχει διαπιστωθεί ότι καθορίζουν μια γεωπαθητική ανωμαλία, είναι οι εξής:

- Η αγωγιμότητα του εδάφους και του αέρα
- Μαγνητικά πεδία συνεχούς ρεύματος
- Περιστρεφόμενα ηλεκτρομαγνητικά πεδία
- Ιόντα αέρα
- Η θερμοκρασία του εδάφους
- Υγρασία εδάφους και αέρα
- Σεισμική δραστηριότητα
- Υπόηχοι
- Ραδιενέργεια
- Ύπαρξη υπόγειων υδάτων
- Ύπαρξη Ρηγμάτων
- Το επίπεδο έντασης του βαρυτικού πεδίου
- Γεωνετρόνια
- Βαθμωτά κύματα (scalar waves)
- Ύπαρξη χαλαζία ή μαγνητίτη στο υπέδαφος

4.0 Αλληλεπίδραση

Σύμφωνα με ερευνητές, υπάρχει νόσος που σχετίζεται με γεωφυσικές ανωμαλίες του υπεδάφους (Derek, 1994), που επηρεάζει την κανονική λειτουργία του σώματος και δύναται να χαρακτηριστεί ως γεωπαθογόνος περιοχή (Kharat, 2000).

Η επίδραση ηλεκτρομαγνητικών κυμάτων και διαφόρων τύπων γεωανωμαλιών στην ανθρωπινή βιολογία είναι προφανής, λόγω :

- Της ύπαρξης μαγνητίτη και μαγνητικών κρυστάλλων στον εγκέφαλο, στην περιοχή του ηθμοειδούς και στα αυτιά (Kirshivink, 1992, Ruttan et al, 1990, Marinaga, 1992)
- Της ύπαρξης σιδήρου στο αίμα
- Της σύστασης του σώματος κατά 70% σε νερό, το οποίο δημιουργεί μαγνητικούς κρυστάλλους και έχει υψηλή ηλεκτρική αγωγιμότητα (Fesenko, Gluvstein, 1995)
- Της ιδιότητας των ιστών να λειτουργούν ως ημιαγωγοί, χωρίς ιδιαίτερες αντιστάσεις (αθερμική επίδραση)
- Της παραγωγής ηλεκτρομαγνητικού πεδίου από την καρδιά και το εγκέφαλο, της ηλεκτρικής μετάδοσης σημάτων μέσω των νεύρων. Το ισχυρότερο ηλεκτρομαγνητικό πεδίο είναι της καρδιάς, 100 φορές μεγαλύτερο από του εγκεφάλου (Mc Craty, 2003)

Ο άνθρωπος και όλα τα έμβια όντα, είναι πέραν των άλλων και ένα δίκτυο παραγωγής και υποδοχής-διάδοσης και εκπομπής ηλεκτρομαγνητικών πεδίων. Η ηλεκτρική λειτουργία των διαφόρων συστημάτων, τα σωματίδια σιδήρου στα κύτταρα, η λειτουργία των πρωτεϊνών ως ημιαγωγών των συστατικών της κυτταρικής μεμβράνης και του ενδο- και εξωκυττάρου νερού ως υγρών κρυστάλλων, στοιχειοθετούν την άποψη παραγωγού, πομπού και δέκτη ηλεκτρομαγνητικής πληροφορίας. Είναι γνωστό ότι οι κυτταρικοί- σωματικοί μικροσωληνίσκοι είναι αγωγοί ΗΜΓ κυμάτων ($f=1013$ Hz και των αρμονικών τους σε $\lambda=mm$) που συντονίζουν τις κυτταρικές λειτουργίες (Lasley, Primgram, 1991), τα κεντροσωμάτια περιέχουν οξείδια του πυριτίου και εκπέμπουν και δέχονται ΗΜΓ σήματα.

Το ανθρώπινο σώμα παράγει μια σειρά θεμελιωδών ΗΜΓ συχνοτήτων, χαρακτηριστικών της δομής και της λειτουργίας του (Andreev, Bely, Sit'ko, 1984). Σήμερα μπορούν να γίνουν μετρήσεις διαφόρων λειτουργιών με σύγχρονα μαγνητόμετρα (SQUIDS) και με τις συσκευές Πυρηνικού Μαγνητικού Συντονισμού (NMR, MRI). Το 1970, Ρώσοι και Ουκρανοί ραδιοφυσικοί ανακάλυψαν ότι υπάρχει συντονισμός των ιστών και κυττάρων με πολύ υψηλής συχνότητας και χαμηλής έντασης ραδιοκύματα. Έτσι για πρώτη φορά καταγράφηκαν οι συχνότητες συντονισμού ανθρώπων, ζώων αλλά και άλλων συστατικών (βιολογικών και χημικών ουσιών) (Petrosyan et al, 1970, Kositsky et al 2001). Η εκπομπή και καταγραφή πολύ χαμηλής έντασης φωτονίων (βιοφωτονίων) από το ανθρώπινο σώμα, διαφορετικής συχνότητας για κάθε όργανο, είναι μια ακόμα σημαντική ένδειξη. (Cohen, Popp, 2003)

Η βιοπληροφορική έχει δείξει ότι η επικοινωνία- η γλώσσα το σώματος, είναι ηλεκτρική και χημική. Οι νευρικές ηλεκτρικές διεγέρσεις περιέχουν πληροφορία, οι βιοχημικές ενώσεις-σήματα περιέχουν πληροφορία προς εκτέλεση, κωδικοποιημένη στη δομή τους. Τα κύτταρα είναι γεμάτα αποδέκτες της πληροφορίας (υποδοχείς) και περιέχουν όλες τις λειτουργικές δομές και τα βιοχημικά μονοπάτια μετάφρασης και μεταγωγής της πληροφορίας αυτής στον πυρήνα προς εκτέλεση εντολής. (Ευαγγέλου)

Τα ηλεκτρομαγνητικά πεδία μεταβάλλουν τη διαβατότητα των κυττάρων σε ιόντα, με αύξηση της εισόδου ασβεστίου. Επίσης μεταβάλλουν την έκφραση των γονιδίων και την μεταβίβαση σήματος στο εσωτερικό των κυττάρων. (Habash, 2008)

Δύο είδη μαγνητικών πεδίων έχουν βρεθεί: του ανθρώπου και άλλων έμβιων όντων, το οποίο παράγεται κατά τη μετακίνηση των ιόντων στα νεύρα, και της λειτουργίας της καρδιάς και του εγκεφάλου, και το γήινο μαγνητικό πεδίο. Φαίνεται ότι τα δύο πεδία αλληλεπιδρούν και επηρεάζουν τις σωματικές δραστηριότητες των έμβιων. Ο Becker αναφέρει ότι το φυσιολογικό γήινο μαγνητικό πεδίο έχει σημαντικό ρόλο στη διατήρηση του -συνεχούς ρεύματος- συστήματος ελέγχου των σωματικών λειτουργιών εντός των φυσιολογικών ορίων. (Becker, 1998)

Το SQUID έχει επίσης πιστοποιήσει την ύπαρξη συνεχούς ρεύματος περινευρικού πεδίου, το οποίο, κυρίως στον εγκέφαλο παράγει σταθερά μαγνητικά πεδία συνεχούς ρεύματος της τάξεως του ενός δισεκατομμυριοστού της έντασης του γεωμαγνητικού πεδίου, περίπου 0.5 Gauss. Πειράματα σε σαλιγκάρια έχουν δείξει την εξάρτηση των βιορυθμών από το γήινο μαγνητικό πεδίο.

Η κύρια διαδικασία της κυτταρικής διαίρεσης κατά την οποία τα χρωμοσώματα του κύτταρου διασπώνται και ευθυγραμμίζονται και διανέμονται εξίσου μεταξύ των δύο κυττάρων, διαρκεί

μόλις λίγα λεπτά. Χρειάζεται να προηγηθούν διάφορα μακρότερα στάδια, ένα από τα οποία είναι ο διπλασιασμός όλου του κυτταρικού DNA. Όλα τα στάδια μαζί διαρκούν μία μέρα. Συνεπώς, η κυτταρική αύξηση και επιδιόρθωση, η οποία στηρίζεται στη ρύθμιση της κυτταρικής διαίρεσης, είναι συγχρονισμένη με το γήινο μαγνητικό πεδίο. (Becker, 1998)

Ο Wever έκανε ένα πείραμα, για να παρατηρήσει την εξάρτηση των κύριων ανθρώπινων βιορυθμών από το γεωμαγνητικό πεδίο. Απομόνωσε δύο ομάδες ανθρώπων σε δύο υπόγεια δωμάτια, από τα οποία το ένα ήταν αποκλεισμένο από κάθε δραστηριότητα ενδεικτική της παρόδου του χρόνου, και το άλλο αποκλεισμένο από τα προηγούμενα και από το γεωμαγνητικό πεδίο. Διαπίστωσε ότι και στα δύο δωμάτια υπήρξε διαταραχή των βιορυθμών, η οποία στο δωμάτιο που είχε αποκλείσει το γεωμαγνητικό πεδίο μεταφραζόταν ως παράταση των ρυθμών. Όταν στο δωμάτιο αυτό εξέθεσε τους εθελοντές σε πεδίο συχνότητας 10 Hz, (ένταση 0,025 V/cm) δηλαδή παρόμοιο με το γήινο, η διαταραχή των ρυθμών αποκαταστάθηκε. (Becker, 1998)

Οι λεπτομερείς μελέτες που έχουν γίνει καταδεικνύουν ότι όλα τα σπονδυλωτά διαθέτουν παρόμοιο μαγνητικό όργανο στην περιοχή του ηθμοειδούς κόλπου, και το όργανο αυτό μεταβιβάζει χρονικά στοιχεία βιορυθμού από τους μικροπαλμούς του γεωμαγνητικού πεδίου στο κωνάριο. (Becker, 1998)

Επιστήμονες στην Ινδία αποφάσισαν να μετρήσουν την επίδραση των ηλεκτρομαγνητικών πεδίων διαφόρων συχνοτήτων σε ανθρώπους. (Subrahmanyan et al, 1985). Οι παράμετροι που κατεγράφησαν, ήταν καρδιακός παλμός, πίεση, εγκεφαλικά κύματα και επίπεδα νευροδιαβιβαστών στο αίμα.

Παρατήρησαν ότι οι εθελοντές είχαν τις περισσότερες αντιδράσεις σε συχνότητες 0,01 Hz σε συνεχές ρεύμα και με παραγόμενο μαγνητικό πεδίο 50 nT. Τα παραπάνω είναι χαρακτηριστικά των ημερησίων διακυμάνσεων του γεωμαγνητικού πεδίου και ειδικά σε περιοχή με ανωμαλίες (Burke, Halberg, 2005).

Επίσης οι επιρροές των γεωανωμαλιών έχουν μελετηθεί και από τον Dr. Persinger, όπου σε μία από τις έρευνες του διαπίστωσε τη σύνδεση ανεξήγητων θανάτων που μεγιστοποιούνται κατά την ανατολή του ήλιου, καθώς οι διακυμάνσεις του γεωμαγνητικού πεδίου κορυφώνονται ακριβώς πριν την ανατολή (Persinger, Psych, 1995).

Σύμφωνα με τον ίδιο τον επιστήμονα, «οι χρονικές και οι περιφερειακές διαφοροποιήσεις στις ψυχολογικές διεργασίες έχουν συσχετιστεί με τρεις γεωλογικούς παράγοντες: τα γεωχημικά χαρακτηριστικά, τις γεωμαγνητικές μεταβολές, και τις τεκτονικές τάσεις. Στον γεωχημικό τομέα, η παρουσία χαλκού, αλουμίνιου, ψευδάργυρου, και λίθιου μπορεί να επηρεάσει την συχνότητα εμφάνισης των διαταραχών σκέψης, όπως η σχιζοφρένεια και η γεροντική άνοια. Αυτά τα κοινά στοιχεία βρίσκονται σε πολλά εδάφη και στα υπόγεια ύδατα.

Οι γεωμαγνητικές ανωμαλίες έχουν συσχετιστεί με αυξημένο άγχος, διαταραχές ύπνου, αλλοιωμένη διάθεση, και μεγαλύτερη συχνότητα εμφάνισης ψυχιατρικών εισαγωγών. Παροδικές και τοπικές επιδημίες παράξενων και ασυνήθιστων συμπεριφορών είναι κοινωνιολογικά φαινόμενα, από τα οποία έχει αρκετές φορές προηγηθεί αύξηση της σεισμικής δραστηριότητας σε μια περιοχή, και συνδέονται με την τεκτονική καταπόνηση.

Πολλές από τις σύγχρονες συσχετίσεις μεταξύ γεωλογικών παραμέτρων και την ανθρώπινη συμπεριφορά είναι εμφανής μέσα σε ιστορικά δεδομένα. Τα αποτελέσματα των γεωφυσικών και γεωχημικών παραμέτρων στην ανθρώπινη συμπεριφορά είναι συχνά περίπλοκα και δεν ανιχνεύονται από το περιορισμένο πεδίο εφαρμογής των περισσότερων μελετών». (Persinger, 1987)

Επίσης, ο ίδιος συμπεραίνει ότι η εγκεφαλική λειτουργία που σχετίζεται με τη συνείδηση ανταποκρίνεται με ανεπαίσθητες αλλαγές στη γεωμαγνητική δραστηριότητα. Μετρώντας τα αποτελέσματα των ίδιων μεταβολών στο εργαστήριο του, παρατήρησε ότι είχαν άμεση επίδραση την ηλεκτρική ευαισθησία των εγκεφαλικών κυττάρων (και σε ακραία μορφή προκάλεσαν επιληπτικές κρίσεις) και επηρέαζαν τη δυνατότητα συγκέντρωσης των ατόμων κατά τη διάρκεια της μέρας. Επέλεξε στα πειράματα του να αναπαράγει τη διακύμανση μαγνητικού πεδίου των 50 nT που συνάδει με τις διακυμάνσεις που προκύπτουν συνήθως στη φύση.

Επιβεβαιώνει, ότι όλα τα ανθρώπινα όντα εμποτίζονται με το γεωμαγνητικό πεδίο, και είμαστε συνδεδεμένοι με αυτό, καθώς και όλα τα δευτερεύοντα πεδία που προκύπτουν από αυτή τη σύνδεση. Ως αποτέλεσμα, πολύ μικρές αλλαγές στην δραστηριότητα του γεωμαγνητικού πεδίου επηρεάζουν άμεσα την ανθρώπινη βιολογία, και δημιουργούν τη δυνατότητα για αλλαγή στην εγκεφαλική δραστηριότητα κάποιου χωρίς να το συνειδητοποιεί. (Persinger, 1983)

Ο γεωφυσικός Andrei Apostol, χρησιμοποίησε μία δική του συσκευή που μετρά τον αριθμό συσπάσεων των μυών σε εθελοντές, καθώς αυτοί μετακινούνταν σε διαφορετικά γεωλογικά υπόβαθρα. Τα αποτελέσματα έδειξαν διασταυρούμενη αναφορά των μυϊκών συσπάσεων, των βαρυντικών ανωμαλιών και των γεωλογικών τομών. (Apostol, 1996)

Ένα ισχυρό παράδειγμα γεωανωμαλίας είναι το λεγόμενο Cliff of Tears, μια περιοχή στην Βόρεια Αμερική, όπου μετά από σχόλια επισκεπτών παρατηρήθηκε ότι οι άνδρες επισκέπτες ρινορραγούσαν, ενώ οι γυναίκες είχαν ξαφνική εμμηνόρροια. Ο David Barron, διευθυντής του Gungyswamp Swamp στο Connecticut, αποφάσισε να διεξάγει ένα πείραμα με 20 εθελοντές και νοσοκόμες, όπου παρατηρήθηκε σημαντική διαφορά στην αρτηριακή πίεση μετά από έκθεση τους στην περιοχή. (Burke, Halberg, 2005)

Ο Dr. Debertolis μελετώντας τον τομέα της αρχαιοακουστικής, παρατήρησε ότι υπάρχουν συγκεκριμένες συχνότητες που ανιχνεύονται σε αρχαία μνημεία και συμπέρανε ότι οι αυτές κυμαίνονται κυρίως μεταξύ 90-120 Hz (πχ στα νεολιθικά μνημεία της Ευρώπης (πχ Αγγλία, Ιρλανδία, Ιταλία, Μάλτα). Υπέβαλε λοιπόν με την ομάδα του εθελοντές σε αυτές τις συχνότητες, ταυτόχρονα εξετάζοντας τους με ηλεκτροεγκεφαλογράφημα EGG, και διαπίστωσε ότι υπήρξε επικράτηση και έντονη δραστηριότητα στον μετωπιαίο ή ινιακό λοβό χωρίς επικράτηση του κάποιου εγκεφαλικού ημισφαιρίου κατά τη διάρκεια της έκθεσης. (Debertolis et al, 2014)

Ο Dr. Cook, γιατρός, επίσης διαπίστωσε τη σύνδεση τοποθεσίας, αρχιτεκτονικής και επίδρασης στη βιολογία. Σε διάφορες αρχαιοακουστικές έρευνες προϊστορικών, και μεγαλιθικών δομών εντόπισε ακουστικούς συντονισμούς σε συχνότητες από 95-120 Hz, ιδιαίτερα κοντά 110-12 Hz, που αντιπροσωπεύουν το ανθρώπινο φωνητικό εύρος. Σε ένα πιλοτικό πρόγραμμα, 30 υγιείς ενήλικες εκτέθηκαν σε 90, 100, 110, 120, και 130 Hz, ενώ η εγκεφαλική δραστηριότητα παρακολουθήθηκε με ηλεκτροεγκεφαλογράφημα (EEG). Η

δραστηριότητα στην αριστερή κροταφική περιοχή βρέθηκε να είναι σημαντικά χαμηλότερη στα 110 Hz από ό, τι σε άλλες συχνότητες. Επιπροσθέτως, το μοτίβο των ασύμμετρης δραστηριότητας πάνω από τον προμετωπιαίο φλοιό μετατοπίστηκε, από υψηλότερη δραστηριότητα στα αριστερά στις περισσότερες συχνότητες, σε δεξιά κυριαρχία στα 110 Hz. Αυτά τα ευρήματα είναι συμβατά με τη σχετική απενεργοποίηση των κέντρων γλώσσας και μια μετατόπιση στην προμετωπιαία δραστηριότητα που μπορεί να σχετίζονται με τη συναισθηματική επεξεργασία. Αυτά τα ενδιαφέροντα πιλοτικά ευρήματα αυτά υποδηλώνουν ότι οι συχνότητες των αρχαίων δομών μπορεί να επηρεάσουν την ανθρώπινη εγκεφαλική λειτουργία. (Cook et al, 2008)

Ο Dharmatikari ορίζει ως γεωπαθητικές ζώνες, τόπους πάνω στη γη γνωστούς για πρόκληση θεμάτων υγείας. Ο ίδιος και η ομάδα του έκαναν μετρήσεις σε άτομα σε μία γεωπαθητική και μια ουδέτερη ζώνη, και τα αποτελέσματα ήταν ότι το ηλεκτρικό δυναμικό του σώματος αυξήθηκε και η αντίσταση του δέρματος μειώθηκε όταν εκτέθηκαν σε γεωπαθητική ζώνη, συγκριτικά με την ουδέτερη ζώνη.(Dharmatikari et al, 2011)

Ο Dr. Aschoff, γιατρός, ήταν ο πρώτος που έκανε χρήση των ηλεκτρομαγνητικών ταλαντώσεων του αίματος, που είναι μετρήσιμες από ένα απλό τεστ αίματος. Μετά από 20.000 τεστ, παρατήρησε ότι άτομα με ηλεκτρομαγνητικά ταλαντούμενο αίμα ζούσαν χωρίς εξαίρεση σε διαταραγμένη γεωπαθητική ζώνη, είτε στο χώρο ύπνου ή στο χώρο εργασίας τους. Τα άτομα που είχαν μόνο μαγνητικά ταλαντούμενο αίμα δεν είχαν εκτεθεί σε γεωπαθητική διαταραχή και ήταν υγιή. Εξαιτίας του στρες από ρεύμα και ακτινοβολία της γεωπαθητικής ζώνης, το αίμα χάνει τη φυσική του δομή και πολώνεται ηλεκτρικά στο αντίθετο σήμα. Επίσης αναφέρει ότι η ακτινοβολία νετρονίων που εντοπίζεται σε γεωπαθητικές ζώνες, μπορεί να προκαλέσει μεταλλάξεις στα κύτταρα. (Bachler, 1976)

Ο Dr. Hacker, επίσης γιατρός, αναφέρει ότι τα διαμήκη βαθμωτά κύματα είναι η αιτία που προκαλεί συμπτώματα στη βιολογία, σε διαφορετικές τοποθεσίες. Μαζί με την ομάδα του, διεξήγαγαν πειράματα με χρήση συστήματος GDV (Gas Discharge Visualization) του Dr. Korotkov και παράλληλα κάνοντας μετρήσεις Ανοσοσφαιρίνης-A (IgA) και Α-Αμυλάσης. Τα αποτελέσματα ήταν σε απόλυτη αρμονία, καθώς σε υψηλότερη GDV Mean Area η IgA ήταν υψηλότερη, ενδεικτικό χαλάρωσης, και στις γεωπαθητικές ζώνες με χαμηλότερη GDV Mean Area, η Α-αμυλάση ήταν υψηλότερη, ενδεικτικό κατάστασης στρες. Τα διαγράμματα Corona Discharge του GDV έδειξαν στην περίπτωση της έκθεσης στη γεωπαθητική ζώνη αποδυνάμωση του ανοσοποιητικού συστήματος και της λειτουργίας επίφυσης.

Η αρχαία μέθοδος για επιλογή ενός τόπου για την κατοικία θεωρείται η παρουσία θάμνων, το χρώμα της γης, η παρουσία των υδατικών συστημάτων και οι ανάπτυξη των δέντρων. Επίσης ο σταβλισμός ζώων στον προτεινόμενο χώρο και η παρατήρηση της συμπεριφοράς και της υγείας τους για ορισμένο χρονικό διάστημα (Bradna, 2002).

Προφανώς, οι γεωπαθογόνες ζώνες δεν επηρεάζουν μόνο τον άνθρωπο, αλλά όλα τα είδη των ζώων, των φυτών, μυκήτων και βακτηρίων (Gerhard, 2008, Dubrov, 2008, Von Pohl, 1993, Gak,2008).

Το 1947, ο H. L. Yeagley στο Journal of Applied Physics έδειξε ότι τα περιστέρια έχουν μαγνητική αίσθηση που τους επιτρέπει να χρησιμοποιούν το γεωμαγνητικό πεδίο όπως εμείς χρησιμοποιούμε την πυξίδα. (Yeagley, 1947). Μαγνητικοί κρύσταλλοι έχουν βρεθεί σχεδόν σε όλα τα ζώα που χρησιμοποιούν το γήινο μαγνητικό πεδίο για πλοήγηση. (Long, 1991). Επίσης η παρουσία αρνητικών ιόντων αυξάνει σημαντικά την ανάπτυξη και απόδοση των φυτών (Kruger, Yamaguchi, 1983).

5.0 Αρχαίοι ναοί

Αναλύοντας αρχαία μνημεία στην Ελλάδα και στο εξωτερικό, παρατηρείται ότι κατά πλειοψηφεία είναι τοποθετημένοι σε περιοχές με έντονες γεωφυσικές ανωμαλίες.

Μεγαλιθικά μνημεία και Πέτρινοι κύκλοι σε διάφορες χώρες της Ευρώπης παρουσιάζουν υψηλή συσχέτιση μεταξύ τοποθεσίας και γεωλογικών και γεωφυσικών επιρροών. Η κατηγοριοποίηση και ταξινόμηση τους μέσω γεωμαγνητικών χαρτών, ραδόνιου, μαγνητικών χαρτών, χάρτες βαρύτητας, γεωλογικούς χάρτες, χάρτες ουρανίου, χάρτες γρανίτη, χάρτες γάμμα ακτινοβολίας, πυριγενών πετρωμάτων (γρανίτη, γρανοδιορίτη, tonalite) και ηφαιστειακών πετρώματων, υδρογεωλογικούς χάρτες και χάρτες ρηγμάτων δίνει μια σημαντική βάση δεδομένων για την ανάλυση της τοποθεσίας των μνημείων από πολλές πλευρές.

Επίσης προτείνονται σαν οι πιθανές λειτουργίες των αρχαίων μνημείων, και ειδικότερα, ο ρόλος των γεωφυσικών ανωμαλιών, στις μυστικιστικές εμπειρίες, τη θεραπεία και την ενίσχυση της ανάπτυξης των σπόρων.

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