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THE SUN'S ACTIVITY AND ITS INFLUENCE ON CLIMATE OF THE PLANET EARTH AND SECURITY OF HUMANKIND

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ABSTRACT
The Sun and its chemical composition. The Sun's activity and its influence on climate of the planet Earth. Eruptions and galactic waves on the Sun and within our galaxy. Ignition of cosmic dust (or interstellar dust). The Earth orbits the Sun. Existence of energetic charged matter in interstellar space penetrating the interstellar space of our solar system. Radiation of the white light. Significant change of electromagnetic radiation – extreme ultraviolet and roentgen spectre. Increase of total magnetic flow of the Sun. Emergence of atmospheric. Increased temperature of the Sun. Change of the ozone layer. Change of temperature inversions in hydrosphere. Increase in the number of significant catastrophes. Increase in the number of earthquakes. Changes of photosynthesis. Negative evolution of plants. Change in the levels of oxygen. Magnetic field of the Sun. Magnetosphere and magnetic field of the planet Earth.

Key words: climate system of the planet Earth, activity of the Sun, heliosphere, magnetosphere of the planet Earth, risks of Sun's activity for the planet Earth and security of humankind

Introduction

Climate is usually considered one of the most important determinants of evolution of the planet Earth. It also deeply influences the security and safety of humankind. Today, humankind has to face one very important fact – climate system of the planet Earth shows us its “darker and even more dangerous face”. Complexity of the survey of climate system is based on findings that

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climate changes are even more frequent and they are usually irreversible, according to **J. Lovelock**. (Lovelock, 2012, p. 20) Various types of climate crises will affect the world. (Lovelock, 2012, p.22) He supposes that not only climate changes, but also other situations such as famine or struggle over territory and resources, as well as wars, will be the most serious threats of the future. (Lovelock, 2012, p.33) Conclusions like the above-mentioned show that deeper and complex survey of climate system of the planet Earth is of great importance. Scientific literature tends to conclusion that greenhouse gases, particularly the carbon dioxide – CO_2, affect the temperature of the planet Earth and cause the global warming effect. Humankind is often seen "as guilty as it gets". On the other hand, many theoreticians and experts do not agree with this conclusion. They started to emphasize another theory, based on the idea that main causes of climate changes of the planet Earth are to be found in natural processes, particularly the Sun's activity.

In the next part of the academic paper, we try to formulate conclusions concerning the influence of the Sun's activity on climate system of the planet Earth and security of humankind.

1 The Sun and its chemical composition

Climate system of the planet Earth and increase of temperatures are connected with cosmic-terrestrial interactions, according to recent findings of scientists. (WM 114/115, 2011, pp. 44 - 45) Their arguments show that while the rise of CO_2 concentration has stopped and amount of methane in atmosphere is still decreasing, imbalance of temperatures and global setting of pressure field is still growing. (WM 114/115, 2011, pp. 44) Considering the last 500 years, Greenland temperatures have been fluctuating 40 times within a period of 25-30 years. Those changes could not have been caused the change of CO_2 because they had started even before the enormous eruption of CO_2 emissions, which started in 1954. Warming in 1915 – 1945 cannot be related to CO_2. Thirty years of global cold (1945 – 1977) happened during enormous increase of CO_2 emissions. (WM 111, 2011, p. 2) Variation in temperatures during the last three decades is not in accordance with greenhouse model prognoses, but they are in close correlation with *changes of the Sun´s activity*, according to climatologists of University of Rochester, University of Alabama and University of Virginia. Climate and temperature of the planet Earth are even more dependable on *cosmic climat*e. Terrestrial climate changes create only a small part of events

occurring in our heliosphere, according to **Dr. A. N. Dmitriev.** (WM 114/115, 2011, p. 40) The theory that climate of the planet Earth is influenced by variations of the Sun's activity, particularly solar winds and magnetic fields influencing the stream of cosmic beams falling into Earth's atmosphere is of the highest probability. It is probable that cosmic beams influence the density of clouds and control amount of solar beams falling into surface of the planet Earth. Therefore, the idea that CO_2 causes the decline of climate system of the planet Earth is often seen as a mistake today. According to **H. Svensmark** from Danish National Space Center laboratory work demonstrates that warming of the planet Earth in the 21st Century can be explained by activity of the Sun and the stars. (WM 136, 2013, p. 8) **H. Svensmark** and **E. F. Christensen** claim that the Sun seems to be the main factor influencing the global climate changes.

The Sun is a star of our solar system. Gravitational activity of the Sun attracts all objects of the solar system. The distance between the Sun and the planet Earth is changing from 147,097,000 km (perihelion) to 152,099,000 km (aphelion). Light from the Sun reaches the planet Earth in around 8 minutes and 20 seconds.[1] The Sun is the biggest space object of the solar system. The Sun is far larger than the planet Earth; it is 190 times as big (in diameter) and 1,300,000 times as dense. Mass of the Sun makes up over 99,8% of the solar system. Its weight is 745 times bigger than the weight of all planets of the solar system, including Pluto. The Sun is a giant rotating plasma sphere with average density; its density is comparable to the density of water. The Sun is a lonely star, it does not create a two-star or multiple-star system and it is not a part of any star cluster. The Sun is a star of main grade, G2V spectral classification. It means that it is a yellow star bigger than the average star but smaller than the blue giant is. Visual brightness (V) means that the Sun is in a stable stage of its evolution, and it transforms nuclear fusion of light hydrogen (protium) into helium. Planets, asteroids, meteorites, comets and interstellar dust orbit the Sun. (Slnko, 2011)

Chemical composition of the Sun is not clear yet. Most information about its chemical composition comes from the spectre of the Sun. In general, the Sun consists of 92,1% of hydrogen and 7,8% of helium (percentage represents the

[1] In comparison, light from the nearest star system Alpha Centauri reaches the planet Earth in 4,3 years. (Kleczek, 2011, p. 47)

number of atoms). Considering the photospheric composition (by mass), the Sun consists of hydrogen (75%) and helium (25%). (Kleczek, 2011, p. 76)

Composition and individual layers of the sun from the core to the surface are as follows:

- *The core of the Sun* (or solar core) is around 175,000 km deep (from the core to the surface). It has a temperature of 14,000,000 Kelvin; pressure in the middle is estimated at $150x10^9$ atmospheres. The core of the Sun has a density of 150 g/cm^3; it is 150 times the density of water. (Kleczek, 2011, p. 33)
- *The radiation zone* (or radiative zone) is internal layer of the Sun. This layer is located between the core of the Sun and the convection zone. Temperature of the radiation zone drops from 15,000,000 to 2,000,000 Kelvin. Temperature of this layer does not support thermonuclear reactions. All energy of the core is transported by means of radiative diffusion.
- *The tachocline* is a thin layer between the radiation zone and the convective zone. (Kleczek, 2011, p. 64) It generates magnetic field of the Sun, according to scientists. It transforms kinetic energy of plasma to electricity and electric waves; it also generates magnetic energy as well. (Kleczek, 2011, p. 65)
- *The convection zone* is the higher layer of internal part of the Sun. The convection zone is 200,000 km deep. (Kleczek, 2011, pp. 32, 65) Temperature of this layer drops from 2,000,000 to 6,000 Kelvin.
- *The Sun's photosphere* is the lowest, the densest and the coldest layer of the Sun. This layer is about 300 km deep. The Sun's photosphere has a temperature between 4,500 and 6,000 Kelvin and a density of about $2x10^{-4}$ kg/m^3. (Kleczek, 2011, p. 31) The Sun´s photosphere is a visible atmosphere/surface of the Sun with various surface features such solar flares and sunspots. This layer lies between the chromosphere and the convection zone.
- *The chromosphere* is a layer of highly ionised gas (plasma). This layer is approximately 15,000 km deep. It reaches around 3,000 km above the photosphere. (Kleczek, 2011, p. 55) It is the bottom layer of the Sun's atmosphere and lies between the photosphere (above the photosphere) and the solar transition region (below the solar transition region). The temperature of this layer increases with increasing height

in the chromosphere. The temperature at the top of photosphere is only about 4.400 Kelvin, whilst at the top of chromosphere – some 2.000 km higher – it reaches 25.000 Kelvin. There are many phenomena that can be observed in the chromosphere such solar prominences, solar flares, spicules and granules.

- *The solar transition region* is a layer between the chromosphere and the corona. This layer is 3,000 km deep and the temperature drops from 10,000 to 2,000,000 Kelvin. (Kleczek, 2011, p. 56) It is a very weak layer of the Sun, in comparison to surface of the Sun and the photosphere. It is also a very thin and irregular layer of Sun's atmosphere, which separates warm corona from colder photosphere. The temperature suddenly changes and rises up rapidly from 20,000 Kelvin (near chromosphere) to 1,000,000 Kelvin (near corona). This layer can be surveyed using telescopes that can sense ultraviolet.
- *The corona* is the upper part of the Sun's atmosphere. The corona is 10 − 12 times as dense as the photosphere. This layer is composed of magnetised gas with the average temperature of 1 – $2x10^6$ Kelvin. This gas is completely ionised and full of electrically charged particles. It is called *plasma*. The Sun's corona extends millions of km into space and generates the solar wind (velocity of solar wind near the planet Earth drops from 300 to 800 km/h). Coronal mass ejection can influence the planet Earth, too. Astronauts and space stations are at risk of intense cosmic rays. Burst of solar wind can disrupt magnetosphere of the planet Earth and cause geomagnetic storms; it can disrupt navigation devices, radio transmissions and electrical transmission lines. (Kleczek, 2011, pp. 52, 60)

2 The Sun's activity and its influence on the planet Earth

The Sun's activity represents a complex of dynamic phenomena, which occur on the Sun's surface, or under the surface, in a limited space and time. Those processes can change the magnetic field and amount of particles released into surrounding space. The Sun's activity is often described as a burst of pulsing tubes of power and magnetic energy into atmosphere, their transformation and extinction. The transformation of kinetic energy into magnetic energy is hidden under the visible surface of the Sun. (Kleczek, 2011, p. 87)

The most important activities/phenomena of the Sun (and impacts on the planet Earth) are as follows:

- *Eruptions and galactic waves in the Galaxy and on the Sun*. Our galactic centre (the Sun) is regularly releasing destroying impulses, called *superwaves*, according to subquantum kinetics of **P. LaViolette**. (WM 104, 2010, p. 34) He concludes that there is only a small interaction between cosmic rays released by galactic centre and interstellar magnetic fields; and this is the main reason why cosmic rays spread in the form of coherent radial spherical tide, very similar to a wave. Galactic wave reaches the climate of the planet Earth every 13,000 years (when solar system crosses the galactic equator), according to **P. LaViolette**. Centre of our galaxy (or galactic core) generates energy pulses every 10,000 years and every phenomenon lasts approximately 100 years, according to **Morris**. (WM 104, 2010, p. 34) Considering the contemporary survey, galactic core emissions like those reached the planet Earth and caused the beginning and the end of ice ages and mass extinction of animals. **P. LaViolette** supposed that superwaves released by galactic core could reach the planet Earth again and cause another period of ice age. He also emphasized that there is a real possibility that such an event could occur in the next few decades. While in the past similar events of "low intensity" stayed unnoticed, today they could represent greater danger for humankind. **P. LaViolette** also supposed that cosmic rays could penetrate the magnetosphere of the planet Earth, form radiation belts and generate *equatorial ring current*, which could generate magnetic field opposite to the magnetic field of the planet Earth. It could disrupt geomagnetic field of the planet Earth and change the polarity. (WM 104, 2010, p. 36) Powerful geomagnetic solar storms can cause a global catastrophe, according to recent warnings of NASA. Scientists warn that solar storms can disrupt radio transmissions and cause damage to navigation devices, satellites, emergency systems, bank systems, air traffic controls and electrical transmission line facilities, resulting in massive and long-lasting power outages. Penetration of the planet Earth by solar magnetic energy reaches its top every 22 years. On the other hand, number of sunspots and bursts of solar energy reaches its maximum level every 11 years. (WM 102, 2010, p. 26) However,

combination of both phenomena could be very dangerous for humankind.

- *Burst of interstellar dust*. Solar system is surrounded by a ring of circulating dust that begins beyond the orbit of Saturn, according to **M. Landgraf** and ESA astronomers. **P. LaViolette** claims that the interstellar dust is the main cause of the brighter Sun and continuous flare of interstellar dust. During the study of the Sun in 1994/1995 and then in 2000/2001 spacecraft Ulysses discovered that interstellar dust coming to the Solar system was 30 times more abundant than it was previously expected. (Wojnar, 2010, p. 35)
- *The planet Earth orbits the Sun*. This could be another cause of climate changes on the planet Earth. This idea was presented for the first time by **M. Milankovic**, Serbian mathematician and astronomer. He claimed that three cyclical movements of the planet Earth around the Sun and changes in the geometry of an orbit affects the amount of solar energy received by the planet Earth and total global temperature. (Ward – Brownlee, 2004, p. 97) The first change is connected with *the orbital eccentricity* of the planet Earth. The orbit of the planet Earth is almost circular, but the eccentricity varies from circular orbit to elliptic orbit every 95,000 years. (Ward – Brownlee, 2004, p. 97) Change of the orbital eccentricity leads to changes in the insolation – approximately one watt per square meter. If it is a long-term phenomenon, for example in ten thousand years it could lead to change of global temperature around 0,5 Celsius. Contemporary orbit is elliptic; the planet Earth is closest to the Sun every year in January, and farthest away from the Sun in early July. Because the majority of the dry land is located on the Northern Hemisphere and the Sun is farther away from the planet Earth during the northern summer, we live in a period when snow in the summer tends to last longer than a long-term norm supposes. The second change is connected with *the axial tilt*, known as obliquity – *change of the angle between rotational axis and orbital axis of the planet Earth*. The Moon has a stabilising effect on the axial tilt of the planet Earth, in comparison to other planets, for example Mars. Despite the above-mentioned fact, the obliquity of the planet Earth varies from about 21,8 to 24,4° with a period of 41,000 years. The axial tilt is also the cause of seasons on the planet Earth. Variations in axial tilt influence the seasons – the greater axial tilt is the bigger differences

between seasons occur. (Ward – Brownlee, 2004, p. 97) Significant change of the angle influences the cycle of seasons in higher latitudes where changes in the amount of solar radiation energy received during the summer do not compensate losses of energy during the winter. Net annual change caused by the axial tilt of the planet Earth may reach 17 watts per square meter in higher latitudes. It can deeply influence global climate. The third change is connected with *the axial precession*. It is an oscillation; a gradual shift in the orientation of axis of rotation of the planet Earth in a cycle of 22,000 years. This precession also influences the seasons. When the planet Earth is farthest away from the Sun, there is a summer on the Northern Hemisphere and winter on the Southern Hemisphere. This is our contemporary situation, but it will change in about 11,000 years; it will be reversed. (Ward – Brownlee, 2004, p. 98) Equinox is a result of movements of Earth's axis and is caused by a change of position of the two opposite points on the celestial sphere, when the planet Earth is closest to the Sun. They are characterised by warmer winters and colder summers on one hemisphere and colder winters and warmer summers on the other. (Barros, V., 2006, p. 61) Because both hemispheres are asymmetrical, those movements affect the climate. The Southern Hemisphere receives and absorbs less solar radiation energy. Its albedo (ratio of reflected solar radiation) is higher. It is because the Southern Hemisphere is mostly covered by oceans and it is cloudier than the Northern Hemisphere. Albedo of the Antarctic (South Polar Region) is higher, considering the annual average, because the ice cover almost disappears during the summer, while in the Arctic it remains throughout the whole year. The planet Earth absorbs less solar radiation energy when the planet is at perihelion (the planet Earth is closest to the Sun) and at aphelion (the planet Earth is farthest away from the Sun). This effect is even stronger if the angle between rotational axis and orbital axis of the planet Earth is growing and the asymmetry of orbit is increasing. Considering the astronomical perspective we go through a period of cooling because the perihelion falls on January 3, i.e. summer in the Southern Hemisphere and the angle between rotational axis and orbital axis of the planet Earth (23,3°) is close to the average. Since the orbital eccentricity of the planet Earth is almost minimal, cooling should not be so intense. Moreover, it can be influenced by increasing

concentration of greenhouse gases in the last two centuries. (Barros, 2006, p. 35)

- *Existence of energetic charged matter* between interstellar spaces. This matter is released into interstellar spaces of our solar system. This "donated" energy generates hybrid processes and disrupts energy situation on the Sun, and on the planet Earth as well. Impacts on the planet Earth can be as follows: *acceleration of geomagnetic reversal*, change in vertical and horizontal distribution of the amount of *atmospheric ozone* and increase in the number of global climate catastrophes. There is a very high probability that the planet Earth is moving towards a period of *radical temperature instability*, similar to a period approximately 10,000 years ago. Adaptability of planet's biosphere, together with human activities, can lead to extinction of life on the planet. Under the specific circumstances, adaptability of planet's biosphere together with human activities can endanger life on the planet Earth. Events of the last decades give us many evidences about significant heliospheric and planetary physics transformations. Adaptability of the planet Earth to external activities and energy transfers was violated by technogenious changes on the planet. The planet Earth goes through the following dramatic changes: changes of electromagnetic sphere, changes of axis of geomagnetic field and changes of ozone and hydrogen saturation levels in atmosphere. Those changes of the physical state are accompanied by climatic, atmospheric and biospherical processes. Those processes are more and more intense and cause irregular transient events. Due to the fact that there was a significant increase of the tropospheric ozone concentration between 5 and 7 miles above the surface of the planet Earth we have to make the following conclusion: process of substantial change of the gas composition and the physical state of Earth's atmosphere has already begun. Reports on decrease of the stratospheric ozone concentration (from 25% to 49%, it was even higher above the Siberia; global loss of ozone between 20 and 26 miles above the surface of the planet Earth) are on the rise. There is no measurable evidence of the rise of ultraviolet radiation concentration on the surface of the planet Earth. Nevertheless, the number of "ozone warnings" in big cities is increasing. (WM 114/115, 2011, p. 45)

- *Radiation of the white light*. The white light is a driving force of biosphere and climate system on the planet Earth. The gravitational force between the planet Earth and the Sun is $18x10^{66}$ Newtons (N). (Kleczek, 2011, p. 98) Photons are released by the Sun and absorbed by the planet Earth throughout a day in approximately 180.000 terawatts. (Kleczek, 2011, p. 99) Photons released by the Sun heat the planet. The planet radiates its own heat energy back to space in the form of infrared radiation. However, photons radiated by the planet Earth carry the energy of 1 Electronvolt (eV) – it is 20 times less than photons arriving at the top of the atmosphere. Approximately 1/3 of the solar radiation (1/3 of 180,000 terawatts) is reflected back to space by clouds and surface. (Kleczek, 2011, p. 101). 2/3 of solar radiation is absorbed by the atmosphere and the surface of the planet Earth, i.e. 120,000 terawatts of solar radiation are being transformed to heat of the atmosphere and the surface of the planet. Energy of solar radiation is absorbed by matter. However, this whole process is asymmetric and it is violated by the use the fossil fuels, mainly by burning of the fossil fuels, which produces greenhouse gases, particularly CO_2.
- *Change of electromagnetic radiation* (in extreme ultraviolet and roentgen spectre). Average is around 400%. Radiation in the plasma sphere located on the outermost edge of our Solar system (the heliosphere) strengthened by 1000%. This tail (often referred to as heliotail) had reached 10 AU before (distance between the Sun and the planet Earth). Today, the heliosphere can be observed as it reaches 100 AU. Solar system is a highly charged sphere of energy. Therefore, we do observe increasing brightness and luminescence. (WM 133, 2013, p. 38) Radiation influences the ionosphere and creation of electric flows in the atmosphere of the planet Earth. It also influences the velocity and the density of the solar wind's particles around our planet. These phenomena connected with solar activity modulate the flow of *galactic cosmic radiation* and the creation of cosmogenic isotopes ^{14}C, ^{10}Be and 180. Short wave radiation components (gamma radiation, roentgen radiation and ultraviolet radiation) attack and penetrate the atmosphere drastically, but the ozone layer and the atmosphere itself absorb and block most radiation in higher latitudes.

- *Enormous increase of the magnetic flow of the Sun* (increases 2.3 times since 1901). This phenomenon influences the whole *heliosphere*. It led to *magnetospheric changes* of the planet Earth, too. *Eruptions* and *coronal mass ejections* (CME) cause various geomagnetic effects (geomagnetic storms, strengthening of electric flows in the atmosphere, aurora borealis etc.). CME influences the magnetospheric flows in Earth's magnetosphere and it could disrupt all forms of electronic communication on the planet. Solar cycles and geomagnetic field of the Sun – the 24th Solar cycle is coming - combined with decreasing intensity of magnetic poles on the planet Earth can affect the climate of the planet, as well as electric distribution networks and human behaviour. Contemporary findings show that the last cycle of solar eruptions could be so enormous to disrupt all electric distribution networks on the planet. (WM 107/108, 2010, p. 40) It could lead to sudden or gradual loss of the heat on the planet, failure of all communication systems and traffic systems and problems with supply of food and fuel.
- *Excess of Energy*. There is a new scenario of excess of energy connected with the following phenomena: generation of plasma in ionosphere, magnetic storms in magnetosphere and cyclones in atmosphere. Those high-energy atmospheric phenomena are very often and so intensive today. The composition of the whole layer of gases – the atmosphere – is changing too. Global changes of *electromagnetic field* and deep changes of the *climate system* can affect fauna and flora on the planet. Natural evolution of new forms of fauna and flora can lead to complex global revision. New physical state can support the evolution of new deeper qualities of life and improved organisms. These new forms of life try to achieve the balance using new evolutionary and reproduction abilities. There is one uncompromising fact. Humankind has to adapt to new planetary conditions, conditions of unstable and unequally diversified biosphere. (WM 114/115, 2011, pp. 44 – 49)
- *Rise of atmospherics (spherics)*. Atmospherics are electromagnetic flashes that occur as a result of natural atmospheric lighting discharges. Discharges increase the total electron density and strengthen *ionospheric electric flows*. Normally, short radio waves go

from the Earth's surface up to the F layer (or the F region that exists from about 150 to 200 km above the surface of the planet Earth), reflect from it and return to the surface. However, ultraviolet and roentgen radiation released by the Sun (solar eruptions) strengthened the ionisation of the D layer, 50 km above the surface of the planet, and the layer absorbs all short radio waves. Near the surface, the D layer causes sudden strengthening of atmospherics, often known as SEA (Sudden Enhancement of Atmospherics). (Kleczek, 2011, p. 146) The D layer absorbs radio wave (the Dellinger effect). (Kleczek, 2011, p. 151) This effect interrupts navigation systems, telecommunication systems and space probe communication. The solar storm affects our environment; it strengthens very long electromagnetic waves (frequency 30 kHz, wavelength 10 km). SEA also affects humans. It is like a jolt of electricity. Our *organism* is a system bounded by electric power. All chemical reactions of the body, processes in human cells, metabolism or even heartbeat are practical examples of electricity in life processes. Atmospherics affect our nervous system; nerves remind us secondary winding of the transformer. (Kleczek, 2011, pp. 146 – 147)

- *Higher luminosity and heat of the Sun*. Since the formation of the planet Earth 4.5 billion years ago, the Sun's luminosity has increased by about 30%. The Sun is a giant hydrogen sphere. When such an enormous amount of hydrogen (plus smaller amounts of helium and other trace elements) collapses under its own weight, internal parts of the star are heated to million degrees C and hydrogen is transformed to helium in the process called nuclear fusion. Helium, a product of this synthesis, is a bit lighter than other heavier elements, for example carbon or oxygen. Transformation of matter to energy is crucial for existence of the Sun. In spite of the fact that almost four tons of matter is transformed to energy in the core of the Sun every second, we do claim that our star is so giant that it can produce the energy for more than ten billion years until it fuses all hydrogen. (Ward – Brownlee, 2004, pp. 121 – 122) The more hydrogen is transformed to helium, the hotter the Sun is. (Ward – Brownlee, 2004, p. 120) Luminosity of the Sun is increasing and, simultaneously, number of atoms of hydrogen in its core is decreasing. Pressure within the Sun depends on two physical quantities: number of particles and temperature of gas. The warmer the gas is, the higher the velocity of particles is. Since the number of particles in the core is

decreasing (the Sun fuses hydrogen, then helium, carbon etc.) the temperature is continually increasing (the pressure has to be constant). As temperature grows, hydrogen (or other elements) is moving faster, collisions are more frequent and the production of helium is increasing. This reaction is the key energy source of the Sun. The more hydrogen is fused in its core, the hotter the Sun has to be to avoid collapse, according to the law of conservation of energy. This slow increase of energy production will last for more than ten billion years. Finally, the Sun will use up all of its fuel; it will fuse all hydrogen and become a red giant. Outer layers of the Sun will blow further, far beyond the orbit of the planet Earth. (Ward – Brownlee, 2004, p. 124) The Sun will destroy the planet Earth; it will burn it down.

- *Change of the ozone layer* (so-called ozone hole). Photons of ultraviolet radiation split molecules of oxygen into O+O. Free atoms of oxygen, connected with un-split molecules, are turned into *ozone* O_3. Ozone molecules absorb ultraviolet radiation and they are turned into O_2 again. They are in balance in the height between 17 and 40 km above the surface of the planet Earth. This layer of ozonosphere absorbs most ultraviolet radiation. Today, there is a high risk of ozone depletion, i.e. creation of the ozone hole. (Kleczek, 2011, p. 104) Total amount of ozone influences the energy distribution processes in the atmosphere. (WM 114/115, 2011, p. 45) Uneven concentration of ozone can lead to sudden changes of temperature, which creates climatic phenomena such as increasing speed of weather fronts and air mass movement, and long-term changes of moisture. Changes of temperature create new thermodynamic conditions. Considering the previously mentioned, we can make the following conclusion - both European and North American continents will suddenly get cold. (WM 114/115, 2011, p. 45)
- *Change of temperature inversions in hydrosphere* (particularly in oceans). There was a shift of the thermal inversion from 13,3 C to 13,5 C along with *the increased content of salts* by 0,02% at the depths more than 2 km in the eastern Mediterranean since 1987. Increase of the salinity of the Aegean Sea has stopped and salt-water outflow from the Mediterranean to the Atlantic Ocean is getting weaker. It was definitely confirmed that the cause of *increasing density of water* is an evaporation in the equatorial region, which was manifested by sudden

decrease of warmer layers to deeper parts of the ocean. It can change the flow of *the Gulf Stream*. As a result, the European continent will probably experience colder winters. The Southern Hemisphere is nearly all oceanic. Ocean influences the climate; climate tends to be milder. Oceans also absorb most radiation from the Sun. On the other hand, the Northern Hemisphere is mostly continental landmass (Eurasia, the North American continent or the Northern Africa). Landmass is climate-sensitive; it is more sensitive to climate changes than oceans. (Ruddiman, 2011, p. 58) The surface located in the middle of vast continental landmasses is being accumulating five or ten times more heat than the ocean. Different characteristics of the planet Earth's surface influence the absorption of the solar radiation.

- *Increase in the number of catastrophes*. There are nine types of catastrophes – *floods*, *hurricanes*, *droughts*, *freeze*, *storms*, *epidemics*, *earthquakes*, *famine* and *landslides*, according to Yokohama conference in 1994. (WM 114/115, 2011, p. 46) There is an increase in the number of wind disasters in the last decade. There were 19 cyclones in the Atlantic area in 1994; 11 out of 19 were transformed to hurricanes. The number of catastrophes increased by about 410% between the years 1963 – 1993. (WM 114/115, 2011, p. 46) There was also a change in the model of formation, development and movement of cyclones. For example, the number of cyclones moving from the west towards Russia increased radically during the last decade. Increasing complexity of climate wind phenomena indicates transformation and formation of a new state. We are on the edge of *the climate chaos*, according to **Kondratiev**. Today, we witness dramatic response of plants to climate changes in the Antarctic. There were 700 species growing in the Antarctic in 1960. This number increased to 17 500 species in 1990. We also witness the sea level rise, as a consequence of melting of ice sheets and glaciers in the polar regions of the planet Earth. It will influence coastal regions, redistribution of relations between the land and the sea, and rise of significant geo-dynamic processes. (WM 114/115, 2011, p. 46)
- *Increase in the number of earthquakes*, as a result of growing number of sunspots. We suppose that solar plasma and charged particles change the whole biosphere of the planet. Charged cosmic particles cumulate along the magnetic lines of force and shift towards the North

Magnetic Pole. Particles go downwards, penetrate the Earth's core and then shift towards the South Magnetic Pole, go upwards and escape to the atmosphere. This process also supports the development of El Nino phenomenon. Oceans are warmer, particularly in the equatorial region. Today, we witness many evidences of these activities. Scientists from all over the world register unprecedented escape of gases (particularly methane) from the underground and increase in the number of earthquakes. Underground volcanic activity has increased by about 500% since 1875, and the number of earthquakes has increased by about 400% since 1973, according to the survey of **Mandeville**. The number of natural disasters has increased by about 410% during the period 1963 – 1993. (WM 133, 2013, p. 38)

- *Photosynthesis*. The Sun's activity deeply influences the photosynthesis on the planet Earth. Intensity of the heat and the light influences the whole process of photosynthesis. Some plants, often referred to as C_4 plants, use 4-carbon molecule. C_4 plants represent only 5% of plant species, but they absorb almost 18% of all organic carbon. C_4 plants have an advantage over C_3 plants, which could lead to extinction of pines, firs, broadleaf trees and tropical forests. They will be replaced by meadows, shrubs and cactuses, as well as palms and bamboos. C_4 plants will probably form forests of the future. (Ward – Brownlee, 2004, p. 132)
- *Change in the production of oxygen*. Contemporary scientific and academic papers indicate that extinction of plant species will determine the production of oxygen (photosynthesis) - it will be the end of production of oxygen. On the other hand, however, oxygen will escape to outer space (as a by-product of dead organic matter oxidation or volcanic gases). 15 million years after the extinction of plant species there will be only 1% of oxygen in the atmosphere (today the concentration of oxygen in the atmosphere is 21%), according to **Catling**. Planktonic organisms and plant species created atmosphere of the planet Earth. Extinction of these organisms and species will violate the atmosphere. Some million years after the extinction of plant species the last living organisms and species will suffocate because of the lack of oxygen, according to contemporary scientific models. (Ward – Brownlee, 2004, p. 138) Lack of oxygen will also lead to *depletion of the ozone layer*. (Ward – Brownlee, 2004, p. 138) Process of evolution

will create new forms of organisms with new morphology and physiology: organisms able to fight changing and challenging physical conditions of environment. In fact, decrease of the carbon dioxide, leading to extinction of plant species, will not mean the end of life on the planet. Bacteria will survive. (Ward – Brownlee, 2004, p. 146) Temperature and temperature limits are important factors influencing the biodiversity and distribution of animal and plant species on the planet. Decrease of the carbon dioxide will change the rise of the temperature on the planet (it will speed it up) - temperature rises by about 10-20 C every 10 million years. (Ward – Brownlee, 2004, p. 147) End of life on the planet Earth will be caused by the lack of atmospheric oxygen and continually growing heat.

- *Degradation and loss of the soil*. Intensive solar radiation can damage the soil structure; it can burn the soil down and unearth the bedrock. This negative activity of the Sun will change the albedo of the planet; most solar radiation will be reflected back to outer space, and it will influence the temperature balance of the planet. The atmosphere of the planet will go through dramatic changes. (Ward – Brownlee, 2004, p. 135) The concentration of the carbon dioxide in the atmosphere will be decreasing and it will lead to continual extinction of plant species (as well as other species, including human beings).
- *Negative evolution of plants*. Changes on the Sun and changes of the whole process of photosynthesis together with previously mentioned changes of oceans and continental landmasses will affect the evolution of plant species. Unfortunately, it will influence the food chain, production of free oxygen and processes of erosion resulting from exogenic processes. Decrease in the number of plant species means decrease of global biological productivity. Falling leafs will not produce enormous amounts of reduced carbon anymore: carbon that can be found in upper layers of sedimentary rocks. There will be no production of carbon and crude oil. Water will not be full of plankton; there will be no sea species and sea creatures anymore. Right after the extinction of plants, the soil will erode and only bedrock will remain. Hydrological cycle will be violated and it will lead to an enormous transfer of carbon between various land, ocean and sedimentary stockpiles. (Ward – Brownlee, 2004, p. 134) Extinction of animal and plant species will drastically influence the character of the surface of the planet Earth.

Extinction of plant species will speed up the process of global warming. First, extinction of plants will support the increase of the CO_2 concentration in the atmosphere. Only a small increase of CO_2 concentration may bring drastic effects – doubling of CO_2 concentration means the rise of the surface temperature by about 1 C. All simulation models show that the amount of carbon dioxide will decrease under the critical concentration – 10 parts of CO_2 per 10 million parts of air. If the concentration of carbon dioxide is too low, process of photosynthesis ends. Plants species start to die out. Low concentration of carbon dioxide will affect sea plants and plankton too. Extinction of plant species will cause drastic reduction of plankton biomass. The problem is that phytoplankton also depends on decomposition processes of land vegetation, which is the main source of phosphorus and carbons, which are carried by rivers to oceans. Decrease in the number of plant species on land means lack of nutrients and the total amount of plankton will be decreasing drastically. (Ward – Brownlee, 2004, p. 133) Second, plants reflect solar radiation. Surface of the planet covered by plants is able to absorb most solar radiation, while the bedrock reflects the radiation back to the atmosphere; and the temperature of the atmosphere continually rises. Because of the growing temperatures, there will be no life on many continents, particularly in the central geographical areas of the planet. Distribution, intensity and duration of rainfall will change; all green areas and regions will vanish and new vast deserts will emerge. There will be no snow-covered regions and no glaciers on the planet. Morphology of rivers in tropic regions will change as well. (Ward – Brownlee, 2004, p. 135)

3 Magnetic field of the Sun

Magnetic field of the Sun plays crucial role in the development of the Sun itself; it influences cosmic climate and evolution of the planet Earth and further evolution of humankind. There are many changes in the magnetic field of the Sun. Magnetic field of the Sun is generated by plasma and its motion inside of this star. The flows of plasma in the convection zone of the Sun generate the magnetic field. This field spreads all around the Sun, according to the last findings. Magnetic field creates various activities (sunspots, eruptions, coronal mass ejection) on the surface of the Sun.

Hot gases released by eruptions are sources of intensive roentgen radiation, and sometimes gamma radiation too. Eruption drags billions of tons of plasma and blows them out from the Sun to interstellar space. (Kleczek, 2011, p. 90) Solar wind carries the magnetic field of the Sun to the Solar System. Magnetic field of the Sun creates the bubble-like space, known as *the heliosphere*. The heliosphere (or the helio-magnetosphere) is a space, which extends beyond the Pluto. It is often defined as a space dominated by the magnetic field of the Sun (100 AU) – 1 AU is the distance between the Earth and the Sun. The Sun is a giant electromagnetic transmitter, which produces heat, light, ultraviolet radiation and charged particles. The heliosphere is full of solar wind and magnetic field. It influences the intensity of cosmic radiation. (Kleczek, 2011, p. 59) This region is so vast; we still do not know its outermost borders. Two spacecrafts, Voyager I and Voyager II, explore the region and try to find them.

Situation in internal parts of the heliosphere has external, interstellar and cosmic roots. Today, we suppose that elementary auto-oscillations of space and physical processes of endless creation are the root cause of contemporary development of the heliosphere. Reactions of our heliosphere to penetration and activities of interstellar energy and matter can be seen in many energetic processes and bodies observed on all planets of the Solar System. The magnetic field of the Sun has strengthened by about 230% since 1901, according to **M. Lockwood** from Rutherford Appleton National Laboratories. (WM 133, 2013, p. 38) Adaptation of the planet Earth to these externalities and energy transfers was violated by technogeneous activities of humankind, which limited natural abilities and features of our geological and geo-physical environment. The planet Earth goes through dramatic changes, from change of electromagnetic skeleton and geo-magnetic field to changes of the ozone layer and individual layers of the atmosphere. (WM 114/115, 2011, p. 47)

4 Magnetosphere and magnetic field of the planet Earth

Magnetic field of the planet Earth is very important for biosphere and human society. *Magnetosphere of the planet Earth* goes far beyond the orbit of the Moon. It is a vast territory around the planet full of lines of force of planet's electromagnet. It is 3,000 km deep and goes to the core of the planet. Axis of the Earth's magnet is not parallel with the Earth's axis. This is the main reason why *the magnetic poles* of the planet do not correspond with poles of rotation. (Kleczek, 2011, pp. 132 - 133)

Magnetosphere protects the planet Earth from solar wind and millions of tons of warm gases released by the Sun during solar storms. This planetary magnetic field reflects the particles back to space. Magnetosphere is very important for life. It protects the planet from solar activities – solar radiation. Magnetosphere absorbs high-energy electrons and ions (around 30 keV). (Kleczek, 2011, p. 135)

Last findings of cosmic processes and their interactions with the planet Earth emphasize the importance of solar activities and the magnetosphere for further development of the planet and humankind. Astrophysicists believed that "holes" in the Earth's magnetosphere are connected with activities of solar magnetic fields. Satellites discoveries show that changes of geo-magnetic field of the planet Earth are caused by the Sun. We can say that every solar protuberance influences the planet Earth. It means that the Sun is the crucial object influencing the oscillation of magnetic fields of our planet. Last data emphasize the increase of the so-called *heliospheric magnetic saturation*. (WM 114/115, 2011, p. 42) This phenomenon is represented by the change of bipolar intensity and localisation, as well as by the shift of magnetic poles and resonance of electromagnetic pole of the planet. The intensity of magnetic pole decreased by about 15% during the last three decades, and by about 6% since 1830, according to American geophysicist **K. MacDonald** from UCLA. Similar results can be found in the work of **M. Siebert** from Geophysical Institute in Gottingen. He supposed the decrease of the intensity of magnetic pole by about 5% during the last century. Based on the above-mentioned facts, we conclude that there will be no magnetic protection of the planet in the year 3400. Life and genetic processes on the planet will be in danger.

Decreasing intensity and shift of magnetic poles can be a sign of the so-called *repolarisation* – exchange between *the North Magnetic Pole* and *the South Magnetic Pole*. Magnetic survey and analyses of rocks proved that the planet Earth was repolarised 171 times during the last 76 million years. (Dopad zmien v magnetickom poli..., online) Last repolarisation occurred 700 000 years ago, according to **Soucek**. (Soucek, 1984, p. 183) The number of inversions of magnetic poles was between 8 and 14 during the last million years. (Prepólovanie..., 2009) Exchange of magnetic poles occurred very 125 000 years. The South Magnetic Pole shifted towards the Indian Ocean and the North Magnetic Pole is shifting from America towards the Siberia. In the future, it should be located near the capital of Mongolia – Ulaanbaatar. Contemporary data considering the location of the North Magnetic Pole show that it moved

more than 120 km between the period of 1973 and 1984. However, during the period of 1984 and 1994 it moved 150 km. The Arctic pole lies at 78,3° N and 104,0° W. (WM 114/115, 2011, p. 42) Magnetic poles can move at between 150 – 200 km per year. There is also a risk of *temporal loss of the magnetic field*. Astronomers **G. Birk** and **H. Lesch** created a prognostic computer program designing the temporal loss of the magnetic field. In this case, the solar wind would embrace the whole planet and create the protection shield, consisting of warm plasma and charged particles. Nevertheless, this shield of solar wind is very dangerous for life on the planet and it would probably burn the vegetation down, kill majority of human population and lead to extinction of all life on the planet.

Activity of the heliosphere, the Sun's activity and changes in magnetosphere of the planet will change *the pressure levels of atmosphere* (approx. 500 mb). It will lead to overheating of the atmosphere and creation of warm air belts over the entire polar region. Warmer air is lighter than cold air, and it is shifting to central geographical areas of the planet. This principle is valid for both the North Magnetic Pole and the South Magnetic Pole. If the North Magnetic Pole is located in the Arctic region, near the Prince of Wales Island, warm air is pushed along Iceland to the European continent. This warm air is much thinner and creates low atmospheric pressure, known as “the Icelandic Low”. Simulation models show that changes of location of the North Magnetic Pole are causally related to the atmospheric oscillation and flows, keeping the cold air (Arctic air) locked in the polar region. (WM 97, 2010, p. 10)

Besides changes of magnetic field, there is a threat of *cosmic radiation*, which could fall into the planet Earth's atmosphere in case of repolarisation. Some scientists suppose that solar wind could protect the planet on the one hand, but on the other, it can disrupt all electric distribution networks on the planet.

Magnetic field in some regions of the planet is weakened by changes of vortex movement of liquid *core*. **N. Olsen**, geophysicist of Danish National Space Center in Copenhagen, claims that sudden changes were detected in liquid metals 3000 km under the Earth's surface. It can influence the reverse (repolarisation) of geomagnetic poles. (M. Mandea from German Research Centre for Geosciences in Postdam). (WM 107/108, 2010, p. 42)

Current magnetic resonance of the planet Earth deeply influences well-known magnetic anomalies (Canadian, east Siberian, Brazilian and Antarctic). Those anomalies create a magnetic source, besides of the main magnetic field.

Intensity of those anomalies is much bigger than that of non-bipolar part. (WM 114/115, 2011, p. 48).

Changes of magnetic field and magnetosphere of the planet Earth influence the *temperature* and *clouds* on the planet. According to **H. Svensmark**, there exists a direct connection between cosmic rays, high-energy particles released by exploded stars of the Milky Way and low clouds. The denser the cosmic rays are, the cloudier the sky is. (WM 136, 2014, p. 8) Low level of clouds is very important because it protects the surface of the planet against intensive solar radiation. Strong magnetic field of the Sun inclines significant part of cosmic rays penetrating the Earth's atmosphere. However, the intensity of solar magnetic field has doubled in the 20th Century and it inclines most cosmic rays. Scientist led by **H. Svensmark** identified the existing causality between cosmic rays and production of clouds in the atmosphere of the planet – cosmic rays support creation and development of clouds. This completely new knowledge is very important for modern climatologists. Understanding the crucial role of the Sun in the Universe can help us to reveal all cosmic processes as well as the position and the role of human beings in these processes, according to **Svensmark**. (WM 136, 2014, p. 9)

Many scientists, for example **D. Beischer**, claim that the change or loss of magnetic poles can endanger all *living organisms* and it can be a source of negative *genetic changes*. Radiation also endangers human beings. For example, bone marrow affected by radiation does not produce red blood cells or it can produce monstrous, functionally inferior forms only. Some scientists claim that geomagnetic storms affect *brain waves* and *level of hormones*, particularly that of men. Increase of solar activity causes psychical problems, aggression, increase in the number of accidents and illnesses. (WM 107/108, 2010, p. 45)

Sudden repolarisation will lead to chaos and extinction of animals and birds. Magnetic lines of force influence the orientation of animals – animal navigation; repolarisation will bring chaos to the world of animals. Whales and dolphins beach themselves, many mammals are starving, although there is a plenty of food all around, dead birds fall down from the sky. Today, we also witness mass extinction of insects. Animals are often disoriented and they suddenly become aggressive – domesticated animals too. There were never so many attacks of dogs and domesticated animals as it is today. (Dopad zmien v magnetickom poli..., online)

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