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SCIENTIFIC REVIEWS AND LECTURES

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MEDICAL AND BIOLOGICAL ASPECTS OF SOLAR-BIOSPHERIC INTERACTION AND HEALTH OF PEOPLE IN THE NORTH

ABSTRACT

The article presents a review of the literature on the effects on human of space and helio-geophysical factors.

Keywords: health, people, North, adaptation, cosmic factors.

Climate and geography conditions have influenced and continue to make a huge impact on human life style. Favorable conditions of moderately damp seaside climate of subtropics became a cradle of humankind and stimulated the civilization development.

People gradually perceived the protection means against the effects of environmental factors and cultivated new territories.

Simultaneously with a peaceful movement of people to free territories, there was a migration of completely ethnic groups in association with military actions, invasions, and the invaders' settlement among the subdued people and their partial assimilation. Both the people who had to leave the settled places because of their lands conquest and the conquerors adapted to new environment conditions, learnt to survive in these conditions and became natives at last.

Keeping features of their ancient ancestors, they acquired certain new properties, partially due to mixed marriages with the native population, partially because of long-term evolutionary adaptive processes.

A considerable portion of the published scientific literature devoted to current research of human adaptation to the living conditions in Sakha Republic (Yakutia) belongs to our group of the authors (1-5, 9-11).

According to A.D.Slonim (6, 7, 8) the examined children can be divided into all the three groups of the adaptive phenomena: those experiencing individual adaptation, those experiencing hereditary fixation of adaptive processes, and those who are at the stage of population adaptation.

One should note that while the migrants of the first generation are at the initial stage of the adaptation to natural factors of the North, the schoolchildren of the contemporary population adjust to social conditions of their inhabitation.

The features of life activity in different national and social groups, geographical conditions of inhabitation, character of environment, soils, water resources, minerals and ecological setting of the studied regions have been found significant.

At present there can be no doubt in A.L.Chizhevsky's (5) statement that we live in "the atmosphere of the Sun". The last decades coinciding with a rapid development of astronautics and with the considerably increasing range of methods to investigate the solar system achieved a definite success in studying the laws of solar activity, climate, and weather. The following items are considered relevant from the medical and biological points of view: discovering the sector structure of the interplanetary magnetic field, creating the concept on solar wind and its interaction with magnetosphere of the Earth, organizing a space system of meteorological information (13, 14, 15, 16, 17).

Considering space influence upon people (and biosphere as well) first of all it is necessary to specify such well known

factors as gravitational attraction of the Sun, the Earth and the Moon, rotation of the Earth round its axis (numerous daily rhythms) and round the Sun (changing of seasons). Space can affect in a more mediated way but not less important is the influence on human life by weather factors – atmospheric pressure, air temperature and humidity, without mentioning particularly dangerous phenomena, like hurricane, flood, drought, etc. So-called "delicate" influence of space at a high biological level is even more complicated (and consequently more dangerous). It becomes possible due to various radiations of electromagnetic fields of extraterrestrial origin (18, 19).

Solar wind gets here through cusps (craters), currents of high energy particles after solar flares causing "rustling" geomagnetic storms rush to these places, and the atmosphere here is the most accessible for the penetration of space particles.

The dark oval indicates mean rates of November time amplitudes of horizontal component in nanoteslas from 18 to 19 o'clock according to the world time. To be more concrete, this is exactly the projection of a cusp (crater) which is the weakest spot of the Earth for the penetration of high energy particles to the surface of our planet. The bigger the size of the amplitude of horizontal component is, the higher geomagnetic activity is stimulated, i.e. "the magnetic storm" becomes greater (16, 18, 25).

The mean rates of the amplitude of horizontal component during the period of increased geomagnetic activity (18-19 o'clock of the world time) in November in the areas studied by us in Sakha Republic (Yakutia) are ranging widely. So, the amplitude is 25-60 nanoteslas in Olyokminsk, Aldan and Neryungri, 60-100 nanoteslas in Nyurb, Viluisk, Sangara, 100-150 nanoteslas in Zhigansk, Batagay, Honu and Zyryanka, and from 150 to 225 nanoteslas in the regions of Syskylakha, Tiksi and Chokurdakha that is characteristic of a geomagnetic storm. It should be noted that these indicators are ranging within just 0-25 nanoteslas in Moscow and Saint Petersburg.

There is no possibility to give a detailed description of all heliogeophysics processes occurring in the near space and influencing the Earth biosphere and the health of people here, therefore we refer the reader to Fig. 1 and 2 where we have tried to summarize the data reported by other authors about the influence of space and heliogeophysical factors

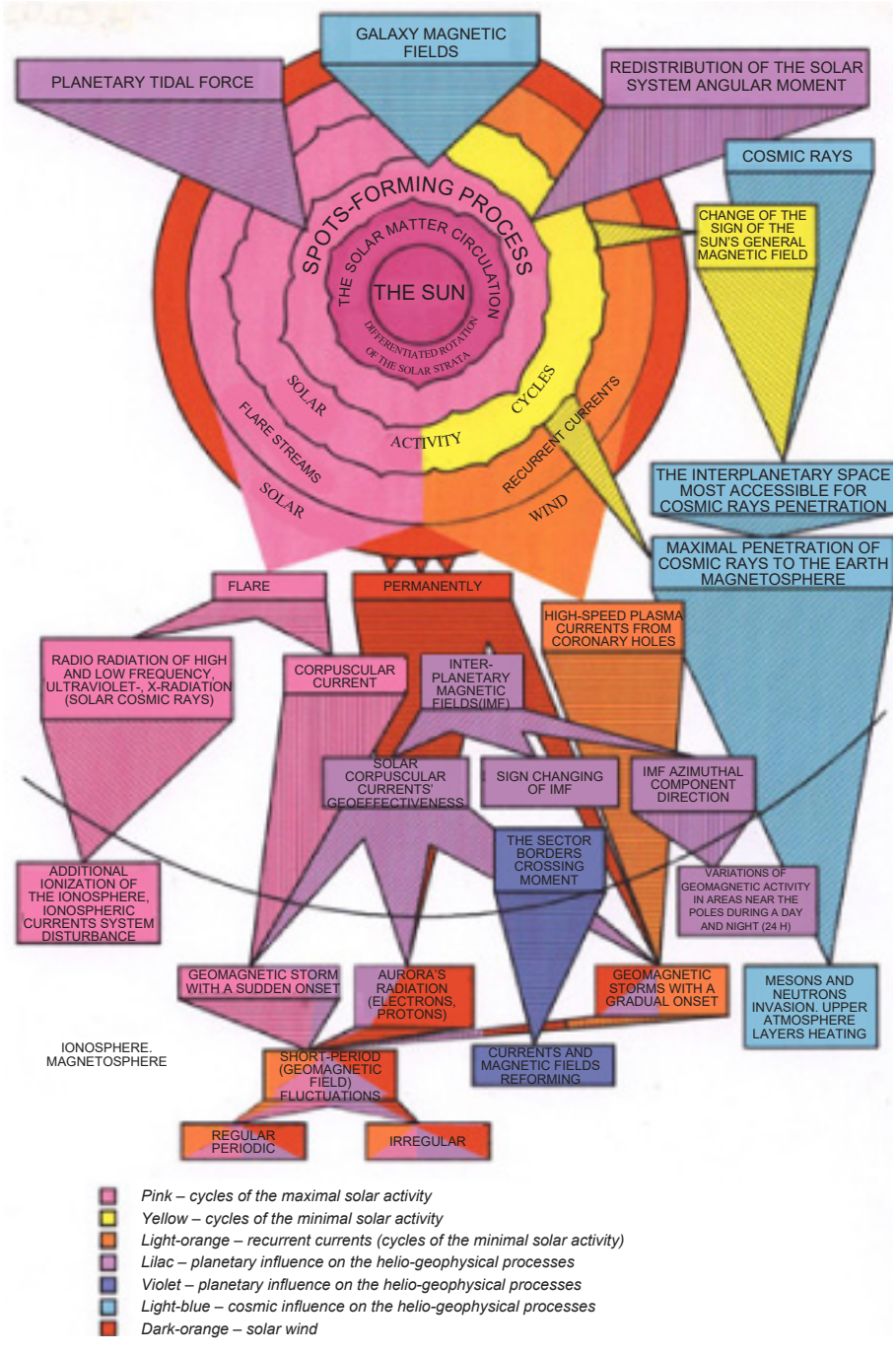

Figure 1. Interaction of cosmic and helio-geophysical factors and their influence on the near-earth space up to the borders of the ionosphere.

on the Earth biosphere. We realize that the presented scheme is rather approximate, besides, it absolutely does not demonstrate gravitational changes that are very essential for all living beings, however it allows presenting visually a complex of natural factors in their complicated interaction (16, 17, 18, 19, 20).

Let us try to divide Figure 1 into the left and right parts in our mind. Then in the left half of the figure we will find processes taking place in the Sun and the magnetosphere characteristic of the Sun's active period and accompanied by multiple chromosphere flares and enhanced thermonuclear reaction. In contrast, the right figure part will show processes specific to the quiet Sun years, whereas the center depicts permanent processes constantly going on in the Sun. It should be noted that the lower the Sun activity is, the more accessible the Earth magnetosphere becomes for distant cosmic rays, and opposite to this, the stronger sun storms are, the less man and the biosphere are affected by the deep space. The following literature

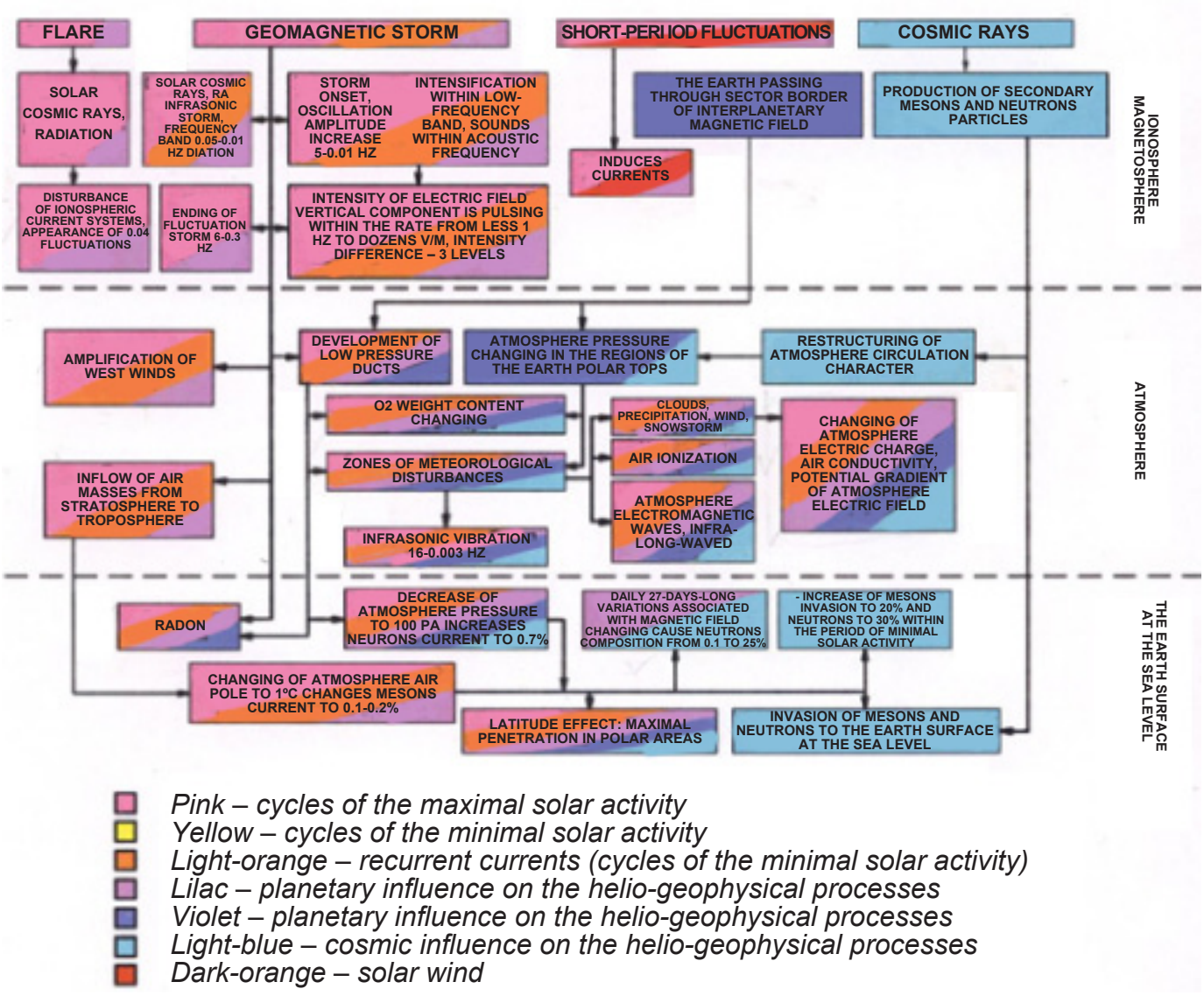

Figure 2. Influence of cosmic and helio-geophysical factors on the biosphere within the range from the ionosphere to the Earth surface

sources give detailed descriptions of all these processes (20, 21, 22, 23, 24, 25).

As one can see it on the figure, cosmic processes constantly interact with each other, they are dependent on one another and interdependent. The Sun processes flow is influenced by the planets tide-generating force, galaxy magnetic fields, angular momentum redistribution of the solar system, change of the sense of the interplanetary magnetic field, etc. (17, 18, 19).

However, the main fact for us is that all these processes turn out to be associated with processes taking place in the Earth biosphere (Fig. 2). Their action is intricately interlaced with each other, adding to or leveling one another.

We can note it here that all the cosmic and heliogeophysical processes accompanying geomagnetic storms – they are: a powerful corpuscular stream, oscillation at different frequencies including infra-sound, sound, radio frequency and biologically significant frequencies (1–50 Hz), intensity of the electric field vertical component, polar aurora etc. – all these factors affect human body dozens and hundreds times more in the polar regions of the Earth than in the midland or at the equator. Thus, it is in the regions we are considering that the negative influence of the heliogeomagnetic factors is the most intensive.

Intensity of the interplanetary magnetic field and cyclicity of the solar activity are closely connected with the effect of another factor on the biosphere, that of the cosmic rays. The cosmic rays have witnessed some stormy ancient processes which went on in the deep space a long time ago, in the same way they cause some processes, not less stormy ones, here, on the Earth. The cosmic rays, or secondary particles formed by their interaction with the atmospheric matter penetrate everywhere. It is only the deepest earth interior that is protected from their influence. The capacity of neutrons and protons to get into the intimate processes taking place at the molecular level seems unique, so it is not by chance that the living matter evolution, its emergence, ageing, mutation is now being linked with cosmic rays. It is certain that there exists some predetermination in the course of all processes on the Earth by an amount of the Earth radiation with high energy particles filling up the galaxy. In spite of the energy stream brought into the atmosphere by cosmic rays being small, this energy can almost totally be used to reshape the atmosphere circulation mode. According to current views, this

component is associated with generating kinetic energy in the atmosphere and with reforming one type of circulation into another (16, 18, 19, 21, 22, 23).

A number of authors attach a large importance to gravitation fields. V.I.Khasnulin (20) points out that gravitation anomalies are becoming a system-forming factor bringing about changes either in the planet's magnetic sphere or in its atmosphere.

Summing up all the above, we would like to emphasize two main points:

1) contemporary investigations in space and on the earth have determined that the Earth biosphere is a subject to a massive impact of cosmic factors among which there are solar activity (electromagnetic radiation, that is a visible light, ultraviolet light, radio and X-ray radiation etc.) and corpuscular radiation (solar wind, solar cosmic rays from flares), as well as the state of the interplanetary magnetic field, galaxy magnetic fields and galaxy radiation.

2) due to the structure of the Earth geomagnetic field these factors are most marked in the polar regions of the planet.

V.P.Kaznacheyev paid much attention to human adjustment to the Polar regions. His point of view was supported by V.I.Khasnulin (25, 26). Nowadays the study of the influence of the Far North climate on people's health has become even more relevant (27, 28, 29, 30).

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THE RELEVANCE OF STUDYING THE PATHOMORPHOLOGICAL AND MOLECULAR-GENETIC CHARACTERISTICS OF COLORECTAL CANCER IN THE REPUBLIC SAKHA (YAKUTIA)

ABSTRACT

The literature review is based on the analysis of sources, covering pathomorphology of colorectal cancer. Topical issues were highlighted for further study of this problem.

Keywords: neoplasm, colorectal cancer, morphology.

The malignant neoplasms (MN) are one of basic reasons of disability and death rate of the person.

Tumors of a large intestine have considerable specific weight in structure of oncological pathology. The colorectal cancer (CRC) for many years is an urgent problem of modern medicine. It is connected as with growth of cancer cases colon and a rectum, and with difficulties of treatment [4].

Today CRC takes the third place in the world on frequency among all malignant tumors. Annually around the world CRC get sick about 1 million and more than 500 000 people die out [15]. CRR most often occurs at persons in an age group 50 years, regardless of a floor, race and ethnic group are more senior [10]. From them 90% – it the population is aged more senior than 55 years, more than in 80% of cases of CRC comes to light at patients 60 years [14] and noticeable increase in incidence aged after 70-75 years are more senior [5].

According to forecasts, in the next two decades as a result of growth and aging of the population, the absolute number of cases of identification of new growths of a large intestine will increase considerably both in developed, and in developing countries [15].

In the Russian Federation (RF) the standardized indicators of incidence of CRC increased by 100 000 men's and female population with 30,35 to 31,77, and with 21,54 to 22,88 in 2010 and 2015 respectively. On death rate at men of CRC is in the third place after malignant new growths of a lung and stomach, at women on the second place after a breast cancer [3,9].

In Republic of Sakha (Yakutia) these indicators are lower, but also increased - with 22,13 to 27,92 (at men) and with