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Solar-diurnal variations of Cosmic rays (CR), connected with the passage of the Earth through the Neutral Layer of the Interplanetary Magnetic Fields (IMF) and the earthquake problem

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Abstract. Key explanation on effect of Fundamental Law of Momentum Conservation is given on the basis of Cosmo-Physical processes, which can be connected with all kinds of recently known geo-effective phenomena. Many works have been devoted to searches of extraterrestrial sources of generation of earthquake initiation preconditions. There is a direct indication on the fact in these works that all kinds of geo-active fluxes of plasma, which goes ahead of strong geomagnetic storms, concomitant to the earthquakes, may be served as favourable conditions for earthquake appearance. If in one group of works, the increase of seismic activity during geo-active solar flare is reported, then in the other group of works, there is the direct indication on the fact, that it is necessary to study the mechanism of generation of electro-magnetic emanation in the seismically active regions of Earth. Certain strong destructive earthquakes are putting in touch by some authors with the outburst of cosmic rays in distant regions of Universe during stellar explosion of supernovae. It's impossible to avoid our attention from announcement of 100% increase of hard component of cosmic radiation above Yerevan 30 minutes ahead of 1988 Spitak Earthquake. And finally, the data on article, in which is shown that about 75% of earthquakes with magnitude $M \geq 6$ takes place during traverse of neutral layer of Interplanetary Magnetic Field by the Earth, in the presence of good correlation with 11-years cycle of Solar Activity. Above mentioned geo-effective phenomena, with an increasable amount, can be reviewed in frame of the Law of Momentum Conservation, if we take into account the peculiarities of its development for a given specific cases.

1. An overview of physical processes by manifestation of mechanism of action for the law of conservation of angular momentum in scales of cosmic space
After eruption of Solar Flare on the limb of the Sun the Solar Wind plasma stream/flux is directed towards the Earth. Overcoming the attraction from the Sun, it enters in the gravitational interaction with the Earth, in accordance with the Law of Universal Gravitation. The fluxw of this mass is merged

into the mass of particles of near-Earth space and both of them begin to rotate around the axis of the Earth. The key aspect of further course of events represents the fact that Solar Wind Particles, having high speed of linear motion, obtained due to the rotation of the Sun around its axis, are carrying their own velocity in the place where they go and which point in space they reach. As it is generally well-known fact, that the velocity of linear motion during moving around the rotational axis of the sun is substantially high in comparison with the linear velocity of particle rotational motion around the Terrestrial axis of rotation (Due to substantial distinction in size between the Solar and Terrestrial radii). In connection with mentioned above, the nearest layers of the Earth (the reference is to Magnetosphere and the Lower Atmosphere of the Earth) are enriched with high speed particles of Solar Wind Plasma. In the other words the redistribution of velocities take place, initiated the Energy of by the Solar Activity, have been transferred by the Solar Flare. In addition, It's necessary to say, that The fluxes of Solar particles carry out Solar magnetic fields, which may reconnect (short-circuited) with the Magnetic Force Lines of Magnetosphere of the Earth and can be shifted from day side (the bow) to the night side (the tail) of the Magnetosphere of the Earth.

Thus, Solar Wind particles carrying with themselves the high velocities, in the time of approaching to the Earth, they are accelerating the Earth's rotation around own axis, and vice versa, they are decelerating the Earth's rotation around its own axis in the time of moving away from the Earth. It takes place because until crossing through the plane inside which the axis of rotation is found, Solar Wind particles are bringing their own energy, and consequently, are giving up the velocity to particles of near-Earth Space region moving in direction of the Earth rotation around its own axis, and as a result the acceleration of this kind of motion takes place.

But after crossing the plane passing through axis of rotation of the Earth, the situation is changed radically. Now, first of all, particles are not approaching to the axis of rotation, but vice versa, they are abandoning and moving away from the axis of rotation of the Earth, and the second, and what is the principal and more substantial issue, they are not giving up their energy and speed, but vice versa, they are taking off to themselves, just from oncoming particles. As a result, the transmitted velocity and energy will be returned to particles until they will not abandon the attraction field of gravitation of the Earth. As a result we shall receive slowdown. . .

All mentioned above, is well demonstrated by the Law of Conservation of Angular Momentum (momentum of quantity of motion) in the form $\vec{L} = [\vec{\omega} * I] = const$, where ω - is the vector of angular rotation (angular velocity) of the Earth, and $I = \sum m_i r_i^2$ — integral moment of Inertia. This equation is obtained in assumption, that moment of Inertia remains constant, as it must be, for absolutely rigid body. Nevertheless this equation is also valid for those cases, when moment of Inertia is changed due to changes of mutual layout of individual separate constituent parts of the body [6]. In particular, when M -resultant moment of all external forces, acting on the body is equal to zero, the product $\vec{\omega} * I$ remains constant and alteration of moment of Inertia I entail an appropriate alteration of angular velocity ω . It is precisely this fact that explains usually demonstrate-able phenomenon, when a human standing on the rotating chair, in case of moving apart both hands, the rotation speed is decreased down. And vice versa, in case of adpressing hands to own body, the rotation speed is increased (Spinning figure skater pulling in her arms, reducing her moment of inertia, to rotate faster. A figure skater pulls in her arms so that she can execute a spin more rapidly). If we shall make a transition on scales of outer space, it is easy to see, that mass of the plasma, which is carried out by Solar Flare is transformed into constituent separate part of the Earth, after «entering» into Gravitational interaction with it, «overcoming» the attraction from the Sun.

Either after Solar Flare the plasma flux is moving forward to the Earth or after crossing of neutral layer of the Interplanetary Magnetic Field (IMF) the Earth is moving forward to plasma with high concentration. As it's already known, due to condensation of magnetic force lines close to sector border of IMF, all frontier region is becoming the area with high concentration of plasma particles. Furthermore, according to Miroshnichenko [5] the concentration of particles may be changed more than 100 times, which is equivalent to increase of density of kinetic energy of particles, which in its

turn is by two order of magnitude is high than magnetic energy of IMF. availability of high concentration with ability of one hundredfold increase of it, in the presence of directed high speed, are making the plasma of near border area more similar to Solar Wind plasma, transferred by Solar Flare.

So, there is not a principal difference between plasma carried out by Solar Flare and plasma of near border area Interplanetary Magnetic Field (IMF) Sector Structure, which is crossed by the Earth. In both cases is traced the same chain of events. . . Entering in Gravitational Interaction, Plasma is becoming the constituent separate part of the Earth and starts to participate in joint co-rotation (around the axis of rotation of the Earth). Meanwhile, additional condition is turned on, according of which, the changes in mutual positions of constituent parts are allowed [6]. As a separate part may serve, either plasma, which have been carried out by the Solar Flare, or plasma of near border area of the Interplanetary Magnetic Field (IMF) Sector Structure.

Having high speed (300 ÷ 1000) km/s at existence of square-law dependence from the distance $\vec{r}$, the moment of Inertia I is rapidly decreased during moving in direction forward to the axis of rotation of the Earth, and vice versa, is increased during moving in direction away from the axis rotation of the Earth, which leads to appropriate increase and then appropriate decrease of angular velocity ω of the Earth rotation around its own axis, in accordance the Law of Conservation of Angular Momentum, mentioned above : $\vec{L} = [\vec{\omega} * I] = const,$

It becomes clear from the said above, why it takes place the uneven, spasmodic alteration of diurnal rotation period of the Earth around its own axis which is followed in its turn either after Solar Flare or after the crossing of the neutral layer of the Interplanetary Magnetic Field (IMF) by the Earth (which is moving usually on Ecliptic Plane, inclined approximately by 7 angular degree relatively to Solar Equatorial Plane). Repeated announcements of many authors from fifties of last century can be counted as understandable and legitimate; the report of French geophysicist A. Danjon, according to his data, the sharp alteration of ω was observed after powerful Solar outbursts of 23.02.1956 and 20.07.1959, when the length of the day (twenty-four hours) was increased by $8.5 \cdot 10^{-4}$ s. In reports of N. V. Stovas and astronomer N. Stoyko attention is payed to practical consequences of unevenness of rotation with what earthquakes. Theoretical justification of influence of unevenness of rotation on geo-tectonic processes is given and connection between changes of kinetic energy of Earth owing to unevenness of rotation and energy of a earthquake is established. The special place in these reports is occupied by work American geophysicist J. Simpson who analysed over 22000 earthquakes for three years period and came to a conclusion that solar impact on seismicity of Earth is reduced to trigger effect and has probabilistic character depending on the power of solar activity. And at finally, our preliminary investigations according to which more than 70 % of destructive earthquakes occur at the moment of approach and crossing of borders of a neutral layer of Interplanetary Magnetic Field (IMF). For 35 years period more than 500 earthquakes with magnitude $M \geq 6$ were analysed, with satisfactory correlation with a 11-year cycle of solar activity.

2. Cosmic rays hard component intensity increase dynamics during crossing of neutral layer

The new peculiarities of behaviour of the neutron and the hard component of cosmic radiation during their passage through the neutral layer of the Interplanetary Magnetic Field (IMF) have been revealed by investigations of recent years carried out by our group and a little earlier by our colleagues from our Institute by Shatashvili L.Kh., and Naskidashvili B.D.

It was turned out to be that there is sharp falling downfall of ratio A_n/A_μ (where A_n and A_μ are amplitudes of Intensity Maximum, for the neutron and the hard component, respectively) at the moments when the Earth is approaching and is passing through the neutral layer of the Interplanetary Magnetic Field (IMF).

This means, that the share of muon component, is increased more than 5 times in comparison with the theory, just only for the crude estimations. Exceptional importance of similar growth is hard to overestimate, inasmuch as may become the key prompt for the purposes of solution of the mechanism of rapid acceleration of protons up to super high energies in the neutral layer of the Interplanetary Magnetic Field (IMF) in the frames of Maxwell Electro-Magnetic Theory for vortex acceleration

$\text{rot}\vec{E} = -\frac{\partial\vec{H}}{\partial t}$ Besides, the semicentennial riddle of emergence of the anomalously high number

of μ -mesons in the lower layers of atmosphere and at the great depths in underground can be resolved.

It's necessary to add to the mentioned above, that possibility for estimation of additional generation of μ -meson component due to up rise of level of their generation as the consequence of heating of upper layers of atmosphere, can also be appeared.

Still in 1950 year, George and Evans [1] have discovered anomalously high number of high energy μ -mesons by means of nuclear photo emulsions at the great depths of London subway station Holborn. There was poor information about neutral layer of the Interplanetary Magnetic Field (IMF) at that time. Therefore several assumptions have been made about existence of additional channels of generation for muons. Namely, direct generation of muons by muons, decay of heavy neutral lepton, which generates muon by scheme: $L^0 \rightarrow \mu^\pm + e^\pm + \nu_\mu$ and, finally, the assumption according which the source of additional muon generation may be discrete source in galaxy.

The above mentioned processes can be neglected, since the total cross section for generation of muon pairs by muons is four orders of magnitude less than the cross section for generation of electron pairs by muons.

As for the decay of heavy neutral leptons, such a lepton is still not detected in accelerators contrary to the allegation of Canadian physicists [2] about discovery of this particle in 1960.

There were also unsuccessful attempts to connect additional channels of muon production with individual discrete galactic sources as Cygnus X3, Hercules, etc.

The major characteristics for our recent investigations was ascertainment of degree of distortion influence of geomagnetic variations on solar-diurnal variations, connected with the decrease of horizontal H constituent of the geomagnetic field. As already is known, the decrease of horizontal H constituent of the geomagnetic field is affected first of all on data registered by stations with geomagnetic cut-off rigidity $R_c = 4 \div 5$ GV since the maximum amplitude of magnetosphere variation of cosmic rays is related to just mentioned above energy, if not to consider its substantial increase with the increase of altitude of observation, high altitude cosmic rays stations are implied. Bearing in mind these peculiarities (special features), Tokyo Neutron monitor and Nagoya meson telescope data which are operated in unified complex, were used as the basic experimental data.

For the purpose of carrying out the careful analysis, along with cases of magneto-quiet days, days with strong magnetic storms were considered. It were days with a case of increase of intensity of cosmic rays when the amplitude of decrease of geomagnetic activity D_{st} -index, was less than 100 γ , and the ratio of cosmic rays neutron component intensity amplitude increase at station Jungfraujoch to the amplitude of increase of total intensity of cosmic rays at Kiel station was ≥ 2 [4].

In account with enumerated peculiarities, list of which can be continued, the ratio $A_T^n A_N^\mu$ was estimated, where A_T^n and A_N^μ are the amplitudes of intensity maximum for cosmic rays neutron and muon components respectively.

As it was already mentioned above, in order to obtain the total structure of single diurnal wave it is necessary to have the experimental data covering as possible wide range of geomagnetic latitudes. In this regard, besides basic data from Tokyo and Nagoya, the data of other stations and the data registered at our station (observatory) were used. As Dusheti's magnetic observatory is approximately in 40 km from our observatory, we considered as possible its inclusion in the general complex of researches unifying in such way the efforts of two observatories. In particular, if to assume that the distance existing between these observatories can't affect on value of horizontal H component of a geomagnetic field so that its true meaning value for Dusheti and for Tbilisi, would be strongly differed from each other, we will obtain, figuratively speaking a horizontal H component of a geomagnetic field «under our feet»..

As observatories are equipped with the identical standard equipment working in a continuous mode, cut-off rigidity R_c for our observatory, which was calculated in theoretical way in the past and was assumed as constant, now it will be set automatically for any moment. For this purpose it is necessary to make the corresponding recalculation to fix the changes of value R_c in a dynamic mode. It will give the chance to get rid of distorting influence of horizontal H component of a geomagnetic field on solar and daily variations. Preliminary steps for such procedure have been already done, and, in the future we hope to receive an official consent of our colleagues for bilateral cooperation both in technical, and in the scientific plan.

The analysis of parameters of a solar wind and cosmic rays solar-diurnal variations [1] shows that during the disturbed conditions in the interplanetary space approximately in 50 % of cases the intensification of a solar-diurnal variation are observed. If to assume that intensification of a solar-diurnal variation during the disturbed conditions in interplanetary space is the reason of low meaning for the values $A_n A_\mu$, from those values considered by us and authors of work [3], at least any part should correspond to normal values, whereas theoretically expected value, according to work [3]:

$$A_T^n / A_N^\mu = W_T(R_c) / W_N(R_c) \geq 6$$

Against abnormally low meaning of the ratio of amplitudes at the expense of intensification of a solar -diurnal variation also testifies the following result:

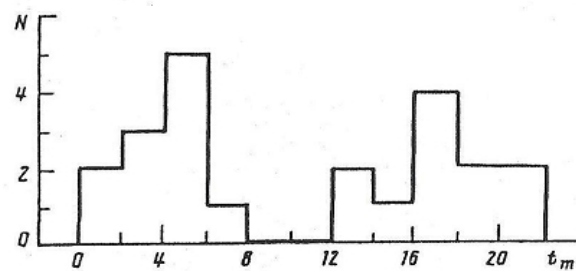


Fig. 1 Distribution of the relation of amplitudes of magnetosphere variations of cosmic rays depending on local time.

On the drawing is presented the distribution of ratios for amplitudes depending on local time of cosmic rays intensity maximum. As is evident from drawing, in this distribution is not manifests itself any substantial diurnal variation as far as the phase of solar-diurnal variation is quite stabile.

All these facts, have been taken together, allows us to make two conclusions of principal importance. In the first, the solar conditionality for irregular alteration of ω is possible to count as statistically proved, and in the second, solar activity affects on the change of a mode of daily rotation of Earth through the law of conservation of angular momentum.

Conclusion.

Analyzing all available data, it is possible to come to a conclusion that action of the law of conservation of angular momentum is shown in full volume and the case when the moment of inertia of Earth changes owing to change of a relative positioning of separate parts of a body isn't an exception! Most likely, it is that case when the formal mathematical proof of fundamental regularity doesn't consider all completeness of its physical contents.

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