Effect of "Supermoon" on Earth Seismotectonics

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***Abstract*— It is well-known that „Supermoon" – the maximum approximation of the Moon to the Earth. It usually presents an unpredictable tragedy for humanity. It is enough to remind that the number of dead or missing in Indonesia disaster was more than 230 thousand, while in Japan for more than 25 thousand people. It is assumed that the tragic earthquakes that occurred in Indonesia (2004 and 2005) and in Japan (2011) were caused by the subduction of the huge tectonic plates, but the direct cause of it became lunar-solar tides, resulting from the closest approach Moon to the Earth, i.e. Supermoon.**

Keywords*— *Moon; earthquake; disaster spontaneous; Supermoon; lunar-solar tides; gravity; Bouge anomaly; folding; plate; tectonics

I. INTRODUCTION

The question of seismicity due to the tidal effects of the Earth, Sun and Moon studied in the middle of the XIX century by French scientist A.Prey, he established frequency of earthquakes with lunar phases, the distance of the Moon from the Earth and its culmination. Earthquakes data due to periodic changes in tidal forces was given by N.N.Volodicheva, A.N.Podorolskim, R.B.Hoffman, A.Ryall, Charles T.Heaton, A.Polumbo, R.E.Uems. At the same time in other studies (L.Knoroff, J.F.Simpson, S.Shien, P.A.Reydelek, C.Tsuruoka, J.Vidal), this is denied. The most comprehensive survey of views about impact of lunar-solar tides on the geodynamic and, above all, seismic processes is given in V.A.Nikolaev and M.M.Dovbnicha [1÷4].

Judgments about the relationship of lunar-solar tides with geodynamic phenomena are ambiguous and are controversial for a number of issues. For more information about the geodynamic connection of phenomena in the lunar-solar tides can be obtained on the basis of joint analysis of the spatial and temporal characteristics of seismic events, occurrence and the simulation results of the stress-strain state of Tectonosphere caused by tidal influence of the moon and sun (Khalilov, 1998÷2011; Aslanov, 2004).

Laboratory gravity data of the State Astronomical Institute of Sternberg (SAI) suggests that the earthquake in Japan triggered an unusually strong convergence of the upcoming Earth and Moon. The observation of major earthquakes gave opportunity to identify some factor named "the influence of the tide". Assumed that some sort of "trigger" the disaster might have lunar tides in the ocean, which were observed in Chile, Sumatra and Haiti. However, research ways not explained. Number of researchers have different solutions of the problem [5, 6].

II. DISCUSSION

Intense earthquake with a focus located deeper than the crust indicated tectonic activity of Earth. A sign of tectonic activity of the moon can be any temporary effects on the moon, which is composed by catalog of B.Middlherstom [7], including the 630 earthquake and 370 temporary phenomena on the Moon for the period from 1904 to 1967. The existence of two types of relationship between tectonic phenomena on the Earth and the Moon was established:

1) Trigger tidal influences through gravitational interaction of the Moon and Earth;

2) The relationship of tectonic processes of the Earth and Moon.

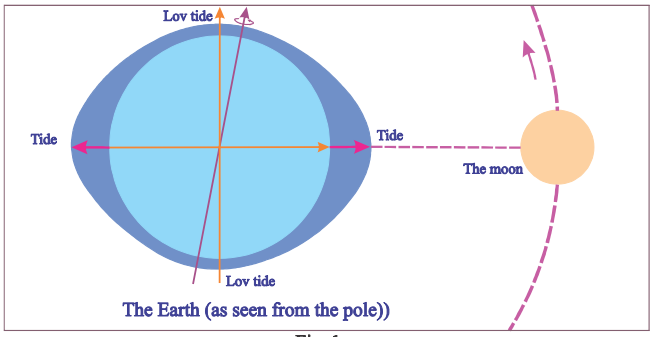

Figure 1. The scheme of lunar tides.

Concerning the mechanism of the tides it can be highlighted that "... the tides are happen due to the gravitational force that the moon affects on the Earth (Fig. 1). The gravitational force of the sun also affects the tides, but lesser. The tidal force as the derivative of the gravitational force is inversely proportional to the third power of the distance from the central body $1/R^3$. Therefore, the moon, which is much closer to Earth, despite it, has smaller mass, creating a tidal force of almost 2 times larger than the Sun. The nearest point to the moon the earth (perigee) is attracted to it by 6 per cent stronger than the most distant point on the orbit of the Moon (Apogee). This difference of the forces stretches our planet along the Earth-Moon system. Lunar tide is moving in the Earth's surface followed by movement of the moon and sun - the sun. During a full moon and new moon when the moon and sun relative to Earth are roughly in line, their tidal waves are added, and come "syzygial", i.e. enhanced flow. In addition, when approaching the moon to the earth, the tides are much stronger (approximately 3-fold) than usual. And in extreme close-ups of the moon to the Earth (Fig. 2), this difference

increases further". (Entry was posted on 09.05.2010, in the headings "Astronomy and Astrophysics").

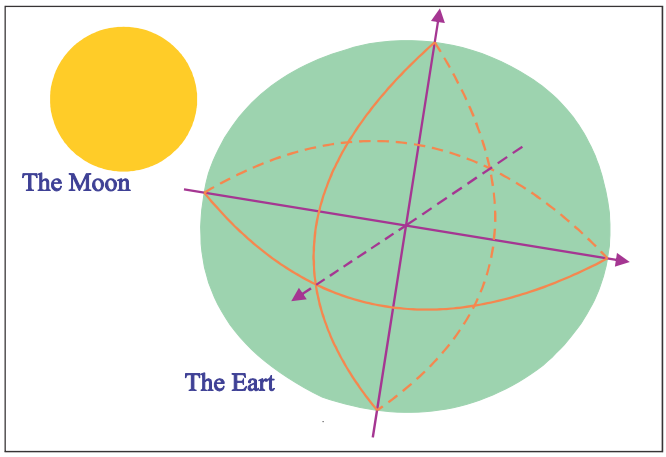

Figure 2. Maximum approximation of the Moon to Earth March 19 2011. (According to NASA)

It should be noted that under the law of gravitation the gravitational field is not homogeneous and has a direction toward the center of the attracting masses. Bowels of the Earth and the Moon, by themselves, are not homogeneous areas. Therefore, when Earth's gravity interacts with the moon's the tectonic structure of mutually deformed. In this discussion are the other things: - why in the 2004-2005 and 2011 lunar tides have caused such a terrible earthquake, tsunami, which subsequently killed hundreds of thousands of people? Indeed, the maximum approximation of the Moon to Earth was observed in 1955, 1974, 1992 and 2005. Tsunami in Indonesia that killed thousands of people, occurred in January 2005, just 2 weeks, and in March 2011 in Japan one week before the approach of the Moon from Earth. As you know, 19th March 2011 the convergence of the Earth with his companion led to a catastrophic earthquake in Japan, and Kamchatka sharply intensified activity of volcanoes. Locked in place of the earthquake in Chile, Greece and Russia. In Thailand, there were powerful tidal waves.

III. Results

March 19, 2011 the distance between the planet and its satellite was 356.6 thousand kilometers instead of the usual 384.0 km in January 2005 - 356.2 km, 384.0 km instead. Above all, "Supermoon" at this time coincided with the full moon (Fig. 2).

It is known that earthquakes tend to occur when the stresses in the crust is a gap. The main source of stress - the "friction" blocks make up the lithosphere, or tectonic plates that make slow motion relative to each other. Earthquakes occur most likely where the boundaries of plates or microplates.

Fig. 3 and 4 show the epicenters of the earthquakes that occurred in Indonesia and Japan and tectonic maps of the fragments. On these maps shown where those junctions of tectonic plates and earthquake epicenters were. In other words, just west of Sumatra (Fig. 3), on the border of the Sunda microplate and Australian plate were located the epicenters of the last two disasters (2004 and 2005.) In the Indian Ocean, separated from each other by less than 300 kilometers, as occurred in 1833.

Figure 3. The epicenters of the last two earthquakes in 2004 and 2005, and a fragment of a tectonic map of Indonesia.

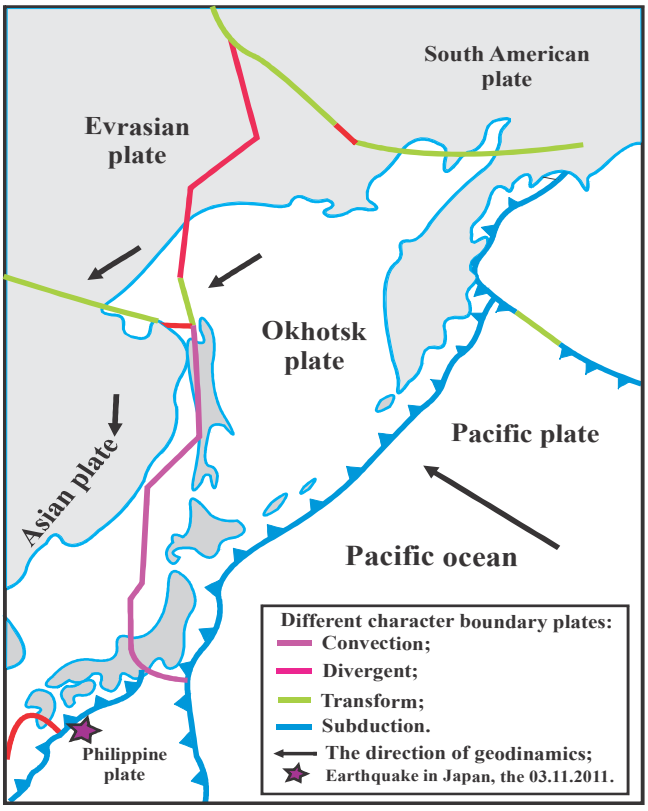

Figure 4. The epicenter of the earthquake 11.03.2011 and a fragment of a tectonic map of Japan.

At 150 km east of Honshu Island from north to south, the border (deep fault) two giant tectonic plates (Fig. 4). Pacific plate sinks beneath the Asian plate at a speed of 9 cm per year, where is the island of Honshu. Since the Asian plate is heavy and large friction, the sliding plate relative to each other is not

smooth: the lower plate is constantly drags deep into the edge of the upper plate and crushes him. The bottom plate slides down sharply, while the upper springs up - and an earthquake occurs. Water, located over springing plates, gets a sharp jolt, causing a tsunami. In this region, earthquakes often occur by this scheme, but not strong.

Thus, the main seismic zone intense focus is on the Pacific Ocean and includes several plates: Asian, Pacific and Indonesian. In 2011 March 11 for Japan, the Philippine plate crawled under Asian. Based on the analysis of the movement of tides of the moon on the Earth's surface (Fig. 5) in 2004-2005 and 2011.

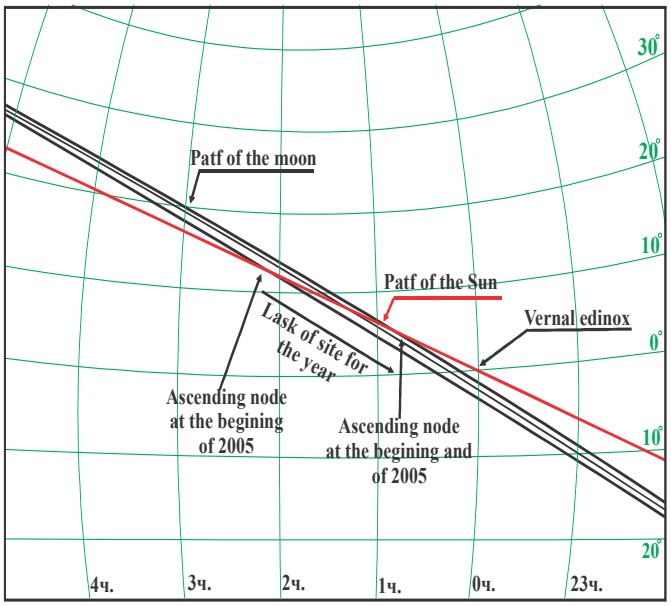

Figure 5. The path of the moon at the end of 2004. and in early 2005.

We can assume that the cause of sudden movements of plates, leading to strong earthquakes have been lunar tides.

According to astronomical data [8÷12], the slope of the moon towards the earth's equator usually varies from 18 to 28°. At the same time, elements of the lunar orbit, too, are not constant: periodically subjected to extreme changes. It has been calculated that in 2004-2005 and 2011 the angle was maximum. Typically, only 18 years and 7 months, when sites do a complete revolution in the ecliptic, the lunar orbit is again its original position. But from 2005 to 2011 was only about 6 years.

Fig. 5 shows the direction of the path of the sun and the moon in late 2004 and early 2005. In 2004-2005 and 2011 sites directing the ways of ascent of the sun and the moon coincided with one another. If we project these trends the way to the surface of the Earth, they fall in 2004-2005 in Indonesia, and in 2011 - Japan (Fig. 3 and 4). Moreover, they coincided in the III quarter of the moon in its orbit. This means that the tidal influence of the moon is composed with the tide of the sun. The important thing is not the point of minimum convergence and the dynamics of growth of the tide, prior to this date.

It should be emphasized another important fact: the motion of the tides of the moon on the Earth's surface is perpendicular to the lines stretch above the deep faults (Fig. 3 and 4). In these regions there have been provoked earthquakes and tsunamis. The essence of this fact is explained as follows:

It is known that the gravity anomalies in Bouguer reduction reflect the tectonics of the crust. In other words, the geometrical parameters of the geological environment are the main arguments of gravity anomalies in Bouguer reduction, i.e. if a unit is raised or lowered in relation to another; it appears in the gravitational field.

The figure shows the disjunctive folding, separated by deep faults. The path of the lunar tide, passing perpendicular to the fault plane, due to high tide and the intensity of gravity, geological environment is distorted. If a similar folding has accumulated a tense situation, the tides will play the role of the trigger mechanism for earthquakes.

IV. Conclusions

We believe that as a result of the lunar-solar tides in 2004-2005 and 2011. Tectonic plates were immersed on each other. With sharp dive units, there was a loosening of the seabed, and the sharp jolt was sea water, which subsequently formed the tsunami.

Of course, another question arises: why, in 1955, 1974, 1992 do not occur such earthquakes? Based on the astronomical and tectonic aspects, this question can be answered as follows.

• lunar-solar tides, which may be a triggering mechanism for the conditions when an earthquake is ripe, but not push. In this case, the tide may be triggered;

• nodes paths climbing the Sun and Moon should be the same between them;

• structural and tectonic framework should represent the disjunctive folding, and the direction of the path of tides must be perpendicular to the lines trending deep faults.

The next "Supermoon" can be observed November 14, 2016, when the convergence of the Moon and the Earth will be 356 511 km, and then - November 25, 2034 (356 447 km).

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