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Origin of the Tunguska-1908 Phenomenon

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Abstract

It is generally accepted that the Tunguska explosion resulted from the disruption of cosmic body. Nevertheless all data favors a tectonic nature of the event.

1. Introduction

On June 30, 1908 a powerful explosion occurred in the Kulik-caldera in Siberia. The blast felled trees in an area over 2150 km^2. Barometric/seismic disturbances and airglows were detected worldwide.

2. Reasons of the Tunguska Event

Linisolar tides related to the earthquakes because the important changes in tectonic eruptive behavior occurred usually close to the solstice and equinox periods. First airglows of the Tunguska event began in Europe on 22 June, 1908 and the explosion occurred just 8 days after summer solstice. Lunisolar tides have been increased due to the solar eclipse on 28 June, 1908 [1]. It has been proved that a new index *M* of the solar rotation, defined by integrating the angular momentum density over the whole solar surface, reached a maximum at solar cycle 14: 1901.7-1913.6 (a next maximum at cycle 21 had a relatively small amplitude) [13]. The vortex structures observed on the Sun during the years 1907-1908 [1] probably reflect an acceleration of surface layers during transport of angular momentum from/into deeper layers (due to a radial gradient because an equatorial gradient reached a minimum at cycle 14). For the first time solar vortex structures were observed in 1857. On May 5, 1907 the same structures were registered again. A. Stentzel has paid attention to a 50-yr period. The inversion of speeds for polarization's points Arago/Babinet has been noted since 10 May, 1907. Increasing of the angular distance of neutral polarization points, which has begun in May, 1907 proceeded till the end of June, 1908. Exactly after the Tunguska explosion the maximum relative increase of the polarization for the whole period from 1905 till 1910 was recorded [3]. Obviously, this effect could correlate with above mentioned vortex structures. For one day before the Tunguska explosion F. Bush at Arnsberg registered the displacement of polarization minima [3]. It can be explained by the changing in critical frequencies of ionospheric layers *E* and *F* at twilight (pulsations of electric vector of the geofield directed in parallel to a plane of scattering of light reaches a night maximum earlier, than the stronger perpendicular vector). That is, the nature of depolarization can depend on changes in intensity of a geoelectric field. Recently it was proven that the interplanetary magnetic field (IMF) interacts with the geomagnetic field and causes it to oscillate in resonance with the characteristic of solar *g*-modes waves [9]. As the Earth moves to the solar rhythm the changes of the geomagnetic field produce small detectable pulsations. It is known that the tangential component of IMF has no compensation, as IMF possesses daily variations with a local peak of intensity nearby 18 h local time. This time coincides with the time of the beginning of pulsations with the period of 3 min registrated by Weber at Kiel on 27-30 June, 1908 [12] (furthermore, although a period of p-mode oscillations of the solar corona is equal to 5 min, a period of pulsations of high layers of the photosphere is equal to 3 min). Now the data of the Sun-IMF-Earth's magnetosphere-ionosphere-lithosphere chain are using to predict tectonic events. Because 3-days pulsations at Kiel began before explosion in Siberia and ended in 15 minutes after it we suppose the solar influence as one of the reasons of Tunguska-earthquake on 30 June, 1908. During the last 100 years an excursions of geomagnetic poles that are possibly connected with processes on the Sun is observed. The assumption about a superimposition of a quadruple field on a main dipole field in the Earth's core, provides an explanation of the reversals of the geomagnetic field [8]. A pole of the Earth's quadruple momentum is located near Tunguska area [7]. In Eastern Siberia an agonic (zero declination) line has an anomaly: western declination is observed instead of the eastern one. This line turned clockwise towards the sublatitude orientations from 1900 to 1920. The largest changes were

observed in 1901-1909, especially along the Irkutsk-Krasnojarsk line, i.e., in the area of Tunguska phenomenon [1]. On the other side, the discrepancy in the secular evolution of the Moon longitude (the big bump) was observed in the 1900-1920. It is a historically old problem. The period of time of the discrepancy in the Moon longitude includes the year of the Tunguska event. For solution it was supposed changeability either in the Moon's period or in the Earth's rotation. The effect of a mass transfer from the Southern to the Northern Hemisphere towards higher latitudes, and a redistribution of the Earth's mass closer towards its axis of rotation caused an increase in free oscillations of movement of the Earth between 1906 and 1908 [6]. It has been found that the amplitude of the vertical z-component of Chandler wobble grow specifically in 1907-1908, and possibly in 1909 [1]. Especially strong change in movement of the North Pole for all the period 1907-1910 was recorded between 14 June and 2 July, 1908 [4]. Probably a susceptibility of Eötvös force to change of gravitation by amplitude of 20 mGal explains an effect of polar movement [2]. We find that the amplitude of 20 mGal accords well with a magnitude of lunisolar tidal forces. We performed reconstructive computer calculations of a lunisolar tide for the Kulik-epicenter for 30 June, 1908 and found that the time of the tide (outflow) coincides exactly with the registered time of the explosion at this geographic location on June 30, 1908 [1]. Magnetic solar fields decelerate the Earth's core while lunar tidal forces decelerate the mantle; and a difference in speeds of rotation of the mantle and the core is a generator for the Earth's magnetic field drift [10]. Hence both the Sun's fields and the lunisolar tide on 30 June, 1908 could lead to changes in the terrestrial magnetic dipole and in the core-mantle layer D'', and to trigger the tectonic activity. Eastern Siberia is a field of protokimberlite pipes. The epicenter of the Tunguska explosion is the middle of the paleovolcanic crater that associates with the mantle plume. A probability of coincidence between the center of volcano and a potential center after the explosion of a comet in the upper atmosphere is equal to zero. In the catastrophe 1908 layer not meteoric debris have been discovered, but an abundance of acute-angled long particles, which is a characteristic of kimberlitic magma [5]. Y. Sbitnev wrote [1]: in May, 1908 (!) shamans informed to Tunguses that they must leave far away from a place of the future explosion in the Kulik-caldera. According to the APO data, turbidity spectrum in July, 1908 closely corresponds to that seen shortly after the Katmai eruption in 1912 [11]. Hence one can suppose the activation and explosion of the Tunguska paleovolcano in 1908.

3. Summary and Conclusions

The whole complex - the discrepancy of a Moon's longitude in 1900-1920 and the anomalous lunar tide, which triggered the Tunguska explosion - could be connected with changes in the Sun's rotation, i.e., changes in the Sun's inner/IMF fields, at that time. We suppose that the Tunguska phenomenon could be most probably a tectonic event caused by solar-lunar-terrestrial coupling phenomena.

References

[1] German, B.: Die Lösung des Tunguska-1908 Problems, Pereverzyev Press, Freiburg, Germany, 2007.

[2] Jeffreys, H.: The Earth, Cambridge Uni Press, Cambridge, UK, p. 56, 1976.

[3] Jensen, C.: Die Verfolgung der neutralen Polarisation Punkte in Arnsberg, Meteorol. Z., Vol. 54, p. 90, 1937.

[4] Kotlyar, P. and Kim, V.: Position of the Pole and an activity of the Earth, Nauka Press, Novosibirsk, 1994.

[5] Marshinzev, V.: Nature of kimberlites, in: A cosmic substance on the Earth, Novosibirsk, p. 47, 1990.

[6] Munk, W. and Macdonald, G.: The rotation of the earth, Cambridge Uni Press, UK, p. 180, 1960.

[7] Parkinson, W.: Introduction to Geomagnetism, Academic Press, Edinburgh, Scotland, p. 100, 1983.

[8] Petrelis, F. et all.: Simple mechanism of reversals of magnetic field, Phys. Rev. Lett., Vol. 102, p. 4503, 2009.

[9] Thomson, D.: Coherence between IMF at observatory data, Cospar Sci. Ass., Canada, p. 3183, 2008.

[10] Volland, H. and Kundt, W.: Dekadenfluktuation der Erdrotation, Naturwissenschaften, Vol. 76, p. 305, 1989.

[11] Volz, F.: Distribution of turbidity after the 1912 Katmai eruption, J. Geophys. Res., Vol. 80, p. 2643, 1975.

[12] Weber, L.: The report to the editor, Astr. Nachr., Vol. 178, 1908.

[13] Yoshimura, H. and Kambry, M.: The 100-year periodic of solar rotation, Astr. Nachr., Vol. 314, p. 9, 1993.