



## Prediction of catastrophic earthquakes in 21 century

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Forced temporal variations of elastic energy of the Earth are one of the most important dynamical processes for creation and realization of the big earthquakes. They are source of the energy for accumulation and realization (in form sharp dumps) of big earthquakes. We can expect definite temporal correlations of the dates of big quakes and dates of the extreme behavior of the elastic energy of the full Earth due to mechanical unity of the considered processes. Two mechanisms of variation of the elastic energy are studied in our report. We in first have obtained the full analytical expressions of the elastic energy of the lunar-solar tides and rotational deformations of the elastic Earth including their mutual terms (Barkin et al., 2004; 2006). From another hand discussed here variations of elastic energy of the Earth practically describe variations of the second harmonics of the force functions of the systems of the axisymmetric Earth shells (in particular core and mantle) with the Moon and the Sun. With accordance with Barkin's geodynamical model the part of this energy is spent on realization of the grandiose endogenous processes (Barkin, 2002). It means that the mechanism of the shell-dynamics (perturbed relative oscillations-displacements of the core and mantle) renders influence on the elastic state of the Earth in same rhythms as and abovementioned tides. Variations of energy depend from the coordinates and rotational parameters of the Earth and have cyclic nature. From celestial-mechanical point of view we can determine variations of the mentioned elastic energy on centuries forever forward and back. We have studied as short time variations (with the Moon and the Sun orbital periods and similar) and interannual and decadal variations (in first with periods 4.45 years, 18.6 years). We have been studied as real curve of elastic energy variations and also approximating envelope curves (bending around peak curves). The dates of the extreme values of elastic energy we have determine for period 100 – 2100 years and in particular compared with the dates of the big earthquakes with magnitudes  $M > 8$  which were happened in 20 century. We have shown that practically all dates of

extreme values of elastic energy (on average curve) coincide with known intervals of sharp seismic activation of the Earth in 20th century ( $M > 8$ ) (Barkin et al., 2006). These dates are centered in comparatively narrow domains of seismic pikes in 1-2 years. An exception here can be connected only with two extreme values of elastic energy for dates 1954 and 1967 years (from the full list of 23 dates). It means that predicted dates of extreme values of elastic energy (on average curve) of the Earth in 21th century: May 2002; October 2006; March-April 2011; August-September 2015; January-February 2020; June-July 2024; November-December 2028; April-May 2033; September-October 2037; March 2042; August 2046; January 2051; June 2055; November 2059; April-May 2064; September-October 2068; February-March 2073; July-August 2077; January 2082; May-June 2086; September-November 2090; April 2095; September 2099 in reality in the majority will correspond by catastrophic earthquakes in this century with biggest magnitudes in 8 and more. Very active big quakes in period 2000-2007 years with  $M > 8$  confirm first two from predicted zones-dates of catastrophic events: Northern Sumatra ( $M=8.6$ , 28 Mar. 2005; Kuril Islands ( $M=8.3$ , 15 Nov. 2006;  $M=8.2$ , 13 Jan. 2007) and oth.

## References

Barkin, Yu.V., Ferrandiz, J.M. (2004) Tidal elastic energy in planetary systems and its dynamic role. *Astronomical and Astrophysical Transactions*, v. 23, Issue 4 (August 2004), pp. 369-384.

Barkin Yu.V., Ferrandiz J.M. , Garcia Ferrandez M., Navarro J.F.(2006) Elastic energy of rotational and luni-solar tides and their role in the Earth seismic activity. *Astronomical and Astrophysical Transactions*, v. 25, N6, pp. 1-20.

Barkin, Yu.V. (2002) Explanation of endogenous activity of planets and satellites and its cyclicity. *Izvestia cekzii nauk o Zemle. Rus. Acad. of Nat. Sciences*, Issue 9, December 2002, M.: VINITI, pp. 45-97.