

Seismic forecasting application of Astro-Meteo-Tectonics concept

Leonid Doda (1), Aleksander Kubyshen (2), and Sergey Shopin (1)

(1) Tula State University, Tula, Russian Federation (l.doda@mail.ru), (2) Independent Researcher, Chelyabinsk, Russian Federation (kubyschen.aleksander@yandex.ru)

Astro-Meteo-Tectonics concept is a further development of empirical scheme of short-term earthquake prediction and seismotectogenesis concept. In Astro-Meteo-Tectonics, interrelations of astronomical, meteorological and geophysical factors at earthquake preparation are considered.

Astronomical factors include

- solar activity (“Earthquakes are born at the Sun”);
- interplanetary medium;
- planetary configurations of type Moon-Earth-Planet or Earth-Moon-Planet;
- resonance interactions of planets.

Meteorological factors are

- general atmospheric circulation and cyclogenesis;
- synoptic processes;
- cloud seismotectonic indicators;
- outgoing longwave radiation (OLR);
- atmosphere chemical potential.

Geophysical factors are:

- deformations of geoid;
- anomalies of Earth rotation parameters;
- rotation of lithospheric plates;
- earthquake initiation by geomagnetic disturbances formalized as the seismomagnetic meridians.

Ideas of cycles and rhythms of geophysical processes are used in the data analysis. In particular, we use harmonics multiple of

- 4 and 8 years (lunar cycles);
- 6 years (recurrence period of Chandler trajectory);
- 19 years (Metonic cycle);
- 18.6 years (cycle of precession of orbit of monthly Earth revolution around the barycenter of Earth-Moon system);
- one week (7,14 and 21 days) connecting Earth geomagnetic field disturbances and dates of earthquakes;
- 104 days (quarter of full lunar cycle) connecting synoptic processes and subsequent earthquakes (A.F. Kubyshen);
- 188 days (half-year cycle of solar tide) expressing the periodicity of strongest earthquakes (Shan).

The idea of Chandler trajectory iso-seismicity is considered. It is the periodic repeatability of Earth’s pole Chandler trajectory segments, along which strong earthquakes occur in the same regions at time intervals multiple of 6 years.

Sequence diagrams of seismic activity are presented providing long-term forecast of dates of strong earthquakes with time advance of up to several years. Analysis of sequence diagrams gives the following long-term prediction: the strongest earthquake with M8+ and a series of earthquakes with M7 are expected in the period of 29.11.2016-26.01.2017, the most probable dates are 8,16,17,23 of January 2017.

The idea of seismic invariants is introduced. It is a sequence of cyclically repeated earthquakes at the margin of two lithospheric plates conjugated by seismomagnetic meridians. Seismic invariants are defined by the coherent anomalies of Earth rotation parameters, long-term time series of gravity measurements, proton migration, radon and other geophysical parameters. Prognostic application is illustrated by the example of medium-term forecast of strong M7.5+ events in the Kuril-Kamchatka, Japan and Sumatra-Java zones till the end of May 2016 realized by M7.2 Kamchatka earthquake of 30.01.2016, M7.9 Sumatra earthquake of 02.03.2016 and a series of earthquakes at Kyushu of 14.04.2016-15.04.2016 with M6.1/6.0/7.0.

Geophysical indicators of strong M7+ earthquake expected at Kamchatka in May 2016 are considered.

One of potential dates is 15.05.2016±2 days.

Results of seismic forecasting experiments conducted at several zones are presented:

-all 7 events with M7+ of 2002-2016 years in Kamchatka-Okhotsk Sea zone;

-7 earthquakes with M6+ of 2009-2010 in Taiwan zone;

-16 earthquakes with M6+ of 2011-2015 in Japan zone;

-four level (from long-term to operative) prediction for the M8.3 Chile earthquake of 16.09.2015 and M6.4 Kamchatka earthquake of 20.03.2016.

The work was financially supported by the Ministry of Education and Science of the Russian Federation (contract No. is 14.577.21.0109, project ID is RFMEFI57714X0109).