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# Fault-block model of seismic processes and tidal triggering of earthquakes at Crimea region, Ukraine

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The Crimean region is a part of Crimean-Caucasus seismic actively segment of the Alpine-Himalayan belt. This region is one of the most seismic hazards in the south of Ukraine. Based on the complex analysis of geoisostatic stress fields and results of modeling stress-deformed state of tectonosphere, caused by the tidal influence of Moon and Sun, was created a fault-block model of seismic process of Crimean region and essential vibration tidal influence was showed, which operating like a triggering of earthquake.

Stress state is one of the main values that characterized the development of the geodynamic processes. The additional information about the stress state tectonosphere can be computed analyzing the disturbances of the equilibrium state of the rotating Earth.

The analysis of the stress state was done, using satellite (project GRACE) and surface gravity data. The stress fields were computed according to the digital model of the geoid anomalies.

The analysis of the stress state showed block boundaries of different scale reflect in local and regional components of the geoisostatic stress fields. These elements, seems to be main tectonic seismic-generated structures, reflect in the stress fields. Majority seismic processes coincided with these stresses and block boundaries. Taking into account high values of the geoisostatic stresses, we can assert that picked zones have a high neotectonic activity. So, the seismicity of this region is defined the fracture zones. The lowering of blocks in Black Sea Cavity is occurs in that zone and majority of earthquakes occurs in the fragment of this zone with azimuth 30-35 º. It is strong reflected in the regional stress fields. The features of the seismic epicentres localisation in these zones defined as boundaries of interaction of its local fragments - the smaller tectonic blocks, reflected in the local stress fields.

The seismic processes are considered as a result disturbance of the continuity of the geological environment, appearing during the uneven exit of elastic deformation energy, accumulated under the action of the tectonic processes. The uneven changes relate with the triggering effect.

Considering the fault-block model of the seismic processes in Crimean region as a system, that is in the unsteady state, closed to the critical; it is possible to assume the luni-solar tides, as a “tectonic vibrator”, render the role of trigger mechanism to the seismicity.

Doing the mathematic modelling, it was showed if luni-solar influenced, than stresses have values 104 Pa.

In spite of that tidal stress value is several orders less than the necessary stresses for the development of the seismic processes, but it periodicity and accumulation speed make it possible to consider luni-solar tides as “tectonic vibrator”.

Considering luni-solar tides as “tectonic vibrator”, the analysis of the interrelation of geodynamic processes with the instantaneous values of tidal stresses is not enough. The calculation and the analysis of the integral characteristics, determining the action of the “tectonic vibrator” during the significant time intervals is necessary. In the author opinions, one of such characteristics can be the sum of average-daily tidal tangent stresses.

The calculation of tidal stresses in the Crimean region for the true position of Moon and Sun was executed for checking this hypothesis. Notice the value of tidal tangent stresses and azimuths of surfaces, where the stresses operated, have both significant importance. The azimuths of surfaces will change in time, according the mutual position of Moon and Sun relative to point on the Earth’s surface. If there is a fracture zone in the continuity of environment on the researching territory, so it is evidently, that the most triggering influence on seismic processes will render the tangent stresses on the surfaces, which azimuth coincided or close to the azimuth of the fracture zone of continuity.

We noticed that the Crimean region has such zone with the azimuth 30-35 º. Conducting these researches the

azimuth selection of tangent stresses was done. The analysis was done, using tangent stress with azimuths of surface, which was in interval 20-50º in considering period of time.

Calculation and coincidence of amplitude spectrum curved sum of average-daily tidal tangent stresses and number curve of seismic events from 1962 until 1989 that happened for the sidereal month, showed four main maximum in amplitude spectrum with close periods for both curve. The additional attitude of maximums in the amplitude spectrum of earthquake curve is close to the attitude of maximums in the amplitude spectrum curve of tidal tangent stresses.

Similar regularities make it possible to assert that the essential influence of tidal vibration can be considered like a triggering of earthquakes. Furthermore, it is very important to take into account the special features of the tectonic structure of studying areas, for which the analysis of interrelation of geodynamic processes with the luni-solar tides was done.