On a seismogravity processes registered in the course of preparation and development of the Great East Japan Earthquake

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The results of observatory observations of seismogravitational processes and gravitomagnetic disturbances, reflecting the preparation and development of large earthquakes, the focal structures of which were formed in subduction zones, are presented. Continuous and multidisciplinary geophysical instrumental observations carried out on the basis of the Geophysical Observatory in Northern Caucasus by means of the high-precision quartz tilt-meters developed by D.G. Gridnev at the Schmidt Institute of Physics of the Earth, Russian Academy of Sciences, allowed to better understand specific processes accompanying the development of large seismic events. Through study of a large number of observatory observations we obtained suggestions that the fine structure of the observed gravitomagnetic disturbances is primarily determined by the geological properties of the medium in the focal zone. Observation data testify in favor of the bifocal nature of the sources of strongest seismic events. The process of earthquake preparation, although stretched in time, is nonetheless an energy-intensive process. Significant rheological changes occur in the medium and so extensive areas of geophysical fields of different nature are formed. Analyzing the dynamics of the dilatancy and compaction zones at the preparatory stage and during the development of a large seismic event, the researcher comes to the bifocal scheme of the earthquake source, which is structurally asymmetric. In this case, the focus of a tectonic event can be represented by a double pair of forces, which indicate the presence of quadrupole-type emitters in the focal area.

The results are compared with the original observations of French and American scientists who managed to register the elaso-gravitational process at the time of the main shock that determined the beginning of the 2011 Great East Japan Earthquake [Vallée et al., 2017].

A comparative analysis of the results of geophysical experimental observations opens up new opportunities for a deeper understanding of the features of natural processes in the seismic source at all stages of the development of a catastrophic process.

References

Martin Vallée, Jean Paul Ampuero, Kévin Juhel, Pascal Bernard, Jean-Paul Montagner, Matteo Barsuglia. Observations and modeling of the elastogravity signals preceding direct seismic waves // Science. 2017. 358. 1164 – 1168. DOI:10.1126/science.aao0746