Monitoring and forecast of trigger effects initiating earthquakes

Benkendorf O.V., Lebedev S.V., Bokov V.N.

Center for geophysical forecasts «Gradient», St. Petersburg, Russia

e-mail: viki333@rambler.ru

Today seismologists believe that earthquakes occur under the influence of trigger effects. Various trigger effects on the earthquakes are known. For example, the impact of a seismic surface Rayleigh wave, an electromagnetic mechanism for the excitation of seismicity, the deformation of the Earth's surface caused by conjugated anticyclones and cyclones. The Rayleigh wave monitoring is a fairly reliable, and a monitoring of the electromagnetic seismic excitation mechanism is associated with many problems. The monitoring for both listed triggers is devoid of the predictive component, which practically nullifies the forecast of trigger effects and, accordingly, earthquakes. However, the monitoring of the deformation of the Earth's surface caused by conjugated anticyclones is very reliable and contains a prognostic component that will allow (depending on the quality of prognostic meteorological fields) to produce both a forecast of trigger effects and earthquakes for two or three days before. In this case, atmospheric trigger effects are realized through various sets of strange attractors, which are represented by atmospheric circulation precursors (ACPs). Daily monitoring of prognostic meteorological fields makes it possible to identify emerging ACPs for the Earth's territory and, in accordance with the spatial and temporal changes of strange attractors, determine the bifurcation point, i.e. coordinates, as well as the time of earthquakes. The strength of earthquakes is determined more accurately in the presence of additional measurements of geophysical precursors. As additional geophysical precursors, it is possible to use measurements of lithospheric gases (radon, toron), geoacoustic noises, measurements of GPS, groundwater level and others. A necessary condition for the successful application of monitoring data of geophysical precursors is the presence of a spatial optimal network of observations. A joint analysis of the ACPs and online monitoring of geophysical measurements will raise the level of a forecast veracity to the practical use.