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Earthquake forecast algorithm based on the set of typical anomalies obtained in the general vicinity of large earthquake

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The used earthquake forecasting methods are not accurate enough [1, 2]. The task of increasing the accuracy of these methods and developing of new ones is urgent. Main reasons of difficulty of forecasting are the high variability of seismic process, which makes it difficult to identify predictive effects, and the lack of a physical model of earthquake [1-4; and etc.]. The proposed approach helps to overcome these difficulties.

The algorithm is based on the use of the results of analysis of the generalized vicinity of a large earthquake (GVLE) [2, 5, 6; etc.]. As a result, the character of the known predictors was detailed and a few new ones were identified. In the GVLE the predictors, due to the summation of data on a large number of strong events can be parameterized valid. The anomalies begin approximately 100 days before a generalized large event (GLE) and increase with decreasing time interval Δt before the GLE. The foreshock flow N has the form

$$log(N) = a + b\, log\, (\Delta t) \qquad (1)$$

The anomalies *A* of increase of the average magnitude, *b-value* anomaly, and a few others have a form

$$A = a + b\, log\, (\Delta t) \qquad (2)$$

In (1) and (2), *a* and *b* are coefficients determined for a given anomaly and catalog. Catalogs of seismic moments of earthquakes, that provide more detailed information about the earthquake sources, provide the increased number of type (2) anomalies.

Another advance is related with confirmation of the differences in the physical mechanisms of earthquakes of different depths. In [7-8] the difference of earthquakes occurring at different depths was verified.

A preliminary test of this forecasting method was carried out by a retrospective analysis of the world ISC-GEM and GCMT catalogs and the regional catalog of Kuril-Kamchatka. The question was addressed how often anomalies (1) and (2) types can be identified in the preparation zones of individual strong earthquake. It is shown that the probability of such earthquake prediction depends on the number of weak events recorded in preparation area. Thus, it is possible to indicate what the registration network should be constructed to predict Mo+ events with probability *p*.

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