ON THE SHORT-TERM PREDICTABILITY OF STRONG EARTHQUAKES. NEEDED DATA VOLUME INCREASE AND SPECIFIC AND NONSPECIFIC PRECURSORS

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The generalized vicinity of large earthquake (LEGV) was constructed as a combination of all events occurring in the space–time vicinities of strong (M≥7) and strongest (M≥7.5) earthquakes, and the examination of the seismicity behavior in LEGV was carried out. The inverse cascade (seismicity rate increasing toward the time of the main shock), the aftershock cascade, and the essentially lesser increase in seismic activity occurring in the larger vicinity of the main shock were found and examined. It is shown that the inverse and aftershock cascades are accompanied by several anomalies indicating the development of a set of precursory anomalies in LEGV; these anomalies consist in decrease of apparent stresses, in decrease of the b-values, in an increase of relative contribution of low frequency oscillations in the earthquake spectrum, and in an increase in correlation (homogeneity) of stress and strain. The majority of these anomalies were found to agree with the power-law character of behavior while approaching the moment of the main shock as it should be expected in the model treating the strong earthquake as an example of the critical-like phenomenon. As an example of such power-law like behavior the b-value behavior in LEGV is presented at the Figure.

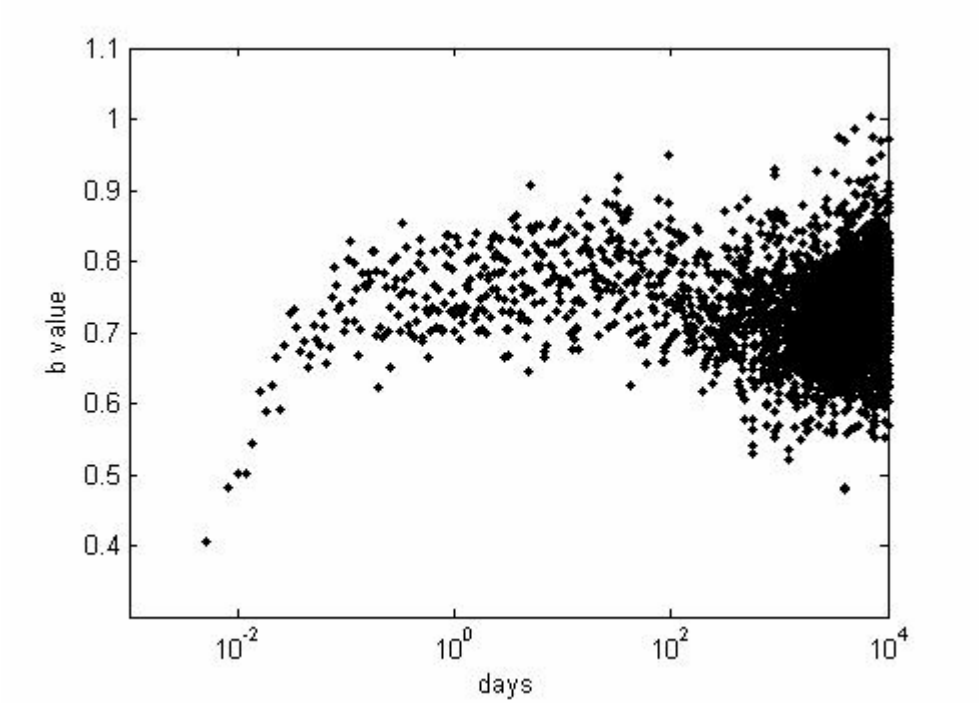
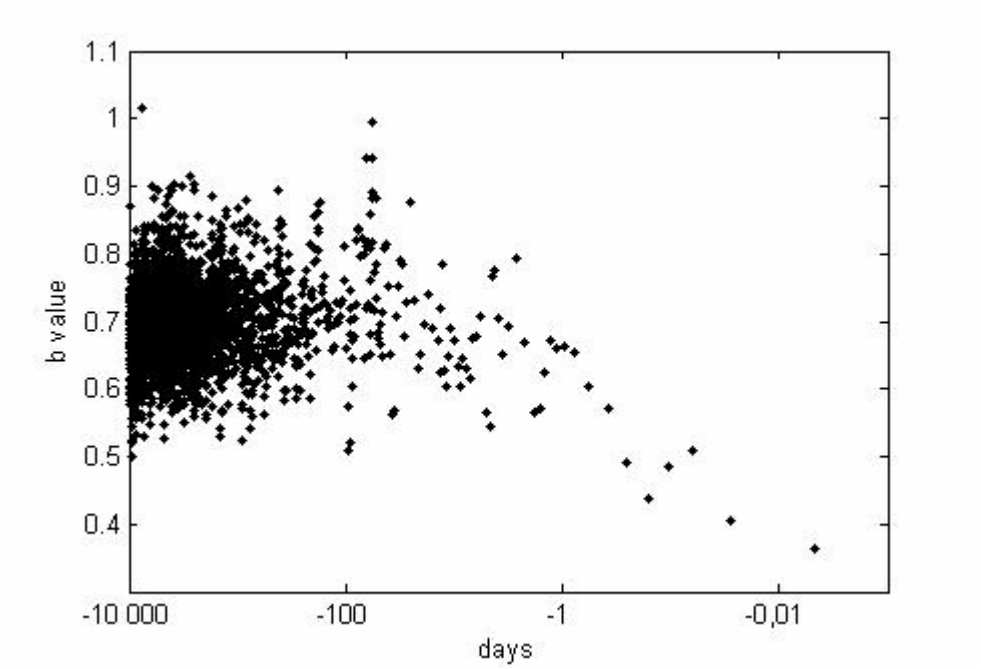


Figure. The change of the mean b-values in LEGV in the foreshock (a) and aftershock (b) areas. X-axis - the time interval of the group of earthquakes from the moment of the main shock.



The precursor anomaly in b-values as well as aftershock b-value anomaly is quite evident. The similar behavior takes place for other mentioned parameters. Thus it seems that "the strong earthquake prediction" is quite possible for the case of the "generalized strong earthquake". And this precursor behavior is similar to this one expected in the case of realization of the scenario of the critical process. The similar anomalies cannot be found however for data concerning any particular strong event because of a strong noise component in the seismic regime and the shortage of data. From here it is possible to assume that the strong earthquake prediction could be possible in the case of a considerable increase in available data, and the needed increase of available information could be evaluated to be approximately 1-2 orders.

It is emphasized also that the mentioned above prognostic features revealing the power-law behavior in the LEGV should be attributed as nonspecific precursors. These precursors correspond to the common features of instability occurrence, but they do not point out the particular physical mechanism of development of the instability. A few examples of possible specific precursors of strong earthquake are discussed also. Some of these precursors appear to be connected with the deep fluid involvement in the process of the earthquake occurrence.