Geophysical Research Abstracts,
Vol. 11, EGU2009-5093, 2009
EGU General Assembly 2009

Changes in seismicity preceding some earthquakes of the Baikal region

N.A. Radziminovich (1) and M.G. Kustova (2)

(1) Institute of the Earth's Crust, Irkutsk, Russia (nradzim@crust.irk.ru / +7-3952-426900), (2) Baikal Division of the Geophysical Survey SB RAS, Irkutsk, Russia

According to the models of earthquake sources available at present, strong earthquakes are preceded by the period of preparation during which the crust properties can be changed. These changes are responsible for seismic patterns in the future earthquake area. Either or both increase in seismic activity and seismic activity reduction down to seismic quiescence are observed prior to large shock. Related changes can serve as precursors of earthquakes and as factors substantiating strong earthquake faulting.

Here we analyze temporal changes in seismicity preceding some earthquakes which are strong regarding to a regional scale. Consideration is being given to the events with KR$\geq$13.6 ($\tilde{M}$5.3) recorded from 1990 to 2005 within the Baikal rift zone and its distal segments. Analysis has been made on the regional earthquake catalogue of the Baikal Geophysical Survey SB RAS from the representative energy class.

The results obtained show that activity preceding the earthquakes is evident as swarms, foreshocks, and increase in a number of backgrounds seismic events. Foreshocks preceded half the events analyzed. The preceding swarms can be subdivided into the foreshock-type and the "independent" ones. In the last case, large earthquakes are localized at the edge of the swarm epicentral area or beyond it. Earthquake swarms are generally separated from the main shock by quiescence or decrease in activity. It is notable that the immediate foreshocks are the most abundant after the foreshock-type swarm or against the background of the previous strong earthquakes with aftershocks (in case of the events paired), i.e. as if the crust volume had been already fractured. Nevertheless, the areas with continuously high seismic activity exhibit few or no foreshocks. The medium is likely to be rather unconsolidated there or the background events act as foreshocks that can be also manifested as the background activity as a whole. The situation is complicated by the fact that foreshocks cannot be distinguished from the background in related areas correctly.

Seismic quiescence effect, along with seismic activity, is rather common in the destruction. This regular trend found previously for the Baikal region involves moderate events too. However, we could recognize with confidence only a few cases of precursory long-term quiescence, with no foreshocks preceding the main shock against the quiescence background.

Analysis has shown that strong earthquake preparation scenarios in the Baikal rift zone are realized as the following seismic patterns: swarm – quiescence – foreshocks – main shock; foreshocks – main shock; quiescence – main shock; background (without changes of seismic rate) – main shock. Seismicity changes prior to a large earthquake are determined by the state of the source area environment – its consolidation or fracturing level determined, in its turn, by other factors (rate of deformation, prehistory of development etc.).