

State of the art and future direction of 'New program for earthquake prediction research'

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The 'New program for earthquake prediction research', which is called new program has lasted for 8 years since its start in 1999. Three years has past since the 2nd new program started. The new program started under the policy of understanding the whole process of earthquake cycle to reveal the phenomena that are expected to occur at the final stage before earthquake occurrence, and aimed at earthquake prediction with high reliability. The 2nd new program has two principal subjects; (1) comprehensive research to clarify the activity in the earth's crust associate with preparation stage of earthquakes, (2) establishing predictive simulation for crust activity and the upgrading monitoring systems for crust activity. As the Council for Science and Technology has made a review on the 2nd new program in 2006, we need to start a discussion for the next program in 2007. In the presentation, we summarize the principal results on earthquake prediction research in the period of new programs, and discuss the future direction of earthquake prediction research.

One of the principal results in earthquake prediction research during the period of the new programs is establishment and successful verifications of physical model that is based on asperity hypothesis for the earthquakes in plate boundaries. The main rupture area of 2003 Tokachi-oki earthquake was revealed to coincide with that of 1952 Tokachi-oki earthquake, supporting the idea of earthquake recurrence based on the asperity model. The asperity model is also able to explain the difference among the earthquakes in Miyagi-oki area that occurred in 1830's, 1978 and 2005. The simulation that considers realistic friction and fracture law on the fault surface and the geometry of plate boundary is able to reproduce the feature of the recurrence cycle of great earthquakes in the plate boundary. The nation-wide network such as Hi-net and GEONET provided very high-quality data set. Slow slip and the low frequency earthquake along the plate boundary are found, and the stress re-distribution processes in the preparation stage of earthquakes are being clarified.

These results show that the policy of the new program was basically correct, and should be continued. However, the physical model for the inland earthquake is still far from establishing and is still qualitative stage for some specific region. The process of stress concentration to the fault region should be investigated as soon as possible. The research concerning the process immediately before earthquake has little advance during the period of the program. A comprehensive observation and study should be concentrate on the region where earthquakes are impending.