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Results of the first 3.5 years of the experiment in prospective earthquake prediction using Reverse Tracing of Precursors (RTP)

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The experiment in prospective documented earthquake prediction using the algorithm Reverse Tracing of Precursors (RTP) has been started in June 2003. The algorithm is based on the analysis of a set of intermediate-term precursors in an area of a shorter-term long-range activation of seismicity, detected by earthquake chains. Earthquake chains are clusters of moderate-size earthquakes which extend over large distances and are formed by statistically rare pairs of events that are close in space and time. We put predictions on record at http://www.igpp.ucla.edu/prediction/rtp (with a restricted access to current predictions). Predictions are not deterministic: they are expected to be true with some probability exceeding 50%.

During the period June 2003 to January 2007 ten predictions were put on record (we do not count current alarms), three of them were extended in modified area to longer time intervals than standard 9 months. Those prolongations are not considered as separate predictions because they largely intersect in time and space with corresponding initial ones. Formally, four of ten predictions happened to be correct (Hokkaido earthquake, September, 25, 2003, Mw=8.3; San-Simeon earthquake in California, 25 December, 2003, M=6.5, earthquake in the sea near Sendai, Japan, August 16, 2005, Mw=7.2; and Simushir earthquake, Kuril islands, November 15, 2006, Mw=8.3). One of them due to technical delay was put on record after the earthquake (third in the list above); its epicenter is within the area of alarm, but near the boundary. One target earthquake is a failure to predict (in the sea near California, June 15, 2005, Mw=7.2; we do not

count its aftershock with Mw=6.6). Estimated from the statistics of target earthquakes occurred in the past, the average rate of expected targets per duration of alarms integrally for all predictions is equal to 1.09; the actual number of earthquakes confirming predictions is 4, almost four times higher (currently we do not score as an additional success the subsequent large earthquake in Kuriles, January 13, 2007, Mw=8.1, although it fits time, space and magnitude range of prediction). The similar number for the whole time and space of the experiment is equal to 5.8; this corresponds well to the actual number, five.

The estimations above are not yet sufficient for final conclusions. However, they are very promising, particularly if to take into account informal details of the experiment. Three predictions, formally scored as false alarms, may be treated as near misses. For one of them target magnitude was documented as Mw>=5.5, and the earthquake within time and space of alarm had magnitude Mw=5.2 and ML=5.7. In two other cases the target earthquakes occurred within the time of prediction, but outside its area, at a distance much smaller than its size.