

## **Large-Scale Short-Term Seismicity Activation prior to the Strongest Earthquakes in and near Japan and Kurile Islands**

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The Reverse Tracing of Precursors (RTP) algorithm for the prediction of strong earthquakes has become known owing to the successful predictions of the Tokachi-Oki earthquake near Hokkaido Island and the San Simeon earthquake of California in 2003, as well as to other well documented predictions posted in the Internet, some of which also proved to be successful. The RTP predictions with the use of the Japan Meteorological Agency (JMA) data for the zone from Honshu Island to the Middle Kurile Islands deserve special attention. None of the five predictions starting in the middle of 2003 was a false alarm, including one formulated for the region where the catastrophic earthquake of March 11, 2011, with a magnitude of  $M = 9$  occurred. One distinctive feature of predictions for this region is a large size (about 1000 km) of alarm regions. At the same time, the relatively short alarm interval makes it possible to record a real number of earthquakes with a magnitude of 7.2 and higher during alarm periods, which is about five times larger than on average over the equivalent period, i.e., to reach a probability gain of about five.

### **References**

- [1.] P. Shebalin, V. Keilis\_Borok, I. Zaliapin, et al., "Advance Short\_Term Prediction of the Large Tokachi\_Oki Earthquake, September 25, 2003,  $M = 8.1$ . A Case History," *Earth Planets Space* 56 (8), 715–724 (2004).
- [2.] P. Shebalin, "Increased Correlation Range of Seismicity before Large Events Manifested by Earthquake Chains," *Tectonophysics* 424 (3–4), 335–349 (2006).
- [3.] V. Keilis\_Borok, P. Shebalin, A. Gabrielov, and D. Turcotte, "Reverse Tracing of Short\_Term Earthquake Precursors," *Phys. Earth Planet. Inter.* 145 (1/4), 75–85 (2004).
- [4.] P. Shebalin, I. Zaliapin, and V. Keilis\_Borok, "Premonitory Raise of the Earthquakes' Correlation Range: Lesser Antilles," *Phys. Earth Planet. Inter.* 122 (3–4), 241–249 (2000).

[5.] V. I. Keilis\_Borok, P. N. Shebalin, and I. V. Zaliapin, “Premonitory Patterns of Seismicity Months before a Large Earthquake: Five Case Histories in Southern California,” Proc. Natl. Acad. Sci. USA 99 (26), 16 562–16 567 (2002).

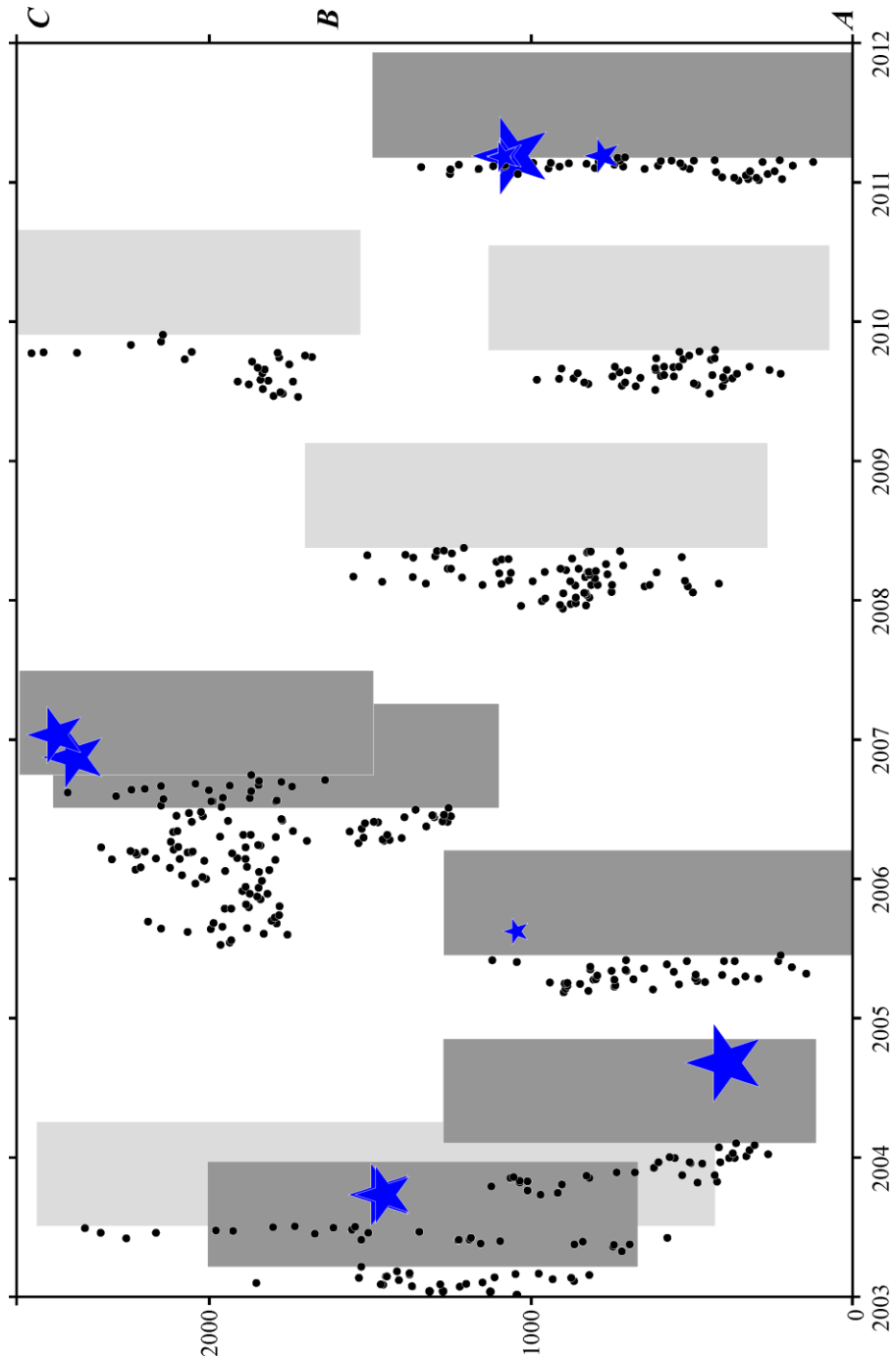


Fig. 1: Spatial–temporal projections of earthquake chains (black circles) and alarm regions (dark gray areas). The two-dimensional space is a projection along island arc. The regions which did not become alarm regions according to the results of the recognition of medium-term precursors (the second stage of the RTP algorithm) are given in light gray. Stars indicate large earthquakes with  $M \geq 7.2$ .