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Long-term seismic quiescence caused by partial decoupling of the plate boundary prior to the 2011 Tohoku earthquake

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Katsumata (2011) found that a long-term seismic quiescence started 22 years before the 2011 off the pacific coast of Tohoku earthquake (M=9.0) by analyzing an earthquake catalog compiled by Japan Meteorological Agency (JMA). A detailed analysis of the earthquake catalog between 1965 and 2010 using a gridding technique (ZMAP) shows that the 2011 Tohoku earthquake is preceded by a seismic quiescence anomaly that starts in the middle of 1989, and lasts about 22 years, until the occurrence of the main shock. The quiescence anomaly area is located around the deeper edge of the asperity ruptured by the main shock. The seismicity rate clearly decreases from 3.0 to 1.5 events/year (a drop of 50%). On the other hand Ozawa et al. (2012) found that a time-dependent analysis indicates aseismic slip offshore of Miyagi and Fukushima prefectures from 2004 based on global positioning system (GPS) data. They suggested that the aseismic slip is a precursor to the Tohoku earthquake. In this study I point out that the seismic quiescence area found by Katsumata (2011) overlaps almost exactly with the aseismic slip area found by Ozawa et al. (2012), suggesting that the seismic quiescence is caused by the aseismic slip.

Katsumata, K., A long-term seismic quiescence started 23 years before the 2011 off the Pacific coast of Tohoku Earthquake (M = 9.0), Earth Planets Space, Vol. 63 (No. 7), pp. 709-712, 2011.
Ozawa, S., T. Nishimura, H. Munekane, H. Suito, T. Kobayashi, M. Tobita, and T. Imakiire (2012), Preceding, coseismic, and postseismic slips of the 2011 Tohoku earthquake, Japan, J. Geophys. Res., 117, B07404, doi:10.1029/2011JB009120.