

Long-term seismic quiescence prior to the 1995 off the Iturup Island Earthquake (Mw7.9)

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Various examples of precursory phenomena before a large earthquake have been reported. One example is called a seismic quiescence. Seismic quiescence refers to a phenomenon in which seismic activity decreases in and around a focal area before a large earthquake. Although the mechanism of seismic quiescence before the earthquake is not well known, we try to understand the causal relationship between seismic quiescence and earthquake occurrence.

In this study we investigated the seismic quiescence prior to the 1995 off the Iturup Island Earthquake (Mw7.9) using a P-value method. Great earthquakes occurred frequently off the Iturup Islands along the plate interface between the Pacific and Okhotsk plates. In addition to the off the Iturup Island Earthquake, many M7.5 or larger earthquakes also occurred. The P value, which is an index of seismic quiescence, is obtained from the Poisson distribution. In a spatial grid, the longer the time period without an earthquake, the smaller the P-value. A spatiotemporal map of P values was created for each grid off the coast of Iturup Island. As a result of the analysis, the P value showed a very small value of 3.14×10^{-4} near the epicenter before the 1995 off the Iturup Island Earthquake. Temporal changes in the cumulative number of earthquakes near the epicenter and the spatiotemporal plots of the P-value also showed a sharp decrease in seismic activity about 10 years before the 1995 off the Iturup Island Earthquake. Therefore, we concluded that seismic quiescence occurred before the 1995 off the Iturup Island Earthquake. In addition, other earthquakes that occurred in the region, such as the 1978 off the Iturup Island Earthquake (Mw7.5-Mw7.8), the 1991 off the Urup Island Earthquake (Mw7.6), and the 1994 the Hokkaido-Toho-Oki Earthquake (Mw8.3), also had small P values near the epicenter before the earthquakes.

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