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Connection of Irregularity of Earth's Rotation and Properties of Seismic Noise in Japan

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Continuous records of low-frequency seismic noise on the Japanese islands have been available since the beginning of 1997 at stations of the F-net broadband network. Their analysis allows us to test a number of hypotheses about how the preparation of strong earthquakes affects the statistical properties of noise, as well as about the possibilities of using changes in the properties of noise to search for precursors of strong seismic events [1]. The temporal evolution of the average values of the properties of seismic noise from the entire network and from its various parts when they are estimated in a sliding time window demonstrate a number of features, the explanation of which requires the involvement of information about planetary causes that can serve as a source of modulations. In the report, it is proposed to consider the irregularity of the Earth's rotation, the data of which has been available since 1962 - the length of day (LOD) time series. Estimates of quadratic coherence between LOD increments and daily medians of seismic noise properties in an annual sliding time window are presented. The maxima of such coherence are concentrated in a narrow frequency band with periods ranging from 11 to 14 days, with a surge of maximum coherence in 2003, which was previously detected for global seismic noise [2]. These properties of seismic noise coupling with LOD are retained for the F-net regional seismic network in Japan, but a number of features appear associated with the preparation of the Tohoku seismic disaster on March 11, 2011 (M = 9.1). In particular, after the previous strong earthquake off the coast of Hokkaido on September 25, 2003 (M = 8.3), variations in the coherence spectrum showed periodicity with a period of about 2 years, which after the Tohoku event changed to a monotonous growing trend. The possibilities of using these features for the purposes of estimating seismic hazard trends are discussed.

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Reference

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