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Long-range coherence of seismic noise properties before strong earthquakes

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The coherences between daily time series of 4 low-frequency seismic noise properties which were calculated for 78 broadband seismic stations of the network F-net in Japan and 81 broadband seismic stations in California for 13 years of observation, 2003-2015, is investigated. The studied time interval includes Tohoku mega-earthquake, M9, on March 11, 2011. The chosen noise properties are the following: minimum normalized entropy of squared wavelet coefficients, multifractal singularity spectrum support width, generalized Hurst exponent and index of linear predictability. These properties were estimated daily as median values taken over all stations of the networks. For each pair of these noise properties from Japan and California squared coherence spectrums were estimated within moving time window of the length 730 days. The maximum values of squared coherence spectra for periods more than 20 days were essentially increasing as the time window approaches the time moment of Tohoku mega-earthquake and achieved their maximum values for position of moving time window strictly before the seismic catastrophe. This fact is interpreted as a consequence of general global seismic noise synchronization before huge seismic catastrophe.