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Covariance Matrix Analysis and Classification of Low-Frequency Tectonic Seismic Activity in Shikoku, Japan

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Low-frequency seismic tremors and earthquakes play an important role in the understanding of the seismic processes occurring in seismogenic fault zones and volcanic systems. The covariance matrix, a method that analyses the spatial coherence of continuous seismic noise records on the surface, has proven to be an efficient tool to detect and localize seismovolcanic processes, allowing the classification between local earthquakes, tremors, and low-frequency earthquakes. We use this method in the analysis of tectonic seismic activity in the region of Shikoku, Japan, where a high rate of tremors and low-frequency earthquakes have been previously reported. The classification of the seismic activity over the spectral width and the network response function, shows distinct characteristic distributions from studies done in volcanic systems. We perform a series of synthetic tests that reproduce the classification patterns and spectral widths observed in volcanic and tectonic systems, allowing us to recognize fundamental differences in the duration, frequency and distribution patterns of volcanic and tectonic tremors and low-frequency earthquakes.

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