

# Global connections between Earth's ambient noises: Earth's tremor, seismic noises, irregular rotation of the planet

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By the ambient noise of the Earth, we will mean the constantly occurring variations of the parameters of seismic noise and tremor of the earth's surface, measured by means of space geodesy. The source of these random fluctuations are the impacts on the Earth's crust from the atmosphere and the ocean, as well as internal processes in the earth's envelopes, including anticipating major geological disasters. Modern tools of geophysical monitoring give the possibility of a detailed study of the Earth's own noise. Currently, the number of active GPS stations that record earth surface displacements in three directions with a time step of 5 minutes exceeds 11 thousand and is constantly growing. The number of broadband seismic stations in the global network amounts to hundreds. This data is freely available for analysis from a number of databases. There is a problem of creating methods for joint analysis of several thousand synchronous time series and interpretation of the results obtained.

The report presents the results of the analysis of global and regional seismic noise using a number of nonlinear statistics estimated in moving time windows. The set of statistics used to study the properties of seismic noise and trembling of the earth's surface includes the multi-fractal and entropy properties of signals, as well as the values of spectral exponents, smoothness indices and linear predictability. The rhythms of changes in coherence and trends of seismic noise parameters with a period of about 2.5 years, presumably initiated by a sharp violation of the Earth's rotation regularity in 2003, are highlighted. For a number of territories in which there is a fairly dense network of stationary GPS points (USA, Japan, Italy), a detailed study of the dynamics of the time variation of the 2-dimensional probability density of the spatial distribution of the extremes of the earth tremor statistics has been carried out. This allowed us to identify a number of anomalous "spots" in which the maximum and minimum values of various tremor properties, including the maximum coherence of noise, are most often achieved. The connection of the selected regions with zones of high seismic hazard is discussed.

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