Geophysical Research Abstracts
Vol. 16, EGU2014-11835-1, 2014
EGU General Assembly 2014

Numerical Simulations of Microseisms in a NE Atlantic 3D Geological Model, using a Spectral-Element Method

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Ocean-generated microseisms are faint Earth tremors associated with the interaction between ocean water waves and the solid Earth. The microseism noise recorded as low frequency ground vibrations by seismometers contains significant information about the Earth's interior and the sea states. In this work, we first aim to investigate the forward propagation of microseisms in a deep-ocean environment. We employ a 3D North-East Atlantic geological model and simulate wave propagation in a coupled fluid-solid domain, using a spectral-element method. The aim is to investigate the effects of the continental shelf on microseism wave propagation. A second goal of this work is to perform noise simulation to calculate synthetic ensemble averaged cross-correlations of microseism noise signals with time reversal method. The algorithm can relieve computational cost by avoiding time stacking and get cross-correlations between the designated master station and all the remaining slave stations, at one time. The origins of microseisms are non-uniform, so we also test the effect of simulated noise source distribution on the determined cross-correlations.