Long-period Ground Motion from Hypothetical Megathrust Earthquakes along the Nankai Through using the Ambient Seismic Field

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Long-period ground motions from megathrust earthquakes are a real threat for large-scale human-made structures. The Nankai subduction zone, Japan, is expected to host a major megathrust earthquake in the near future and has therefore been instrumented with offshore and onshore permanent seismic networks. To simulate the long-period ground motions that could be generated by such earthquakes, we take advantage of the continuous data recorded offshore (DONET1 and DONET2 seismic stations) and onshore (Hi-net stations). We compute offshore-onshore impulse response functions from the continuous records using seismic interferometry by deconvolution. After amplitude calibration, we show that the impulse response functions reproduce well the long-period ground motions of moderate (M_w ~5) earthquakes. We construct realistic source models of several M_w 8+ earthquake scenarios that we use together with the computed impulse response functions to predict the long-period ground motions in the surrounding region. We finally calculate the velocity spectral response of our simulated waveforms and compare them to those obtained with ground motion prediction equations. This study suggests that the ambient seismic field recorded by the ever-increasing number of ocean bottom seismometers can be used to simulate the long-period ground motions from megathrust earthquakes.

Keywords: Long-period ground motion, Seismic noise, Green's function

