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# Insights on the Japanese Subduction Megathrust Properties from Depth and Lateral variability of Observed Ground Motions

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## Abstract

Two GMPE models for subduction zones have been tested using a public ground motion database of the KiK-net records obtained by automated processing protocols (Dawood et al., 2016). The database contains records of more than 700 interface earthquakes that occurred on the Japan subduction between 1998 and 2012. Zhao et al. (2006) GMPE has shown to be the best-suited model for the region. It was then used as backbone to analyze the variability of ground motion records. The residuals between observed and predicted ground motions have been analyzed to study the spatial variation of the earthquakes' ground motion frequency content on the Japan megathrust. This analysis revealed a depth dependency of generated ground motions consistent with the down-dip segmentation proposed for subduction interfaces (Lay et al., 2012), a regional ground motion dependency that may be related with lateral variations of the mechanical properties of the subduction interface, and a high frequency radiations drop in the earthquake sequence that preceded the Tohoku-Oki earthquake Mw 9.0. The regional ground motion dependency suggests the existence of different domains along trench of the Japan subduction megathrust that control the wave radiation patterns of interface earthquakes, and the location of their boundaries are consistent with the extension of the rupture of the 2011 Tohoku-Oki earthquake, with pre-Tohoku interseismic coupling, and with the free air gravity anomalies.

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