Modeling of Topographic Effects of Seismic Wave Propagation Around Sakurajima Volcano, Japan

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Seismic wave propagation is strongly affected by not only subsurface structure but also topography of land and seafloor. In order to investigate seismic structure of a volcanic area and source processes of earthquakes occurring in the area, appropriate modeling of effects of the topography on seismic wave propagation is essential. In this study we model the topographic effects of Sakurajima volcano area. Sakurajima volcano is one of the most active volcanoes in Japan, which is located in a part of Kagoshima Bay, i.e. Aira caldera, in the south of the island of Kyushu, Japan.. It has elevation of 1117 m and three main peaks; Kita-dake (1117 m), Naka-dake (1060 meters) and Minami-dake (1040 m). Sakurajima is connected to the Osumi Peninsula in the east. Our model area is 20 km x 20 km wide, which includes Sakurajima volcano around the center. For the surface model construction we use the 50m-mesh DEM provided by the Geographical Survey Institute of Japan for land surface, and nearly-250m-mesh topographic data of Kishimoto (1999) for seafloor, while for the subsurface structure model construction we exploit the Japan Integrated Velocity Structure Model provided by the Headquarters for Earthquake Research Promotion. For numerical simulation we use a time-domain staggered-grid finite-difference method (FDTD), which is often employed for strong-motion simulation. To incorporate the topography of land and seafloor into the FDTD model, a simple and accurate fluid-solid boundary condition is implemented. In the presentation we illustrate the topographic effects through some numerical simulation results.