南極氷床上の観測地震波形に氷床が与える影響について

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Influence of Antarctic ice sheet on observed seismograms at intra-Antarctic region

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Recently, a lot of temporal broadband seismic stations had been installed on the intra-Antarctic region by the projects related to the International Polar Year (IPY) 2007–2008. Antarctica is known as a window toward the Earth's deep interior since it is the seismically quietest location on the Earth, its wide extent covering large epicentral distances needed to detect various seismic phases, and seismic waves observed at Antarctica cross regions within the Earth that previously have been sampled only poorly. We have been working to construct an accurate and efficient technique to model global seismic wave propagation. Our numerical scheme solves wave equations in spherical coordinates using the finite-difference method (FDM) based on the "2.5-D approach" which calculates 3-D seismic wavefields on a 2-D cross section of the Earth (e.g., Toyokuni et al., 2005). This time, our method is applied to investigate influence of Antarctic ice sheet on observed seismograms obtained at intra-Antarctic region. We calculate synthetic seismograms for both a spherically symmetric Earth model PREM (Dziewonski & Anderson, 1981) and a laterally heterogeneous model with a simplificated ice sheet. In order to reduce equations and calculate synthetics up to higher frequency, only *S* wave is simulated using a torque source assigned at a depth of 600 km just below New Zealand. The epicentral distance range of Antarctica is $52° \leq \Delta \leq 92°$. The ice sheet model has a constant thickness of 3 km and single values of the density (0.914g/cm^3), the *P*-wavespeed (4km/s), and the *S*-wavespeed (2km/s). Several computations have been performed using source time functions with various pulse widths (4s~30s). Figure 2 shows paste up of synthetic seismograms at the free surface within an epicentral distance range of $30° \leq \Delta \leq 120°$ calculated for (a) the PREM and (b) the ice sheet model, using a source time function with width of 10 s. We can see marked amplification of all major phases on waveforms above the ice sheet. In the presentation we will further show results obtained for other dominant periods.

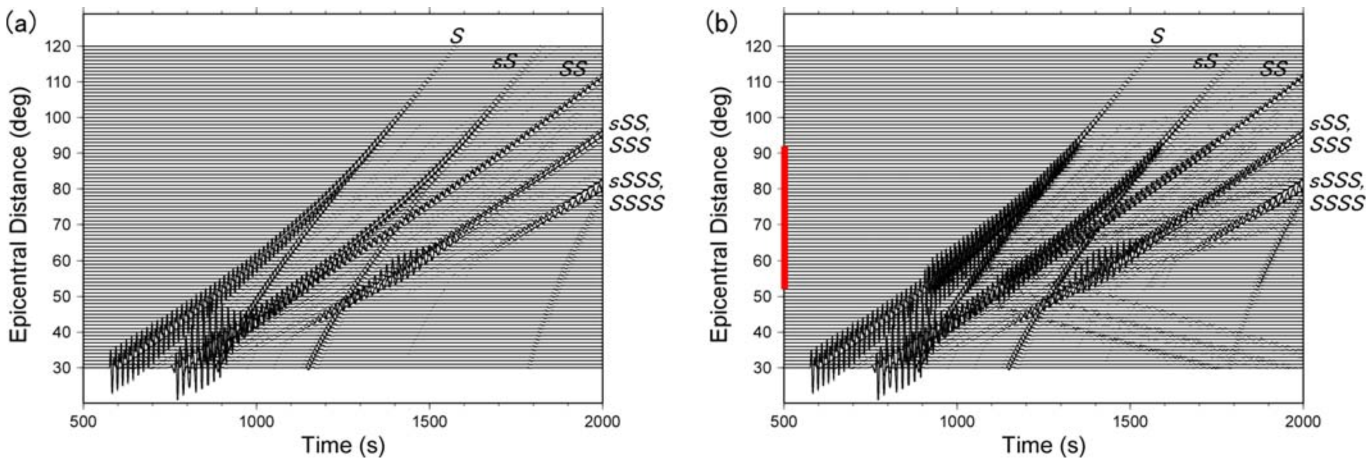

Figure 1. Synthetic seismograms within an epicentral distance range of $30° \leq \Delta \leq 120°$ calculated for (a) the PREM and (b) the ice sheet model. A red line on the panel (b) indicates the epicentral distance range of the Antarctic ice sheet model.

References

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