Site response of vertical component ground motion excited by obliquely incident S wave

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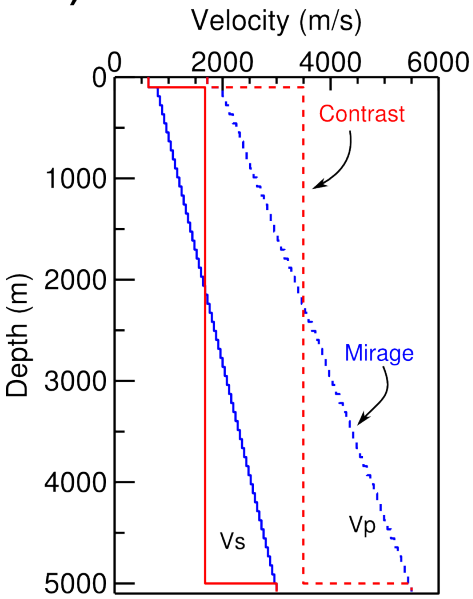
We investigate vertical ground motion of S-wave portion in a continuous velocity structure model. In many case, vertical ground motions of S-wave part have been assumed as a wavefield of that part is dominated by P wave. However, this assumption sometimes seems to be inappropriate to real data. We calculated spectral ratios of surface to borehole ground motions on P and S wave parts recorded at 6 KiK-net vertical array sites. At some sites (e.g., KMMH16), the spectral ratios on P and S wave parts have similar shapes, however, some other sites (e.g., TYMH02) indicated different shapes of spectral ratio between P and S wave parts. The site which have different spectral ratios between P and S wave are expected that seismic velocities in the sediments (between the Earth surface and seismic bedrock) below the sites are continuously varied with depth, and have not clear discontinuity. Theoretical examination of vertical component ground motions excited by the obliquely incident S-wave pulse (incident angle=10˚) indicate that a spectral ratio of surface and borehole data in a continuous velocity model (mirage model) differs from one in a discontinuous velocity model (contrast model) (Fig. A). Difference of the spectral ratio in the contrast model between for the oblique incident S-wave and for the vertical incident P-wave indicates that the assumption of the P-wave incident in the previous studies is not reasonable for the continuous velocity structure. We examined vertical component ground motion recorded at TYMH02 KiK-net vertical array assuming a continuous velocity structure model. Although the synthetic waveforms at the surface from the borehole for the vertical incident P-wave indicated unacceptable monotonic waveforms, the synthetics for obliquely incident S-wave were comparable to the observed one (Fig. B).
Acknowledgement: KiK-net data was used.

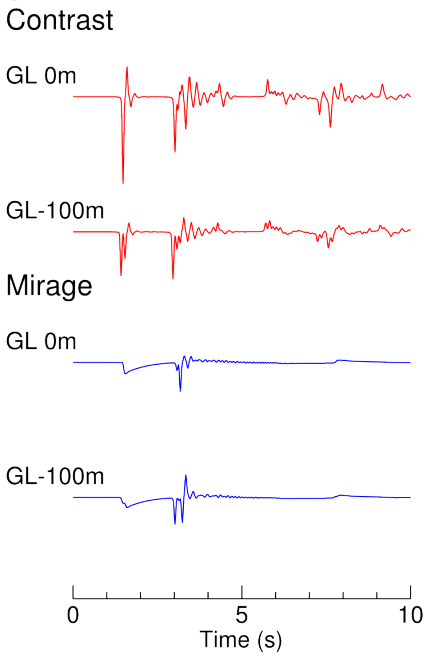
Keywords: continuous velocity structure, oblique incident, S wave, vertical component

A) Theoretical examination

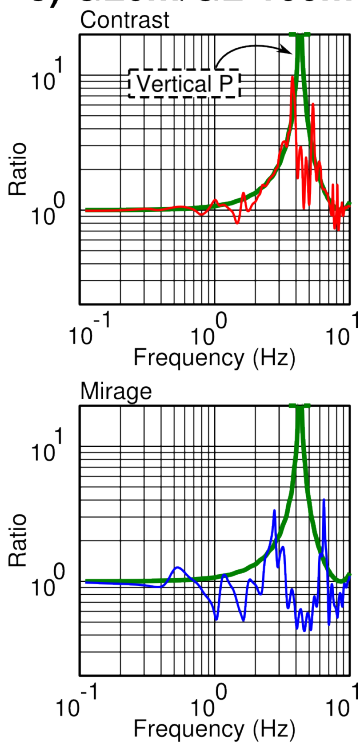
1) Structure model



2) Waveform

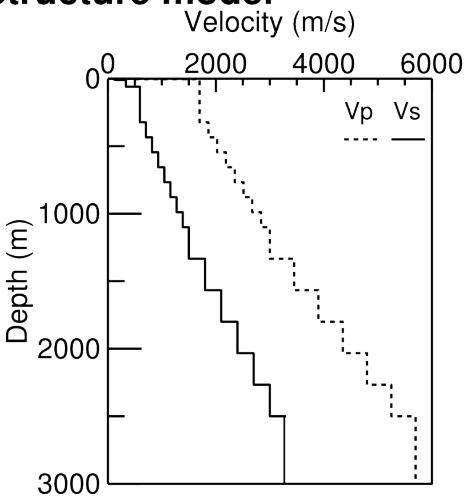


3) GL0m/GL-100m



B) TYMH02

1) Structure model



2) Waveform