S050-001 Room: 202 Time: May 29 9:15-9:30

Simulation of 2-D wavefields of Rayleigh wave propagation

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The present paper simulates 2-D wavefields of Rayleigh wave propagation and extracts characteristics of wave propagation by calculating a series of snap shots of the wavefields. The simulations are performed for two crustal and upper mantle models of Models T and LB in the Tien Shan region. Model T has a mountain root structure similar to the Tien Shan range located at the western part of the Lop Nor nuclear test site in China. Model LB has a double low velocity zone (LVZ) at the bottom of the mountain and at depths of 110-160 km in the upper mantle, the horizontal lengths of the double LVZ being 250 km.

The snap shots of the wave fields of the vertical component show following behaviors of the wave propagation. (1) The reflected waves are successively generated until the incident plane Rayleigh waves cross over the mountain. This phenomenon can be understood from the figure that the phase components of positive and negative displacements are concentrically propagating in the direction of the epicenter. (2) The wavetrains for Model LB increase the wavelength compared to those for Model T, owing to the superpositions of the same phase components of the scattered waves which generated at the double LVZ. (3) For both Models T and LB, the amplitudes of the vertical component at depths of 200-300 km are partly larger than those at shallower parts. These amplitude anomaly is caused by the effects of scattering of propagating Rayleigh waves at depths near the double LVZ in the upper mantle. This phenomenon suggests that the eigenfunction of the displacement does not decrease exponentially and regularly from the surface to inner parts of the earth.

References

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