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Numerical analysis on the dynamic interaction between ACROSS seismic source and layered elastic media

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The objective of this research is to analyze the dynamic interaction between motion of an ACROSS seismic source and the ground. In this research, we develop a program to calculate the compliance function of the rigid circular disk on the elastic layered half space and analyze motion of the disk. In the numerical analysis, we investigate the relationship between motion of the rigid circular disk and velocity structure of the ground.

In case that an ACROSS seismic source is fixed on the free surface of the ground, an observed response due to the ACROSS seismic source is affected by some causes like temporal changes of atmospheric temperature, rain falling and so on. It is considered that the temporal variations of atmospheric temperature and rain falling change the shallow ground properties and the change of ground properties changes the observed response. This change of response is noise for monitoring the properties of deep target region around fault. Therefore it should be removed from the observed responses. However, the mechanism of the change of response due to the change of shallow ground properties has not been made clear, yet. Then, we try to make clear the mechanism and analyze the temporal change of the observed response by numerical approach.

In this research, we model the ACROSS seismic source as a rigid circular disk and the ground as a layered elastic media. We develop a program to calculate the compliance function of the rigid circular disk on a layered elastic half space and analyze the response of the disk. In numerical analysis, we find out the following facts:

i) The motion of rigid circular disk highly depends on the surface velocity structure especially in case that a thin surface layer exists on the elastic half space. In this case, the ratio of thickness of the surface layer to the wave length of S wave is very important factor.

ii) Frequency dependence of the motion is appeared when the thickness of surface layer is comparable to the quarter of the wave length of S wave. In some frequencies, phase delay of the motion is relatively larger instead in other frequencies the phase delay is small.