Temporal variation in travel time of P and S-waves using ACROSS

*rina suzuki[1], Koshun Yamaoka[2]

1. Graduate School of Environmental Studies, Nagoya University, 2. Earthquake and Volcano Research Center,Graduate School of Environmental Studies,Nagoya University

We analyzed the temporal variation of travel time of P and S wave using observation data for one year by an artificial seismic source ACROSS which can generate controlled vibration repeatedly. In this study, we used a new type of ACROSS called ACR2014 that is installed in Toyohashi City, Aichi Prefecture. This ACROSS source can excite vertical vibration as well as horizontal vibration by rotation of the weight around the horizontal rotation axis to excite P wave efficiently. We used records at three observation stations called NU.MIK, N.THNH, and N.MKBH installed around ACR2014 and calculated transfer functions. From the components of transfer function, we chose the vertical component by vertical excitation and horizontal component by horizontal excitation for calculation of travel time of P and S wave, respectively. We calculated travel time variations from these components of transfer function using cross spectrum method. In this calculation, a window ranging 0.2 to 0.3 seconds was applied to the P and the S wave part, respectively. We compared the travel time variations with the precipitation data of nearby AMeDAS at Toyohashi and Mikkabi. In NU.MIK, short-term change with a step-like delay and following recovery occurred in both P and S waves at rains. The tendency of this recovery was different between the P and S wave. On the other hand, the long-term variation differs between the P and S waves at some observation stations. We interpreted the influence of rainfall on these short-term and long-term travel time variations, using a theoretical effect of the crack density and fluid saturation on the seismic velocity change. The observed difference in the P and S wave change can be explained with the difference in the response of crack density and fluid saturation between P and S waves. The long-term travel time variations in the P and S waves can be interpreted by assuming that the fluid saturation increases in the periods with high precipitation and decrease in the periods with low precipitation. The short-term change with the difference of the recovery between the P and S wave can be interpreted in similar way as the long-term variation.

Keywords: travel time variation, velocity change