

## Estimation of a seismic velocity structure by heuristic search using seismograms in Osaka Basin.

# Makoto Nakamukae[1], Einoshin Suzuki[2], Hiroo Nemoto[1], Koichi Nakagawa[3]

[1] Geosciences, Osaka City Univ., [2] Elec. Comp. Eng., Fac. Eng., Yokohama Nat'l

Univ., [3] Geosci., Osaka City Univ.

The purpose of this study is to estimate seismic velocity structure in an unconsolidated sedimentary layer. Low velocity in the sedimentary layer causes delay of travel time. Delay of travel time adversely affects accuracy in hypocenter determination. In order to remove this effect, it is necessary to estimate seismic velocity structure in the sedimentary layer and to correct travel time.

In this study, velocity structures just below 13 observation sites of Committee of Earthquake Observation and Research in Kansai Area (CEORKA) were estimated. 5 earthquakes whose seismogram were obtained at over 10 observation sites of CEORKA, were chosen among the earthquakes occurred in and around Osaka Basin. Seismograms at observation sites on basement were also used.

Using Primary wave velocity ( $V_p$ ) and Shear wave velocity ( $V_s$ ) in the sedimentary layer, arrival times of P-, S-, and its transform waves, depth of basement ( $D$ ) can be estimated. Corrective values of arrival times of P-wave ( $dp$ ) and that of S-wave ( $ds$ ) were yielded by dividing  $D$  by  $V_p$  and  $V_s$ , respectively. Hypocenters were calculated using  $dp$ ,  $ds$ , and arrival time on sedimentary layer and on basement. To calculate the hypocenters ABU model, which is used routinely at Abuyama observatory, Disaster Prevention Research Institute (DPRI), Kyoto University, was used.

A velocity structure was evaluated by three empirical criteria as below. Firstly, residual between calculated and observed arrival times at an observation site on the basement in Osaka Basin was used. Secondly, error of hypocenter determination was used. Finally, RMS (Root Mean Square) of residual between calculated and observed arrival times at all the observation sites was used. Heuristic search that could reduce the size of exploring search space based on empirical criteria was applied to estimate the velocity structure.

The velocity structure in sedimentary layer below 13 observation sites was estimated using the heuristic search method. The velocity structure below observation sites was consistent with the results of other geophysical methods, such as gravity, seismic reflection, and microtremor, and seismic logging. The calculated hypocenters using the seismogram corrected with the velocity structure on sedimentary layer and using seismogram on basement, were very close. Furthermore, by using estimated velocity structure, errors of hypocenter determination using arrival time on sedimentary layer became being less. Thus, the velocity structure could be estimated more precisely using the heuristic search method based on the empirical criteria.