

The observation and analysis of ACROSS signals by seismic networks (Part IV) - Time change of the transfer function -

Yasuhiro Yoshida[1]; Sumio Yoshikawa[1]; Satoshi Takahama[2]; Takahiro Kunitomo[3]; Mineo Kumazawa[3]

[1] MRI; [2] Seismological and Volcanological Department, JMA; [3] JNC Tono

A seismic ACROSS transmitter installed at Tono mine has been operated almost continuously to broadcast the particular type of FM signal for about 2 years since 2003. Interruptions due to some technical problems took place only several days in total period of time. The transmitted signals have been recorded at Hi-net and JMA network stations. The previous analysis of the data acquired before Feb.20, 2004 showed that P and S phases can be identified well to the source-receiver distance of ~50 km in the wave form traces obtained by Fourier Transform of the transfer function stacked for 20 days in frequency domain. The most notable point in that work is that the 6 components of transfer function tensor (instead of 3 component seismogram) can be acquired by means of routine operation of ACROSS.

The present contribution is the work improved in the following respects: (1) Transmission of a new type of FM signal with a modulation period of 50 s and a frequency range of modulation between 10.25 and 19.45 Hz (started on 2004/02/20). The extension of modulation period to 50 s from the previous 20 s has suppressed the aliased time-folding significantly at the source-receiver distances greater than several tens of km. (2) The procedure of deriving transfer function from the raw data was improved and also automated by using shell script. (3) Analysis of data for ~1 year since Feb., 2004 was made to provide the six time sequences of tensor transfer function together with the rigorously evaluated uncertainty levels.

The detailed procedures of data processing are the same in essence as that presented in the SSJ meeting in last autumn. The sequence of transfer functions thus obtained for one year is further stacked in a way of weighted moving average of 30 days to give a smoothed sequence of transfer functions with larger S/N under the expense of time resolution of temporal variation.

The transfer function sequence shows definitely the presence of temporal variation at around the P and S wave arrivals surely beyond the uncertainty level specified by S/N. Resolution both in time and natures (place & type) of the detected variation is improved by raising signal level through (1) the shorter distances between the (larger number of) receivers and the signal sources, and (2) the use of low frequency signal with smaller wave attenuation. These improvements will be made this year by a new transmitter, which will be deployed in Shizuoka Prefecture under the special research program of MRI.