Performance of tiltmeters as long period seismographs equipped at the Hi-net stations

Sadaki Hori[1]

[1] NIED

A tiltmeter is installed together with a high sensitivity seismograph at each station of the High Sensitivity Seismograph Network of Japan (Hi-net) operated by National Research Institute for Earth Science and Disaster Prevention (NIED) for the purpose of geophysical monitoring of the observational condition at each site. Two (NS and EW) component crustal tilt data from the sensor are digitized in a format of more than 24-bit at a sampling rate of 20 Hz and are continuously transmitted to the Hi-net data center at NIED in a WIN32 TCP/IP packet via the frame relay (FR) lines. Being different from the high sensitivity seismographs of the Hi-net or the strong motion accelerometers of the KiK-net, the tiltmeters are not always or perfectly maintained by the routine operation at NIED. However the continuous data obtained from these sensors are stored in the data storage server in the data center under the good condition to date and are available for any cooperative user who understands the policy of the data use for the tiltmeters.

In this study, we examined the availability of data obtained from these tiltmeters not as the crustal movement data but as the data of long period horizontal component seismographs. At first we compared the observed tilt data with the synthetic acceleration seismograms and with the broadband seismograms recorded at the nearest station of the Broadband Seismograph Network of Japan (F-net; including former Freesia stations) for teleseismic events with magnitudes greater than or equal to 6.5. Agreement in amplitudes and phases among them is reasonably good. We also examined low frequency seismic spectra (less than or equal to 2.0 mHz) of the Earth's free oscillations excited by teleseismic events with magnitudes greater than or equal to 7.0. Because the tilt data sometimes have glitches which might cause spectral offset, deglitching or elimination of spike-like noises is required before analysis. Comparison of the pre-processed tilt data, which are created after deglitching and removing linear trend and earth tide, with the spectra of the broadband records obtained from the F-net and with synthetic spectra shows that the tilt data are comparable to (or in some case superior to) the broadband seismogram data in a low frequency seismic signal range. Systematic and near real time monitoring of the data from the tiltmeters would bring more important geophysical knowledge to us.