Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

MIS036-P24 Room:Convention Hall Time:May 26 14:15-16:15

Strain seismograms of the 2011 off the Pacific coast of Tohoku Earthquake recorded by high-sampling rate borehole strain

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Coseismic strain steps and groundwater changes, associated with the 2011 off the Pacific coast of Tohoku Earthquake, were observed at observatories of Geological Survey of Japan, AIST in Tokai and Southwestern Japan (Itaba et al., and Kitagawa et al., in this session). Our borehole strain observation is performed at a high sampling rate of 20Hz or higher, so we could record strain seismograms caused by this gigantic thrust earthquake with a high signal-to-noise ratio. Here we introduce these strain seismograms recorded by our high-sampling rate borehole strain meter array.

Okubo et al. (2004) indicate that borehole strain seismograms show very similar waveforms with broadband seismograms at the range of a flat response of broadband seismometer. By comparing two-hours long section (14:00-16:00 on March 11, 2011) of strain seismograms with those of NIED F-net broadband seismometers, we found that they are similar each other at a period shorter than 100 sec.

We then performed a semblance analysis to determine a spatio-temporal distribution of long-period radiation energy using 5 GSJ borehole strain meters located at Kii peninsula, incorporating nearby 6 NIED F-net broadband seismometers. We focus on a period shorter than 100 sec, on the basis of the above consideration. The semblance analysis revealed that the seismic radiation migrates from north to south during the mainshock faulting, which is consistent with other studies. In addition, we detected seismic radiations caused by large-scale aftershocks at appropriate locations. It is noted that the spatio-temporal resolution is significantly improved if we combine the strain meters with F-net borehole seismometers.

Reference
Okubo, M., Y. Asai, H. Ishi, and H. Aoki, Earth Planets Space, vol. 57, pp. 303-308, 2004.

Acknowledgement. We used F-net broadband seismograms operated by NIED.

Keywords: strain seismogram, array analysis, semblance analysis