

Wide Observation Range of Borehole Stress meter and Strain meter ,and Comparison among Long Period Observation Instruments

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During the Tohoku Earthquake (M_w 9.0) on March 11, 2011, the long-period components recorded by most of the STS seismometers and velocity seismographs in Japan went off-scale and these instruments were not able to record large amplitudes. However, all of the borehole stress meters and strain meters developed for continuous observations at the Tono Research Institute of Earthquake Science (TRIES) were capable of recording the maximum amplitudes of the signals. In this study, we examined the observable ranges of the borehole stress and strain meters used for continuous observations. We found that the borehole stress meters have wide observable ranges (even for high-sensitivity components) and these instruments respond to the direct current (DC) components of frequency.

In addition, the borehole stress meters were able to observe stresses and strains in an earthquake with a wave amplitude several times as large as the Tohoku Earthquake without the signals going off-scale. Also it becomes clear that the stress and strain meters can record wave amplitude without the signals going off-scale even if the instruments are set up at coasts of Tohoku area near the hypocenter.

Next, we compared waveforms observed by STS1 seismometer, Guralp seismometer, servo velocity meter (Tokyo Sokusin CO.LTD) and our stress meter. It is found that three seismometers recorded similar wave forms. And after body wave arrival 4 instruments indicate similar wave forms even for stress meter.

Keywords: Borehole stressmeter, 2011Tohoku Eq.MW9.0 , Wide observation range, Comparison of records among long period observation instruments, Stress seismogram