# In situ Measurements of Tide Gauge Response and Corrections of Tsunami Waveforms from the 2007 Niigataken Chuetsu-oki Earthquake

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A large earthquake occurred off the coast of Niigata prefecture, Japan, at 10:13 a.m. (JST) 16th July, 2007. The Japan Meteorology Agency (JMA) assigned magnitude of 6.8 and named the Niigataken Chuetsu-oki Earthquake in 2007. About 1,300 houses were completely collapsed around the source and 15 people were killed. It accompanied by tsunami with maximum height (single amplitude) of about 1 m at a tide gauge station at Banjin, Kashiwazaki city, near the source region. In order to use tsunami waveform data observed at tide gauges for source studies, linear and nonlinear responses of ten well-type tide gauge stations on the Japan Sea coast of the central Japan were estimated by in situ measurements.

We poured water into the well or drained water from the well by using a pump to make artificial water level difference between the well and outer sea, then measured the recovery of water level in the well. At three tide gauge stations, Awashima, Iwafune, and Himekawa, the sea level of the outer sea around these stations is usually transmitted to the tide well simultaneously. However, at seven tide gauge stations, Nezugaseki, Ryotsu, Ogi, Teradomari, Banjin, Kujiranami, and Naoetsu, the sea level change of the outer sea is not always transmitted to the tide well simultaneously. At these stations, the recorded tsunami waveforms are not assured to follow the actual tsunami waveforms. Tsunami waveforms from the Niigataken Chuetsu-oki Earthquake in 2007 recorded at these stations were corrected by using the measured tide gauge responses. The corrected amplitudes of the first and second waves were larger than the original ones, and the corrected peaks are a few minutes earlier than the recorded ones at Banjin, Kujiranami, and Ogi. At Banjin, the correction was a significant; the corrected amplitudes of the first and second upward motion are +102 cm and +114 cm, respectively, while the original amplitudes are +95 cm and +88 cm. At other tide gauge stations, the difference between the observed and corrected tsunami waveforms was insignificant.

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