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Tsunami records due to the 2010 Chile Earthquake observed by GPS buoys established along the Pacific coast of Japan

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We have developed GPS buoy for detecting tsunami for over 12 years, considering that early detection of tsunami serves for mitigating tsunami disaster. The developed system is now operated at about 13km west of Cape Muroto, southwest Japan, and also has been implemented as a part of the Nationwide Ocean Wave information network for Ports and HArbourS (NOWPHAS) system of the Ministry of Land, Infrastructure, Transport and Tourism. Twelve GPS buoys are now operated in total around the Japanese coasts.
The Central Chile earthquake (Mw8.8) that occurred on 27th February 2010 generated significant tsunami and reached the Japanese coasts. We present the records of tsunamis that have been registered at these GPS buoys. The presentation tries to compare the records with numerically simulated records.
The record of experimental GPS buoy operated nearby Muroto is low-pass filtered with 120 seconds cut-off to segregate the long wave length tsunami from higher frequency wind waves. The effect of tide is also removed from the filtered record. The obtained record is visualized through internet facility (http://www.tsunamigps.com/gpsreal.php) . The tsunami due to the Central Chile earthquake arrived at the GPS buoy at around 3:22PM of 28th February (JST), which is nearly one day after the earthquake. The first peak of tsunami is about 12 centimeter above the mean sea surface height. The second peak arrives about one hour and 46 minutes later with about 20cm height, which is the highest peak among the series of the tsunami waves. The later phases of recognizable tsunami waves continued about one day after the first arrival of tsunami.
On the other hand, GPS buoys of NOWPHAS at eleven sites along the Pacific coast of the Japanese Islands also recorded tsunamis with 20 to 30 centimeters of maximum heights (http://www.mlit.go.jp/common/000109713.pdf). The record of tsunami is similarly processed as at Muroto.
Comparison of these tsunami records with numerically predicted tsunami suggest that the predicted tsunami arrives about 30 minutes earlier than the observed tsunami. If we manually shift the record on the time series, we find that longer term of about 1 hour period components fit very well whereas shorter term of 10-30 minutes of tsunami components shows significant phase shifts. Difference of arrival times of about 30 minutes is under investigation by considering various factors such as water depth model, spatial resolution of gridding, modeling errors, etc. Prediction of tsunami heights is fairly well, suggesting that the prediction of inundation height at the coast may be made with considerable precision.

Keywords: GPS, GPS buoy, tsunami, 2010 Chile earthquake