Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

HDS27-07 Room:A04 Time:May 27 11:15-11:30

A new technique for tsunami numerical simulation using tsunami observations in a source region as an input

TANIOKA, Yuichiro[1*]

[1]Hokkaido University

After the 2011 devastating Tohoku-oki tsunami, improvement of tsunami warning system is one of key issues in Japan. Japanese government is decided to install 125 ocean bottom pressure sensors and seismometers with a cable system along the Japan and Kurile trench. More than 50 sensors have already been installed off Boso to Sanriku. The rest of them will be installed by March, 2016. We should take an advantage using those data for real-time tsunami forecast.

Although the tsunami is generated by coseismic deformation due to a large earthquake, sensors on the top of tsunami source area do not observe a large vertical coseismic deformation. They observes a tsunami wave when it starts to propagate. It will be a network of pressure sensors on the top of tsunami source area in near future. In this paper, a new technique, which uses the observations at a network of pressure sensors on the tsunami source area as an input to compute the tsunami, is presented.

In this technique, a time derivative of observed heights at sensors are used as an input to compute the tsunami. Actual tsunami heights at the sensors on the source area is difficult to know immediately because the cosismic vertical deformation is unknown. However, we observe directly the time derivative of tsunami heights at the sensors.

Equations of finite difference schemes using linear long wave equations with a staggered grid system are transformed. So, at first, time derivatives of tsunami heights at each grid are used as inputs. Then we can numerically compute a tsunami using a traditional finite difference technique. First, the technique was tested using the synthetic tsunami waveforms computed using 5 minutes grid system off Tohoku. Time derivatives of tsunami heights in 36 X 36 grids are used as an input to compute tsunami instead of coseismic deformation or ocean surface deformation. The tsunami computed from this new technique is consistent with the tsunami computed from the previous tsunami numerical simulation using the vertical ocean surface deformation as an initial condition. This result indicates that tsunami forecast using this technique do not need any information about the source of the earthquake but the observed tsunami waveforms near the source area.

Keywords: Tsunami numerical simulation, Tsunami forecast, S-Net, tsunami ocean bottom cable