Quantitative Evaluations for Meteorite Impact Tsunami

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Tsunami induced by earthquakes, submarine landslides, volcanic eruption in submarine and coastal area and meteorological phenomena is one of the most devastating natural disasters. A meteorite impact into the oceans spawn large tsunami depending on the size and velocity of the meteorite and the sea depth at the location of the impact as well. However, we do not have a numerical model to reproduce both of meteorite impacts and tsunami propagations. We have started to develop a new numerical model to simulate tsunamis generated by the meteorite impact combining iSALE (Wünnemann et al., 2006) for simulating impact phenomena and JAGURS (Baba et al., 2017) for simulating tsunami. The iSALE is a multi-material and multi-rheology shock physics code for simulating impact phenomena. JAGURS is a parallelized tsunami simulation code to solve two-dimensional non-linear long-wave equation with Boussinesq terms for representing observed tsunami waveforms, tsunami height and inundation. We set sea-floor deformation, sea-surface disturbance and velocity of gravity wave which is the output from iSALE to the input of JAGURS. We then calculate tsunami height along the coastlines in any place using ASTER GDEM version 2 (Fujisada et al., 2012) and GEBCO_2014 Grid. ASTER GDEM has one arcsecond (about 30 m) spatial resolution and covers land between 56S and 60N latitude as a topographic data. GEBCO’s gridded bathymetric data has thirty arcseconds (about 1 km) spatial resolution for the worldwide.
We first investigate the tsunami generation using iSALE code for creating tsunami source model depending on the meteor size, the velocity of impact, the size of cavity, the width and depth of crater and tsunami propagation speed. We also investigate probabilistic hazard of meteorite impact tsunami using simplified cavity curves with developed JAGURS built-in. Finally, we construct a new numerical model of meteorite impact tsunami combining iSALE and JAGURS. Additionally, we consider the way of automatic detection of meteorite impact using the recode of the highly sensitive seismograph network in real-time.
We gratefully acknowledge the developers of iSALE, including Gareth Collins, Kai Wünnemann, Boris Ivanov, H. Jay Melosh and Dirk Elbeshausen. Data analysis and visualizations of iSALE were carried out on PC cluster and the computers at Center for Computational Astrophysics, National Astronomical Observatory of Japan. This work was partially supported by JSPS KAKENHI Grant Number JP18K04674.

Keywords: Meteorite, Impact, Tsunami

