[JJ] Evening Poster | H (Human Geosciences) | H-DS Disaster geosciences

[H-DS10]Tsunami and Tsunami Forecast

convener:Naotaka YAMAMOTO CHIKASADA(National Research Institute for Earth Science and Disaster Resilience), Kentaro Imai(Japan Agency for Marine-Earth Science and Technology), Hiroaki Tsushima(気象庁気象研究所)

Wed. May 23, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

This session discusses issues related to improving real-time and long-term prediction accuracy of tsunami from earthquakes, landslides, and volcanoes, which include such as a better understanding of tsunami dynamics, new real-time tsunami observing systems deployed in the open ocean and coastal waters, methodologies of more rapid and accurate prediction during tsunami emergencies, more extensive and accurate inundation maps, and long-term tsunami potential forecast.

[HDS10-P04]Volcanic Tsunami Earthquakes on the Kermadec Ridge, North of New Zealand

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Abnormal non-double-couple earthquakes are sometimes observed near volcanic or geothermal areas [*Shuler et al.*, 2013ab, JGR], some of which generate tsunamis larger than expected from its moderate seismic magnitude, M=5-6. The Torishima earthquakes on the Izu-Bonin Ridge are such examples, and have been attributed to volcanic activities at a submarine caldera edifice [e.g. *Fukao et al.*, 2018, JpGU; *Sandanbata et al.*, 2018, JpGU]. This type of events therefore can be regarded as "volcanic tsunami earthquakes."

On 8 Dec 2017 (UTC), another volcanic tsunami earthquake occurred near Curtis and Cheeseman Islands on the Kermadec Ridge, north of New Zealand (Fig). Tsunamis with the maximum amplitude of ~40 cm were recorded by tide gauges on Raoul Island and the North Island of New Zealand. In the past, another volcanic tsunami earthquake occurred on 17 Feb 2009, which also accompanied tsunami waves in tide gauge records. The two earthquakes are remarkably similar in seismic magnitudes (M~6.0), focal mechanisms (dominant NDC components), centroid location (distance of ~10 km) and observed tsunami waveforms (Fig).

In this study, we preliminary located its source region by numerical tsunami simulations, in order to investigate the geophysical condition of the source region. For initial conditions, Gaussian-shaped uplift models on sea surface were assumed at 9 locations in an area of ~100 km2 around the seismic epicenters. The linear Boussinesq equations including the Coriolis force were solved with the simulation code JAGURS [*Baba et al.*, 2015, PAGEOPH]. Bathymetry data are created from GEBCO_2014 [*Weatherall et al.*, 2015] and New Zealand Regional Bathymetry 2016 [*NIWA*, 2016].

The uplift model around Curtis and Cheeseman Islands yields synthetic waveforms similar to observed tsunami waveforms at the tide gauges, while other uplift models distant from the islands showed poor agreements. Therefore, the tsunami earthquakes probably occurred at the submarine volcano below the islands and accompanied large seafloor uplift.

To explore the geophysical condition of the source region, topographic structures and crustal deformations characteristic of caldera edifices has been found; (1) From bathymetric view, there exists a circular bathymetric depression around Curtis and Cheeseman Islands, which is a common structure in collapsed caldera edifice[s3] [e.g. *Cole et al.*, 2005, Ear. Sci. Rev]. (2) Large regional uplifts were reported on the islands during 1929 and 1964 [*Doyle et al.*, 1979, J. Roy. Soc. New Zealand], which may be explained as a "resurgence," or uplift associated mainly with subsurface magmatic pressure, which is often observed on seafloor at collapsed calderas [e.g. Lipman, 2000, Academic Press]. These might imply that Curtis and Cheeseman Islands are portions of a resurgent dome on a collapsed caldera on seafloor, and that the volcanic tsunami earthquakes are related to some activity at a submarine collapsed caldera, similar to the Torishima earthquakes.