# Tsunami simulation due to the Anak Krakatau Volcano activities on 22 December 2018 and analyses on the potential future observing systems

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A deadly tsunami occurred on 22 December 2018 claimed hundreds of lives, as well as injured and displaced thousands of people living across the Sunda Strait regions. The tsunami was associated with the Anak Krakatau volcano, which according to the Indonesian Centre for Volcanology and Geological Hazard Mitigation, had exhibited an increase in seismic activity followed by explosions and volcanic ash emissions prior to the event (https://magma.vsi.esdm.go.id/, last accessed 22 May 2019). However, the Anak Krakatau had never been known to generate significant tsunami. During the 2018 event, the edifice formed by the accumulation of pyroclastic material partly collapsed and slid down the water, triggering an impulsive wave.

We use numerical models to reveal the generation (NHWAVE, Ma et al., 2012) and propagation (FUNWAVE-TVD, Shi et al., 2012) of the tsunami caused by the southwest flank collapse of the Volcano. With the estimated volume of 0.24 $km^3$ and the relatively short duration (~3 to 5 min), the landslide of volcanic edifices triggers the tsunami of approximately 40 m in the vicinity. The tsunami, however, attenuates rapidly as it propagates away from the generation area resulting in <2 m wave heights at tide gauges around the Sunda Strait. The observed tsunami waveforms at these tide gauges are well reproduced by our model. The maximum tsunami energy is mainly distributed towards the west coast of Java leading to significant number of casualties compared to other areas.

To mitigate future tsunami disasters in the region, we assess the efficacy of potential tsunami observations using ship height positioning and oceanographic radars. We demonstrate that the relatively small tsunami amplitudes of the event are still considerably larger than the noise level of a typical observation by ship height positioning. Furthermore, applying a tsunami data assimilation (Maeda et al., 2015) to the tsunami velocity field detected by radars can produce accurate forecasts of coastal tsunami heights.

 