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Numerical Simulations of Landslide-Induced Tsunami Event of Guishan Island

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In the past, estimating tsunami characteristics induced by volcanic-related landslides often relied on approximations of total tsunami volume or using empirical formulas to estimate initial wave heights. In this study, we take the example of Guishan Island off the eastern coast of Taiwan and employ a numerical model, specifically the Discontinuous Bi-viscous Model (DBM), combined with a three-dimensional incompressible flow model (Splash3D). This approach aims to comprehensively depict the dynamic processes of rockslide-induced landslides and the ensuing behavior of landslide-induced tsunamis upon entering the sea.

Huang (2018) utilized multi-beam bathymetric data, sub-bottom profiler, sides can sonar, sparker seismic reflection data, and remotely operated vehicle (ROV) dive data
to investigate landslide features in the northern maritime region of Guishan Island.
The study proposed that the landslide deposits can be divided into three MTD (Mass Transport Deposit) units (MTD1, MTD2, and MTD3). The main volcanic debris avalanche deposits are identified as MTD3, and a model was proposed to explain the lateral collapse and subsequent submarine landslide events.

By leveraging the measurements of MTD3 from Huang (2018), this study was able to calibrate the parameters used in the DBM to reconstruct ancient tsunami events around Guishan Island. This not only facilitates a more in-depth understanding of the dynamic processes during landslide events but also offers an ideal basis for disaster prevention references and formulating strategies for potential tsunami hazards in the region in the future.

Primary authors: Mr HUANG, Yi-Xuan (National Central University); WU, Tso-Ren; Ms HUANG, Pi-Chun (National Central University); Prof. HSU, Shu-Kun (National Central University)

Presenters: Mr HUANG, Yi-Xuan (National Central University); WU, Tso-Ren

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