Meteotsunami observed in Japan following the Hunga Tonga eruption in 2022 investigated using a one-dimensional shallow-water model

*Shion Sekizawa[1], Tsubasa Kohyama[2]

1. Research Center for Advanced Science and Technology, University of Tokyo, 2. Department of Information Sciences, Ochanomizu University

On January 15, 2022, the volcano Hunga Tonga about 8000-km away from Japan explosively erupted. Following the eruption, tsunami-like sea-level fluctuations were observed in Japan, several hours earlier than expected based on the oceanic long-wave traveling from Tonga to Japan. These sea-level changes can be considered as meteotsunami forced by atmospheric pressure perturbation generated by the eruption. Indeed, surface pressure changes were also observed in Japan about 30-minutes earlier than the sea-level fluctuations. However, the mechanism of this meteotsunami is not yet fully understood. This study attempts to understand the nature of this meteotsunami as simply as possible by using an one-dimensional shallow-water model. The results show that the time and amplitude of the observed sea-level changes are consistent with the simulated sea-level changes forced by the atmospheric pressure perturbation. A set of experiments with different bathymetry profiles also reveals the importance of amplification due to the Proudman resonance over deep basins and shoaling effect over the continental slope, while extremely deep and narrow topography such as trenches has a minor contribution.

