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Tsunami Resonance Characterization and Response in Japan Due to Transpacific Sources

Yuchen Wang^{1,2}, **Natalia Zamora**^{2,3}, Marco Quiroz^{2,4}, Kenji Satake¹, and Rodrigo Cienfuegos^{2,4}

¹Earthquake Research Institute, The University of Tokyo, Tokyo, Japan

²Research Center for Integrated Natural Risk Management, CONICYT/FONDAP/1511007, Santiago, Chile

³CYCLO - Millennium Nucleus the seismic cycle along subduction zones, Valdivia, Chile

⁴Departamento de Ingeniería Hidráulica y Ambiental, Escuela de Ingeniería, Pontificia Universidad Católica de Chile, Santiago, Chile

Tsunami resonance in the bays/harbors and the continental shelf leads to amplification of the wave heights and extends the duration of wave activity. Therefore, for the early warning systems and emergency response, it is important to understand the resonance behavior and mechanism. Tsunami resonance is caused by reflection and interference of tsunami waves from the edge of a harbor or continental shelf. The resonance over continental shelf is controlled by the bathymetry characteristics, and the bay/harbor resonance is mostly due to the features of the coastline. However, quantifying the impact in Japan from transpacific sources has not been systematically conducted. In this study, we assess the tsunami resonance processes from transoceanic and local sources in the ports of Japan. We first analyze the characteristics of the resonance behavior based on past events and also generate a set of ruptures like the 1730 Valparaiso earthquake to forecast these effects in Japan for a future event along the central Chilean margin. With the synthetic earthquake sources, we are able to further characterize the area using a larger number of tsunami events.