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Submarine landslides in the west continental slope of the South China Sea and their tsunamigenic potential

Xiaoyi Pan[1], Linlin Li[2], Hong Phuong Nguyen[3,4,5], and Dawei Wang[2,6]
[1]Guangdong Provincial Key Laboratory of Geodynamics and Geohazards, School of Earth Sciences and Engineering, Sun Yat-Sen University, Guangzhou, 510275, China
[2]Southern Marine Science and Engineering Guangdong Laboratory (Zhuhai), zhuhai, 519082, China
[3]Institute of Geophysics, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet street, Cau Giay District, Hanoi, Vietnam
[4]Graduate University of Science and Technology, Vietnam Academy of Science and Technology
[5]IRD, Sorbonne Universités, UPMC Univ Paris 06, Unité Mixte Internationale de Modélisation Mathématique
[6]Institute of Deep-sea Science and Engineering, Chinese Academy of Sciences, Sanya, Hainan

The 109 meridian fault is located in the west of the South China Sea (SCS) connecting to the offshore Red River Shear Zone. The evolution processes of the 109 meridian fault: striking-uplifting-subsidence of adjacent basin led to a nearly 1000m sharp bathymetric difference in the offshore region of central Vietnam. Combined with the high sediment input from numerous montane rivers in the rising hinterland, the continental slope near central Vietnam possesses the ideal condition for developing submarine landslides. Seismic data indicates many submarine landslides were developed along the steep continental slope. In this study, we analyze the possible trigger mechanisms of these landslides based on the local geological background and sedimentary environment, and assess their tsunamigenic potential along the coast of the Southern Central Vietnam (SCV). We point out that the landslide failures in this region could be triggered by several mechanisms, including seismic activities in the offshore SCV, volcanic activities, gas seep on the slope and the relative sea-level changes. The seismic and volcanic activities are related directly to the late middle Miocene volcanism generated by the change from left- to right-lateral motion on the Red River Shear Zone, showing that tectonism play a significant role in the generation of submarine landslide in the western continental slope of the SCS. To estimate the impact of tsunami waves on SCV coastline, we use two numerical models—NHWAVE and FUNWAVE-TVD to model 4 representative landslides with volume ranging between 1-4km^3 and water depth of 300-1000m. The submarine landslides were treated as rigid slump and deformable slide corresponding to two different sedimentary environments. Our results show that the tsunami waves generated by rigid slump can reach up to 20m height in the landslide source area and arrive earlier to the coast of SCV than waves generated by deformable slide. Among these simulated scenarios, tsunami waves generated by the worst-case scenario arrive at the populated cities including Quy Nhơn (109.3°E,13.77°N), Tuy Hòa (109.37°E ,13.08°N) and Vung Ro Bay (109.43°E□12.86°N) in less than 25mins with maximum height of 5m. It is worth mentioning that the Vung Ro Bay will be affected by tsunami waves in all simulated scenarios. We quantify the

influence of landslide characteristics (volume, water depth and material) and highlight the local effect of coastal bathymetry on the tsunami generation and propagation which lead to different hazard level of SCV coast.