Analysis of Tsunami Wave Potential from Gela Nappe Fault Displacement in Southern Sicily, Italy based on Earthquake Focal Mechanism Since 1970

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The Gela basin, located in the subduction-collision zone between the African and European plates, has high seismicity. It represents the Pliocene-Quaternary foredeep of the Maghrebian fold and thrust belt. From 1970 to 2022, dozens of earthquakes occurred with epicenter depths between 5-50 km. Researchers have conducted studies on the possibility of tsunami generation, however, they only focused on the submarine landslide in the Gela Basin Eastern Slope (GEBS) by overlooking the potential of Gela Nappe fault (GNF) displacement. In fact, the GNF is an active fault part of the Maghrebian thrust belt which has been known as a source of earthquakes in southern Sicily. Therefore, this study will reveal the possible run-up height and propagation of tsunami waves along the southern coast of Sicily based on the GNF movement scenario. The methods involved include the simulation of tsunami wave generation and propagation onshore based on the shallow linear water equation and the application of the non-linear shallow water equation to predict tsunami inundation propagation onshore. The input parameters for tsunami formation by GNF displacement are derived from the focal mechanism of earthquakes between 1970 and 2022. The results of this assessment indicate that the movement of the GNF is expected to induce an Mw 7.58 earthquake that generates a tsunami with a maximum run-up height of up to 2.4 m and a wave arrival time of about 20 minutes from the generation of the first wave offshore. The maximum inundation distance of seawater from the southern Sicilian coastline is 163.25 m at Scoglitti. We infer that earthquakes generated by GNF displacement, ignoring the occurrence of submarine landslides after the earthquake, still have the possibility of triggering tsunamis even with insignificant run-up heights and inundation distances.