Tsunami propagation and flooding maps: An application for the Island of Lampedusa, Sicily Channel, Italy

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Abstract	a:2:{i:0;s:1999:"The Mediterranean coastlines are densely populated zones which host key socio-economic and commercial activities. For this reason, coastal areas are vulnerable sites in case of natural disasters as tsunamis that can strike coasts causing widespread damage to the population and facilities. For these reasons, several studies were performed over the last decade to study the impact of tsunami waves on the coasts. This research assessed the inundation risk due to a tsunami wave which can hit the southeastern coast of Lampedusa Island. The coastal low-lying geomorphological setting of the southeastern part of the island led to significant socio-economic growth, but Lampedusa falls within the Mediterranean Sea, a high-tsunamigenic area, therefore, the need to investigate tsunami propagation and coastal flooding of this sensitive site emerged. For this scope, a calculation chain model was implemented incorporating three steps: the DELFT-3D software for earthquake effects modelling, MIKE 21 Flow Model FM for nearshore propagation and HEC-RAS for onshore tsunami inundation modelling. The simulations illustrate the impact of three tsunami scenarios with different magnitudes (Mw 8.5, 7.5, 6.5) generated by hypothetical earthquakes in the Hellenic Arc. In the Mw 8.5 magnitude scenario, significant flooding occurs in the harbour region, with maximum water depths reaching approximately 3.5 m. The maximum water velocity in this scenario reaches about 15 m/s in the eastern portion, adjacent to cliffs impacted by the tsunami wave. In contrast, the Mw 7.5 magnitude scenario demonstrates reduced flooded areas, with the cliffs containing the waves and preventing further flooding. Water depths and velocities in the Mw 7.5 scenario remain minimal. Changes in both propagation and flooding are not significant between scenarios Mw 7.5 and Mw 6.5. This methodology can be employed for more accurate tsunami wave simulations not only in the Mediterranean region but also in various case studies.";i:1;s:477:"The graphical abstract summarizes the tsunami inundation risk assessment for Lampedusa Island. It highlights the study area (Hellenic Arc and Lampedusa), the high tsunamigenic risk of the Hellenic Arc and socio-economic importance of Lampedusa. The modelling methodology includes the adoption of DELFT-3D, MIKE 21 FM and HEC-RAS software. It shows the calculation chain and validation process, with inundation depth and velocity maps that are the outputs of the workflow. image";}
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