EGU24-18892, updated on 10 Nov 2024
https://doi.org/10.5194/egusphere-egu24-18892
EGU General Assembly 2024

Optimal positioning of two deep ocean bottom pressure gauges for tsunami wave detection in the western Ionian Sea

Fabrizio Romano[1], Stefano Lorito[1], Alessio Piatanesi[1], Manuela Volpe[1], Hafize Basak Bayraktar[1], Nikos Kalligeris[2], and Alessandro Amato[1]
[1]Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy (fabrizio.romano@ingv.it)
[2]Institute of Geodynamics, National Observatory of Athens, Athens, Greece

Tsunami warning and forecasting largely benefit from using offshore bottom pressure gauges (OBPG); these sensors, installed far offshore and typically close to causative sources, can measure the tsunami waves before reaching the coasts to maximize the lead time for alerting. Most of these sensors are installed around the Pacific Ring of Fire (e.g., DART buoys, S-NET), which hosts ~90% of the global seismicity and most significant tsunamigenic earthquakes. Even though less frequent than in the Pacific Ocean, tsunamigenic earthquakes can also occur in the Mediterranean Sea (e.g., the M8+ 365 AD in Crete or the M7 2020 Samos earthquakes), in which the Ionian Sea is characterized by relatively high tsunami hazard (Basili et al., 2021). However, offshore sensors are not present in the Mediterranean Sea and the Tsunami Service Providers operating in the basin (CAT-INGV for Italy, NOA for Greece, KOERI for Türkiye, and CENALT for France) can rely for the tsunami monitoring activities only on the coastal tide gauges networks. One of the objectives of the Italian MEET project (MONITORING EARTH'S EVOLUTION AND TECTONICS), in the framework of the National Recovery and Resilience Plan (PNRR) funded by EU, is the deployment of two OBPGs offshore the Italian coasts. To maximize the lead time gain and due to the high cost of the instruments (including both the maintenance and installation), a careful analysis of the optimal locations where to deploy these instruments is required.

Here, we present the results of the study carried out to identify the more suitable locations to deploy two OBPGs offshore the Ionian coasts of southern Italy. The method proposed considers an ensemble composed of more than 150k scenarios selected from the NEAMTHM18 source model; these scenarios are the ones capable of causing at least a 20 cm tsunami height in front of the Ionian coasts of Italy. For each scenario, we compute i) the tsunami detection times for each point within a target area (i.e., more than 200 possible locations) where the OBPG deployment is envisaged, and ii) the tsunami detection times at all tide-gauges on the coasts of the Ionian Sea. The optimal location for the two OBPGs is established by minimizing a cost function which is a summation of the minimum travel times, for each potential tsunami source, to all available existing coastal gauges and all the potential pairs of OBPGs, weighted by the rate of occurrence of each individual source according to NEAMTHM18.

Basili et al. (2021). The Making of the NEAM Tsunami Hazard Model 2018 (NEAMTHM18). Front. Earth Sci. 8:616594, doi: 10.3389/feart.2020.616594