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Results for the calibration of the Tsunami Early Detection Algorithm TEDA for the tide-gauge stations of Catania and Tremestieri, Sicily

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The calibration of the Tsunami Early Detection Algorithm TEDA (Bressan and Tinti, 2011) for a given tide-gauge station has the goal to maximize the algorithm efficiency by considering the site-specific characteristics of the background signal and at the same time the features of the potential tsunamis. Typical calibration analysis data are a sufficiently long series of background sea-level data and a sufficient number of tsunami signals, that can be either tsunami records or synthetic tsunami time histories from numerical simulations. Within the Italian national project Ritmare (Ricerca ITaliana per il MARE), the new tide gauge stations of Tremestieri and Catania, installed in 2008 and 2009 respectively in the frame of the previous project TSUNET, have been calibrated by making use of seven synthetic tsunami signals derived from a local hazard study based on tsunami worst-case scenarios (Tonini et al., 2011), due to the lack of real tsunami records. The synthetic tsunami signals have been added to the background sea-level series in four different sea conditions, for a total of 28 tsunami cases.
The test of TEDA allows one to select the most appropriate parameter configuration for the algorithm, which is the one that detects most tsunami events in the shortest time. For both stations, the best configuration detects all events in all sea conditions in less than 10 min from the tsunami arrival time. Further, the detection times are not very affected by the different sea-state conditions.
In addition, the study of the background has shown relevant features. An important result, both for Catania and Tremestieri, is the coherence and the statistical stability of the background over years, with clear year cyclicity and seasonal intra-year variability. If this were confirmed also for other sites, which is likely, this would entail that calibrating TEDA with background data shorter than one year would produce biased results.
The detailed analysis for the calibration of Catania and Tremestieri allows us to conclude that TEDA seems a useful tool for tsunami detection.

Bressan, L. and Tinti, S. (2011), Structure and performance of a real-time algorithm to detect tsunami or tsunami-like alert conditions based on sea-level records analysis, Nat. Hazards Earth Syst. Sci., 11, 1499-1521, doi:10.5194/nhess-11-1499-2011.
Tonini, R., Armigliato, A., Pagnoni, G., Zaniboni, F., and Tinti, S. (2011), Tsunami hazard for the city of Catania, eastern Sicily, Italy, assessed by means of Worst-case Credible Tsunami Scenario Analysis (WCTSA), Nat. Hazards Earth Syst. Sci., 11, 1217-1232, doi:10.5194/nhess-11-1217-2011.