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The role of a decision support system (DSS) in tsunami early warning for near-field sources

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One of the key challenges in the tsunami early warning (TEW) research field consists in reducing drastically the time needed to detect a tsunami and to send proper alerts to all the countries and/or the communities that are close to the tsunami sources. The persistent lack of a proper and effective answer to this challenge has been demonstrated by the last three major tsunamis occurred in the world, namely the events of 29th September 2009 in the Samoa archipelago, of 27th February 2010 in Chile and of 25th October 2010 in the Mentawai islands. On 29th September 2009 the Pacific Tsunami Warning System issued an alert more or less at the same time when the tsunami waves were already attacking different islands, killing in overall nearly 200 people. In Chile, the national TEW system did not detect the tsunami generated by the 27th February 2010 earthquake and did not launch an alert. But a huge tsunami was generated, propagating through the entire Pacific, but producing the largest damage and killing people along the Chilean coastal regions comprised between Valparaiso in the North and the Golfo Arauco to the South. Finally, in the case of the Mentawai 2010 tsunami a warning was timely issued by the Indonesian TEW system, but did not reach properly all the Mentawai islands population on the coast under risk, and about 340 people were killed by the tsunami waves. These examples, as many others in the recent past, demonstrate that a TEW system has first of all to be able to handle near-shore tsunami sources, which yields that an essential requirement of a TEW is that the response time of the system must be confined within a few minutes (less than 5 minutes).
Although many state that the only possibility for the population at risk in these cases is to react to natural warning (e.g. earthquake shaking), since no TEWs can be effective in such a short time span, our believe is instead that TEWs that are based on appropriate monitoring system, appropriate Decision Support System (DSS) component and appropriate alert dissemination chain are a needed and unavoidable means and that building up such systems is a trend to pursue in the near future, taking advantage of the huge developments in information and communication technology. In this work we analyse the role of the DSS, by viewing and reviewing the most critical items that can be a reason for its success or failure, with special focus on the European tsunami sources. We move from a number of tsunami scenarios for the southern Europe seas to illustrate the different parts that form the TEW architecture, comprising the scenario definition for both earthquake- and landslide-generated tsunamis, the integration of the available real-time sensor networks and data, the definition of the roles of national TEW systems and of the local civil protections agencies, the identification of the end users. This work has been performed in the framework of the ongoing FP7 EU project TRIDEC.