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Database of tsunami scenario simulations for Western Iberia: a tool for the TRIDEC Project Decision Support System for tsunami early warning

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TRIDEC is a EU-FP7 Project whose main goal is, in general terms, to develop suitable strategies for the management of crises possibly arising in the Earth management field. The general paradigms adopted by TRIDEC to develop those strategies include intelligent information management, the capability of managing dynamically increasing volumes and dimensionality of information in complex events, and collaborative decision making in systems that are typically very loosely coupled. The two areas where TRIDEC applies and tests its strategies are tsunami early warning and industrial subsurface development. In the field of tsunami early warning, TRIDEC aims at developing a Decision Support System (DSS) that integrates 1) a set of seismic, geodetic and marine sensors devoted to the detection and characterisation of possible tsunamigenic sources and to monitoring the time and space evolution of the generated tsunami, 2) large-volume databases of pre-computed numerical tsunami scenarios, 3) a proper overall system architecture. Two test areas are dealt with in TRIDEC: the western Iberian margin and the eastern Mediterranean. In this study, we focus on the western Iberian margin with special emphasis on the Portuguese coasts. The strategy adopted in TRIDEC plans to populate two different databases, called "Virtual Scenario Database" (VSDB) and "Matching Scenario Database" (MSDB), both of which deal only with earthquake-generated tsunamis. In the VSDB we simulate numerically few large-magnitude events generated by the major known tectonic structures in the study area. Heterogeneous slip distributions on the earthquake faults are introduced to simulate events as "realistically" as possible. The members of the VSDB represent the unknowns that the TRIDEC platform must be able to recognise and match during the early crisis management phase. On the other hand, the MSDB contains a very large number (order of thousands) of tsunami simulations performed starting from many different simple earthquake sources of different magnitudes and located in the "vicinity" of the virtual scenario earthquake. In the DSS perspective, the members of the MSDB have to be suitably combined based on the information coming from the sensor networks, and the results are used during the crisis evolution phase to forecast the degree of exposition of different coastal areas. We provide examples from both databases whose members are computed by means of the in-house software called UBO-TSUFD, implementing the non-linear shallow-water equations and solving them over a set of nested grids that guarantee a suitable spatial resolution (few tens of meters) in specific, suitably chosen, coastal areas.