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Modeling of Marine Natural Hazards in the Lesser Antilles

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The Caribbean Sea countries are often affected by various marine natural hazards: hurricanes and cyclones, tsunamis and flooding. The historical data of marine natural hazards for the Lesser Antilles and specially, for Guadeloupe are presented briefly. Numerical simulation of several historical tsunamis in the Caribbean Sea (1755 Lisbon trans-Atlantic tsunami, 1867 Virgin Island earthquake tsunami, 2003 Montserrat volcano tsunami) are performed within the framework of the nonlinear-shallow theory. Numerical results demonstrate the importance of the real bathymetry variability with respect to the direction of propagation of tsunami wave and its characteristics. The prognostic tsunami wave height distribution along the Caribbean Coast is computed using various forms of seismic and hydrodynamics sources. These results are used to estimate the far-field potential for tsunami hazards at coastal locations in the Caribbean Sea. The nonlinear shallow-water theory is also applied to model storm surges induced by tropical cyclones, in particular, cyclones “Lilli” in 2002 and “Dean” in 2007. Obtained results are compared with observed data. The numerical models have been tested against known analytical solutions of the nonlinear shallow-water wave equations. Obtained results are described in details in [1-7].

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