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Global Probabilistic Tsunami Risk Modelling – Methods and first results

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Tsunamis figure prominently amongst the most devastating natural disasters in human history. The last decade denotes a period when several of these events affected the coasts of the Pacific and Indian Ocean. Many efforts were made to develop tsunami risk modelling methodologies. However, both the complexity of the problem and the limited amount of data are major obstacles. Most of these problems have been so-far resolved mostly in regional tsunami hazard and risk studies. Here, those methods have been applied within a global tsunami risk modelling framework, for earthquake-triggered tsunamis, called TsuPy.
A global assessment of plate motion and earthquake activity was done in conjunction with a parametric subduction zone assessment to constrain potential maximum magnitudes and earthquake return periods. Rupture processes are represented by the stochastic simulation of heterogeneous slip distributions. Wave propagation is covered by a GPU-powered finite difference solution of the non-linear shallow water wave equations. The simulation of inundation is undertaken both numerically and statistically. Finally, losses are computed using empirical vulnerability functions resolved from the recent decade of tsunamis. The framework was built for global application. Thus, all underlying data was resolved on a global scale. First results for the Pacific and selected scenarios are discussed.