



## Tailoring tsunami Digital-Twins for future Destination Earth integration

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Probabilistic Tsunami Forecasting (PTF) combines early estimates of earthquake parameters with large ensembles of urgent shallow water tsunami propagation simulations using the GPU based Tsunami-HySEA model (Selva et al. 2021, Nature Commun.). The present version of the PTF is initialised by the earthquake information, but not updated further with new data. In the recently started Horizon Europe project DT-GEO, this PTF is presently being upgraded to a Digital Twin. The first and essential upgrade to realise the Digital Twin is continuous data assimilation enabling a close to real time synthesis of data products and a set of numerical models that allow an updating of the model forecast as new data are continuously assimilated into the model. In DT-GEO, an extended set of data sources, including improved earthquake solutions, sea level tsunami data, and GNSS, will be integrated. A second objective of the PTF is to implement a modularised Digital Twin Component that allows for the inclusion of improved wave and source physics through dispersion, non-hydrostatic tsunami generation, inundation, improved earthquake physics, and cascading earthquake triggered landslide tsunamis. The model will be tested at site demonstrators, in the Mediterranean Sea for eastern Sicily and Samos, and in the Pacific Ocean for Chile and eastern Japan. The presentation will explain how the PTF as it works today, followed by an outline of the design of the components in the Digital Twin, as well as briefly describing initial improvements and plans for further development, including potential integration into Destination Earth. This work is supported by the European Union's Horizon Europe Research and Innovation Program under grant agreement No 101058129 (DT-GEO, <https://dtgeo.eu/>).