



## **Tsunami-HySEA: A GPU based model for the Italian candidate Tsunami Service Provider**

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Tsunami Service Providers (TSP), providing tsunami warnings in the framework of the systems coordinated by IOC/UNESCO worldwide, and other national tsunami warning centers, are striving to complement, or replace, decision matrices and pre-calculated tsunami scenario databases with FTRT (Faster Than Real Time) tsunami simulations. The aim is to increase the accuracy of tsunami forecast by assimilating the largest possible amount of data in quasi real time, and performing simulations in a few minutes wall-clock time, possibly including the coastal inundation stage. This strategy of direct real time computation, that could seem unfeasible a decade ago, it is now foreseeable thanks to the astonishingly recent increase in the computational power and bandwidth evolution of modern GPUs.

The INGV in collaboration with the EDANYA Group (University of Málaga) are developing and implementing a FTRT Tsunami Simulation approach for the Italian candidate TSP, namely the Centro Allerta Tsunami (CAT), which is in pre-operational stage starting from 1 October 2014, in the 24/7 seismic monitoring room at INGV. The mandate of CAT is to provide warnings for potential tsunamis within the Mediterranean basin to its subscribers, in the framework of NEAMTWS ([http://www.ioc-tsunami.org/index.php?option=com\\_content&view=article&id=70:neamtws-home&catid=9&Itemid=14&lang=es](http://www.ioc-tsunami.org/index.php?option=com_content&view=article&id=70:neamtws-home&catid=9&Itemid=14&lang=es)). CAT also performs global monitoring, for continuous testing, training, and validation purposes.

The tsunami-HySEA model, developed by EDANYA Group, implements in the same code the three phases of an earthquake generated tsunami: generation, propagation and coastal inundation. At the same time it is implemented in nested meshes with different resolution and multi-GPU environment, which allows much faster than real time simulations.

The challenge set by the Italian TSP for warning in the NEAMTWS region is twofold: to be able to reasonably constrain the earthquake source in the absence of deep sea tsunami sensors, and to be able to compute the generation, propagation and a first inundation stage of a seismically generated in the Mediterranean Sea, within a few minutes after the earthquake origin time. The approach will then be extensively tested with past tsunamis worldwide, as well as with any future event in the framework of CAT global monitoring training mode.