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PRACE resources to study extreme natural events: the SCENE project

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Forecasting severe storms and floods is one of the main challenges of 21th century. Floods are the most dangerous meteorological hazard in the Mediterranean basins due to both the number of people affected and to the relatively high frequency by which human activities and goods suffer damages and losses. The numerical simulations of extreme events which happen over small basins as the Mediterranean ones are need a very fine-resolution in space and time and as a consequence considerable memory and computational power are required. Since the resources provided by the PRACE project represent the solution for satisfying such requirements, the Super Computing of Extreme Natural Events (SCENE) project has been proposed.

SCENE aims to provide an advanced understanding of the intrinsic predictability of severe precipitation processes and the associated predictive ability of high-resolution meteorological models with a special focus on flash flood-producing storms in regions of complex orography (e.g. Mediterranean area) through the assessment of the role of both the convective and microphysical processes. The meteorological model considered in the project is the Weather Research and Forecasting (WRF) model, a state of the art mesoscale numerical weather prediction system designed to serve both operational forecasting and atmospheric research needs. Thus, among all the parameterizations available in the WRF model, the WRF Single-Moment 6-Class Scheme and the Thompson microphysics scheme will be adopted for the numerical simulations in combination with three different approaches for the treatment of the convective processes, that is the use of explicit method, Betts-Miller-Janjic Scheme and Kain-Fritsch.

As for flash-flood producing storms, the project considers the recent sequence of extreme events occurred in the north-western portion of the Mediterranean sea; some of these events are the so-called critical cases of the DRIHM project (www.drihm.eu), i.e. selected severe weather events considered for the high-end simulations and the completion of the flood forecasting chain.

A further aim of the SCENE project is a performance analysis of the WRF model. We will arrange a set of test to study the scalability of the model, the impact of nesting domains, to evaluate I/O operation issues, and to compare performance using shared and distributed memory architectures when it is possible. The aim is to obtain these information by varying physical parameterizations to classify HPC resources on the base of such benchmarking information.

The SCENE project has been founded and it is now starting.