



Impact of high-resolution SST data on fully-coupled hydro-meteorological forecasts in small Mediterranean catchments

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Sea surface temperatures (SSTs) play a major role in extreme precipitation events in the Mediterranean region, because sea–atmosphere exchange mechanisms interact with complex coastal orography, leading locally to meteorological processes whose complexity is often interpreted not correctly by models.

In the present study, impact of improved SST representation on integrated hydro-meteorological forecasts in Calabria Region (Southern Italy, Central Mediterranean) is assessed. Specifically, two severe hydro-meteorological events affecting the region in the second half of the year 2015 are analyzed, the first focused on a relatively small area and with short and very intense precipitation, the second more persistent and affecting a wider area.

For the analysis of both events, the fully two-way dynamically coupled atmosphere-hydrology modeling system WRF-Hydro is used with a 2 km-resolution for the innermost domain. Three reference forecasts are achieved with initial and lateral atmospheric boundary conditions given by both the 0.5° and the recently available 0.25° output resolution GFS grid dataset, and the 16 km resolution ECMWF's Integrated Forecasting System (IFS). Then, in different steps, both initial and lower boundary SST data are replaced with high-resolution datasets (such as the Medspiration L4 Ultra-High Resolution SSTfnd from the Medspiration Project by IFREMER/CERSAT). Precipitation estimates are compared with both ground-based data and observations from a National Civil Protection Department single-polarization Doppler radar. Impacts on discharges of the small rivers and creeks affected by the extreme precipitation events are also assessed.

Results highlight that correct representation of SST fields is of paramount importance for hydro-meteorological forecasts in coastal areas of the Mediterranean and suggest that improved space–time monitoring of SST conditions can positively affect weather forecasting in these regions.