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Multi-model evaluation of the benefit provided by the new ERA5 reanalysis in reproducing high impact weather events in a Mediterranean domain

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ECMWF has recently released the new climate reanalysis product ERA5, improving considerably the previous ERA-INTERIM reanalysis both in terms of spatial resolution (31 km globally and 137 levels up to 0.01 hPa vs. 79 km globally and 60 levels to 0.1 hPa) and output frequency (hourly analysis fields vs. 6-hourly analysis fields).
This study aims at highlighting the added value given by the new ERA5 reanalysis in reproducing high impact weather events in southern Italy. Specifically, a highly convective summer event (11-12 August 2015), a stratified autumn event (31 October 2015 - 2 November 2015), and a fairly localized autumn event (25-26 November 2016) are analysed. For each of these events, ERA5 and, for comparison, ERA-INTERIM reanalyses are used to provide initial and boundary conditions to two different non-hydrostatic numerical models, namely WRF and MOLOCH. Furthermore, since there is a strong dependence of all the analysed events to air masses interactions with sea surface, together with the effects of the improved GCM resolution also the impact of higher SST resolution is assessed. To this aim, in addition to the SST fields provided by the reanalyses, the Medspiration L4 Ultra-High Resolution SSTfnd from the Medspiration Project by IFREMER/CERSAT (with 24 hour time resolution and 2.2 km spatial resolution) is used.
The comparison is mainly focussed on precipitation, using observations from both ground-based monitoring networks and radar estimates. Results show that ERA5 higher resolution allows model initializations to take in account orographic effects better, even though some specific features (e.g., some diffluence pattern in the analysis, apparently due to explicit convection in the summer event) need to be further analysed. Overall, ERA5 initial and boundary conditions produce more water vapour and rainfall, providing improved results encouraging for integrated atmospheric-hydrological reanalyses.