

Impact of the variation of model domain size and native resolution on the applicability of the CRA analysis on QPF verification: A MesoVICT study

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Spatial verification methods could provide a more detailed evaluation of the forecast quality, overcoming some of the shortcomings of traditional verification methods and having the appreciable appeal of supporting the forecaster's judgement in evaluating the forecast errors. With the aim to better understand how forecast performance is addressed by these methods, especially when considering convection-permitting models, the "MesoVICT–Mesoscale Verification Inter-Comparison over Complex Terrain" was promoted in 2014. Meteorologically complex events observed during the WWRP MAP D-PHASE and COPS projects have been considered as test cases.

As contribution to MesoVICT, ISPRA has evaluated the feature-based verification method known as contiguous rain area (CRA) analysis. The CRA approach is based on the pattern match of two contiguous precipitation features identified in the forecast and observation fields. The best match is then obtained by moving along the longitudinal and latitudinal directions the forecast feature over the observed one, until the selected pattern-matching criterion is met. On the basis of the best match found, it is then possible to evaluate the sources of the forecast error.

All the six MesoVICT cases have been considered, with a major focus on the "core event" on 20–22/6/2007 and the event on 26–28/9/2007, plus one additional high impact event occurred during the MAP D-PHASE Operations Period (22–24/11/2007).

The work benefits from the availability of deterministic precipitations from the Swiss model COSMO-2 and the Canadian high-resolution model GEM-LAM, with a model domain covering the Alpine area, the ISPRA hydrostatic BOLAM model in four different configurations, with horizontal grid size from 0.07° to 0.1° and model domain extending from only the Alpine area to the Central Europe, and by an ad-hoc ISPRA configuration of the convection-permitting MOLOCH model, with grid size of 0.0225° and domain centred over the MesoVICT test-bed area. The 8-km fields obtained by using the Vienna Enhanced Resolution analysis (VERA) scheme and the 10-km fields obtained by using a two-pass Barnes scheme are both used for forecast verification.

Starting from the results of previous studies, this work investigates how the variation of the model domain size and native resolution can affect the CRA application, by mainly considering those events where the rainfall feature was not completely observed (e.g., over the sea) or forecast (e.g., the forecast feature was partly predicted outside the verification domain). The aim is to provide caveats about the effective usage of the CRA analysis for forecast verification and model inter-comparison and to demonstrate benefits of applying this approach over complex verification domains, providing that additional quality-check tests or more complex matching criteria are set to detect suspicious results and localize realistic pattern matches. How the CRA approach works with convection-permitting NWP models is also assessed.