2.2 IMPACT OF MULTIPLE RADAR REFLECTIVITY DATA ASSIMILATION ON THE NUMERICAL SIMULATION OF A FLASH FLOOD EVENT DURING THE HyMeX CAMPAIGN

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An analysis to assess the impact of multiple radar reflectivity data with a three-dimensional variational (3D-Var) assimilation system on a heavy precipitation event is presented. The main goal is to build a regionally tuned numerical prediction model and a decision-support system for environmental civil protection services and demonstrate its validity in the central Italian regions. Moreover, an investigation on which type of observations, conventional and not (or a combination of them), is more effective in improving the accuracy of the forecasted rainfall is also carried out. In that respect, during the first special observation period (SOP1) of HyMeX (Hydrological cycle in the Mediterranean Experiment) campaign several intensive observing periods (IOPs) were launched and nine of which occurred in Italy. Among them, IOP4 is chosen for this study because of its low predictability regarding the exact location and amount of precipitation. This event hit central Italy on 14 September 2012 producing heavy precipitation and causing several cases of damage to buildings, infrastructure, and roads. Reflectivity data taken from three C-band Doppler radars running operationally during the event are assimilated using the 3D-Var technique to improve high-resolution initial conditions. In order to evaluate the impact of the assimilation procedure at different horizontal resolutions and to assess the impact of assimilating reflectivity data from multiple radars, several experiments using the Weather Research and Forecasting (WRF) model are performed. Finally, traditional verification scores such as accuracy, equitable threat score, false alarm ratio, and frequency bias interpreted by analysing their uncertainty through bootstrap confidence intervals (CIs) are used to objectively compare the experiments, using rain gauge data as a benchmark.