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Development of a Rapid Update Cycle system using radar and conventional data for short-term forecasting. Preliminary results on a severe weather event

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The Italian territory have numerous areas particularly exposed to hydrogeological and hydraulic risk, a problem of great social impact, both for the number of victims and for the huge damages produced. The complex orography and the presence of small river basins, which quickly respond to the precipitations, make the territory particularly vulnerable to intense and persistent phenomena. In the last decade the reliability of short-term forecasts has greatly improved and a further step has been made in estimating the initial conditions using data assimilation techniques that allow both the use of conventional and non-conventional observations, such as radar and satellite data. In order to improve the estimation of short-term quantitative precipitation forecasting (SQPF) an iterative assimilation system called Rapid Update Cycle (RUC) was implemented using the 3D-Var variational technique. The algorithm uses a very high frequency assimilation cycle of in-situ surface and radiosonde observations in combination with radar reflectivity data on a high resolution domain (3km). The analysed event is characterized by the intrusion of colder air into the Mediterranean basin that produced a minimum depression over the Ligurian Sea. The associated cold front generates intense rainfall and high instability over Liguria and Tuscany regions in the first part of October 14, 2012. Then, it moves towards central and north-eastern Italy during the afternoon and evening, causing precipitation peaks higher than 160 mm/24h. The event was analysed using the Weather Research and Forecasting (WRF) numerical model. Three different experiments (NODA, SYN and CNTRL) have been performed in order to evaluate the impact of RUC on different types of observed data. In addition, a statistical analysis has been carried out using different verification techniques from the Model Evaluation Tools (MET).