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Impacts of KITCube extra observations on the prediction of the HyMeX IOP13 severe weather event

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The Special Observation Period 1 (SOP1) was a campaign carried out during the autumn of 2012 coordinated by the Hydrological cycle in the Mediterranean Experiment (HyMeX) scientific community, which enabled an unprecedented monitoring of high-impact weather events in the Mediterranean Sea. Its main objective was to investigate heavy precipitation and flash flooding in the Mediterranean, with special emphasis on the triggering mechanism and the environmental preconditioning of convection. One of the most active platforms during the campaign was the KITCube of the Karlsruhe Institute of Technology, a mobile platform equipped with remote sensors (radar and lidar) and in-situ instruments. During SOP1, the KITCube operated on the island of Corsica, providing direct observational data on severe weather occurring in the northeastern region of the Western Mediterranean. Among 20 intense observation periods studied during the campaign, IOP 13 occurred between 15-16 October 2012 and was characterized by heavy rains over northern and central Italy. Storms initiated over and offshore the French coastlands, progressing eastwards across the Gulf of Genoa. The most affected areas were northeastern Italy (with stations reaching 160mm/24h), Liguria-Tuscany (120mm/24h) and central Italy (600mm/24h). The prediction of these maritime convection-driven cases is highly challenging for high-resolution numerical models and operational prediction offices. Ensemble data assimilation methods provide a rigorous mathematical framework that allows combining observational and model information in a forecasting system, producing space-time information transferences that result in better initialization and integration of the forecasting systems. We test the performance of an Ensemble Kalman Filter (EnKF) system for the prediction of the IOP13 event and particularly, we assess the impact of assimilating the special observations taken by the KITCube on the forecast of socially sensible parameters such as probability of severe and accumulated precipitation. We analyze the value of assimilating extra observations in addition to the operational ones, and attribute the forecast quality improvements to each observation type, proving the impact and value of the extra observations taken by the KITCube for this severe event.