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Guidance for targeting campaigns of Mediterranean High-impact weather

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Sensitivity analyses to precursing states and processes involved in the evolution of a system open the door for establishing optimized observational plans. The ensemble sensitivity technique has been recently suggested as a straightforward and inexpensive approach for observation targeting guidance in a real-time forecasting environment. For the sake of efficiency, optimized observing strategies should take into special account high impact weather episodes due to the larger potential benefits of derived forecast improvements. Hence, this study tackles the application of ensemble sensitivity analysis to Mediterranean high impact weather events. The DTS-MEDEX-2009 targeting campaign provides a unique framework to test the performance of ensemble sensitivity products for observational targeting guidance in the Mediterranean. To this end, we apply the ensemble sensitivity technique to DTS-MEDEX-2009 targeting cases using the ECMWF EPS since it provides an adequate set of perturbed initial conditions and forecast fields.

The derived ensemble sensitivity results contribute to the catalog of sensitivities of Mediterranean High-impact weather events built up during Autumn of 2009. In fact, during the DTS-MEDEX-2009 operations, four different sensitivity analysis techniques were carried out to provide targeting guidance: Singular Vectors (SV) from the ECMWF, Ensemble Transform Kalman Filter (ETKF) and Kalman Filter Sensitivity (KFS) from Météo France, and MM5 adjoint sensitivities from the University of Balearic Islands. However, the usefulness of the derived ensemble sensitivity results for future targeting strategies in the Mediterranean has not been evaluated yet and thus it must be certified by means of a quantitative verification process including all considered sensitivity fields. For this purpose, we test the ability of each method in identifying the area where an additional observation in the initial conditions leads to a greater impact on the forecast of these high-impact weather events. Specifically, the WRF-DA system is used to assimilate a synthetic sounding over the region highlighted by each available sensitivity field and its impact on the prediction is evaluated. The results of this verification are presented in detail and further discussed.