Are current sensitivity products sufficiently informative in targeting campaigns? A DTS-MEDEX-2009 case study.

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Within the second phase of MEDEX, the DTS-MEDEX-2009 field experiment was carried out during the autumn of 2009 and the adaptive observation concept was applied to the operational radiosounding network and to commercial aircraft data (AMDAR). This targeting campaign focused on improving the forecast skill of HIW events linked to Mediterranean cyclones and used the Data Targeting System (DTS) from the European Centre for Medium-Range Weather Forecasts (ECMWF) to manage the main issues in the targeting observation process. However, the most crucial concern in any targeting campaign is to guide the decision about where additional observations would most benefit the quality of the forecast of each potential adverse event. To this end, five 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 ensemble and adjoint sensitivities from the University of Balearic Islands. Despite not all sensitivity computations were available to the forecasters/scientific teams in real-time, all these sensitivity computations were devised to identify the best location for additional observations. Therefore one immediate question arises: which sensitivity method best advise decision makers on where to deploy an extra observation? This talk attempts to shed light on this question and other such observational and sensitivity concerns by analyzing the guidance provided by these five sensitivity analyses for one case study of the DTS-MEDEX-2009 campaign.

Since radiosonde and AMDAR profiles were the only observational means available during the DTS-MEDEX targeting campaign, this study tests the ability of each sensitivity product in identifying the region where a plausible sounding leads to a greater impact on the forecast of a potential high impact cyclone over Southern Italy on December 5th 2009. All targetable radio-soundings sites are also tested and a severe weather meteorologist is used as a confronting reference. The verification testbed comprehends single sounding experiments and multiple sounding strategies by using the WRF Data Assimilation system. Single sounding tests reveal that sensitivity products fail to recognize the best location for a primary observation since most of the soundings added over operational radio-sounding stations have a larger influence on the intense cyclone forecast than the areas indicated by the objective sensitivity calculation methods. Additionally, after evaluating available sensitivity information, human-based decisions are proved to be non optimal, neither in single nor in multiple sounding strategies. These results evidence the need for an improvement of the tools aimed at providing a more robust objective guidance to operations centers during targeting campaigns.