Insight into the meaning of North Atlantic TReC 2003 Hessian singular vectors based sensitive areas.

A. Doerenbecher (1), N. Fourrié (2), M. Leutbecher (3), S. Majumdar (4), G.N. Petersen (5)

(1) Météo-France/CNRM, Toulouse, France, (2) CNRS/GAME (CNRM), Toulouse, France, (3) ECMWF, Reading, UK, (4) University of Miami, USA, (5) Dept of Meteorology, University of Reading, UK, (alex.doerenbecher@meteo.fr)

Real-time observation targeting was implemented during the NA-TReC 2003 field campaign. Extra observations (in situ and remotely sensed) were deployed in sensitive regions with the aim of improving forecast skill.

Flow-dependent sensitive areas were computed daily, up to 66 hours in advance, with both singular vectors techniques (using various models and initial metrics) at ECMWF, NRL and Meteo-France and with the Ensemble Transform Kalman Filter at the Met Office and NCEP.

First impact studies yielded mixed results: the detected impact of additional observations was not very consistent among these studies. For example, the Météo-France e-suite did show not such a strong impact over the North Atlantic area. The most significant impact was a bias correction in the stratosphere over Europe, that was due to the inclusions of additional radiosondes. However, some cases of good improvement over the verification area have been found ! A posteriori studies also showed that the computed sensitive regions did not always agree with each other and that their combination may be sub-optimal. We also verified that the prediction of the sensitive areas is sensitive to some constraints/hypotheses used in the real-time targeting techniques they were computed with. Considering singular vector (SVs) based techniques, this implies that the targeting products are sensitive to the uncertainty of the flow.

The importance of such a drawback is case-to-case varying and it may impact the efficiency of targeted observations. Thus, a better understanding of these issues implies more insight into the mean and meteorological nature of the NA-TReC target-

ing regions, especially those based on ECMWF *Hessian* SVs. These are compared to the total energy SVs (TESVs). Secondly, the consistency between the *Hessian* SVs based sensitivities, the forecast error and the targeted observation increments along the optimization periods is to be investigated. Thirdly, the quantitative predictions of the statistically expected forecast improvement by the *Hessian* SVs based technique (forecast error variance reduction) have still to be validated; some possible experiment settings are discussed.