A verification and validation study of the prototype products of the 3D high-resolution radar reflectivity for SESAR

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The Single European Skies Air Traffic Management Research (SESAR) Programme has been tasked with the delivery of a next generation Air Traffic Management (ATM) system, with the first stage of EU-wide deployment due at the end of this decade. As part of the MET Information Systems Development Work Package (WP11.2), a collaborative effort between Met Office and Météo France has been undertaken to provide a suite of high resolution (1km², 5min) 3D radar reflectivity products to meet the requirements of SESAR.

In this paper details of two verification and validation methods are described. Firstly, simulated PPIs are generated matching the operational scan patterns of the radar networks surrounding each of two Terminal Maneuvering Areas (TMAs), Charles de Gaulle in Paris and Heathrow in London, and using three types of theoretical Vertical Profile of Reflectivity (VPR): convective, stratiform and sinusoidal (to simulate an inversion). The retrievals using the simulated PPIs are then compared to the theoretical VPRs. The second method is also carried out for both TMAs and requires a reference radar to be chosen for each one. A retrieval is then carried out once including the reference radar and once excluding it. By comparing the retrievals, information can be gained about the stability of the method when a radar is missing from the network and also about the performance, because the missing radar can be used as an independent source of verification.

Two candidate methods for the retrieval of 3D products have been developed as part of a prototype system, as described by Scovell et al. (2014). These include an adapted version of the French MUSCAT method (FRM, Bousquet and Tabary (2013)) and a new method which allows more flexibility to select the best data from overlapping radars (UKM). For each method, profiles of the RMS and mean errors are calculated, using the theoretical profiles as a reference and also relative to each other. The results demonstrate that UKM performs better despite some visible artefacts in the retrieved mosaics. Further work is planned improve the accuracy of UKM, e.g. by tuning the amount of smoothing.