Observation processing for NWP at the Met Office: current status and future plans

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Requirements on observation processing for NWP continue to grow - rapid and reliable ingestion of observations into data assimilation, the creation of perturbations for ensemble predictions and monitoring the quality of observations all need an efficient and flexible software system. In particular, there are more demanding requirements for using quality controlled observations for downstream products and services as well as verification, with higher volumes of data that are also more diverse. As NWP models become more skilful and embrace more physical processes, it becomes more important to discriminate poor, especially biased observations and there are also greater opportunities to provide corrections from model information. It is also important to have tools that allow precise comparisons of observation and modelled equivalents.

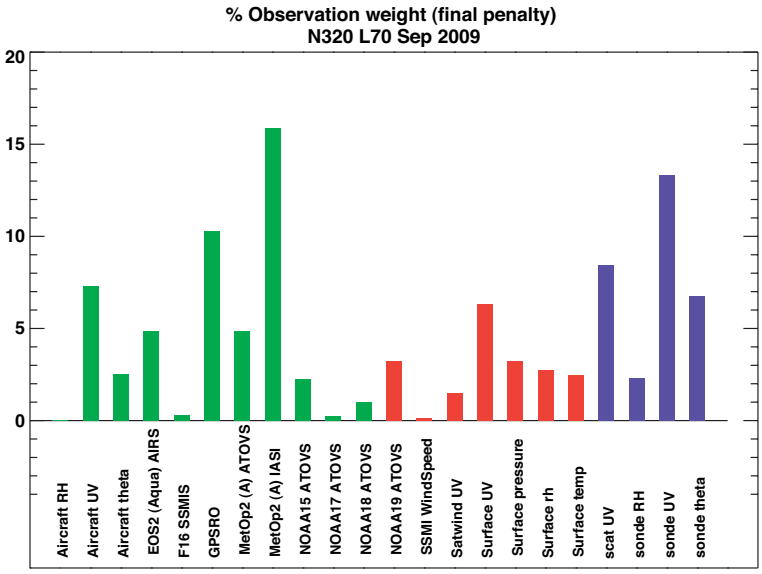

Fig. 1

Figure 1 shows the total final penalty of different types of observation in the Met Office global operational model, giving a measure of their relative weight in the assimilation. This confirms the dominance of satellite sounding data but note that wind measurements from radiosondes remain important – these includes wind profilers in the plot shown since they share the same generic processing path.

Currently the Met Office has separate observation pre-processing (OPS) and 4DVAR data assimilation (VAR) steps, with all communications from a permanent observations database (MetDB) through OPS; there is also some processing, such as mapping and antenna corrections for satellite data at an earlier stage (RADSAT): see Figure 2. This works well in an operational environment, allowing main forecasts suites to start with a data cut-off 160 minutes after the nominal analysis time. A wide range of monitoring activities is provided, with programs accessing MetDB data. This allows both continuous monitoring, with regular updates for data rejection, and longer scientific studies allowing systematic observation-model inconsistencies to be corrected, such as an earlier overestimation of winds from ships, due to assumptions of anemometer height. However, these facilities are not readily available for off-line trialling and combining observational data with intercepted model calculations is not always straightforward. There are also software development issues for the MetDB in meeting the needs of both NWP and a wider set of users.

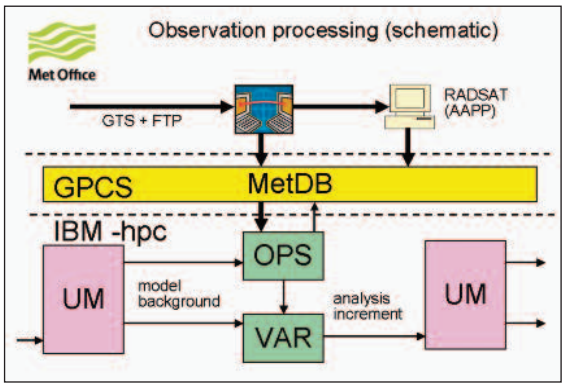

Fig. 2

Therefore it has been decided to integrate ECMWF ODB applications into the Met Office system for the purpose of allowing a greater range of monitoring, and more flexible extension to off-line investigations, allowing more detailed information to be obtained for model to observation comparisons before full installation of model or assimilation upgrades in our operational suite. This also allows other opportunities for more sophisticated observation impact studies and applications, with adjoint sensitivity calculations, radiosonde bias corrections and variational quality control all under active development. The use of the ODB in the Met Office environment has been demonstrated for monitoring a number of observation types and further development is planned. Once existing applications have been proved, this allows an extra opportunity to rationalise MetDB functions, replacing direct NWP based interactions by the ODB, helping to improve the modularity of our software and streamline data processing within NWP. As for any operational system, there are many interfaces to consider, and so a gradual enhancement of functionality is expected, rather than an abrupt transition. The wider use of the ODB by other NWP centres will also, with time, benefit this community by offering more scope for collaboration.