METplus Implementation: Grid-Stat & GenVxMask

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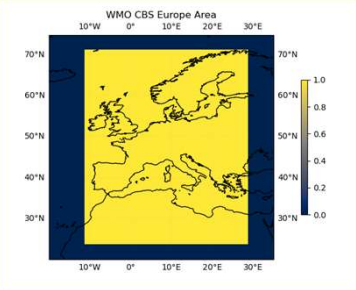
Importance of Area Masking – As part of the World Meteorological Organisation's (WMO) Commission for Basic Systems (CBS), verification scores are required over a range of areas around the globe.

Aims:

- Explore differences between area masking in the currently operational Verification System (VER) and the proposed new system, Model Evaluation Tools (MET).
- Assess the impact these would have on operational verification scores.

Tools & Methodology

The operational capabilities of VER were replicated using MET's Grid-Stat and GenVxMask tools.
Grid-Stat calculates verification statistics for a matched forecast and observation grid.
GenVxMask is used to generate a verification masking region to be used by the MET statistics tools.



Geopotential heights at 850 hPa from the Unified Model (UM) were verified using VER and MET between 00UTC 01/03/2021 to 18UTC 07/03/2021 at 6 hourly intervals from T+6 to T+36. Data were re-gridded to 1.5˚ and 2.5˚ grids using the nearest neighbour interpolation method. The results presented here are for the Europe region on a 2.5˚ grid.

Number of Grid Points in Masks

Initial comparisons showed MET area masks contained few grid points than their VER counterparts across all areas and grid resolutions. For the CBS Europe region, using a MET can be seen to produce a difference of ~4% RMSE.

To account for the difference in grid point totals the coordinates used for MET masks were extended outwards to include more points. An extension of 0.6˚ in each direction was found to be the minimum increase possible across both the 1.5˚ and 2.5˚ grids. Considering the same number of grid points in the verification reduced the differences in RMSE to ~2%.

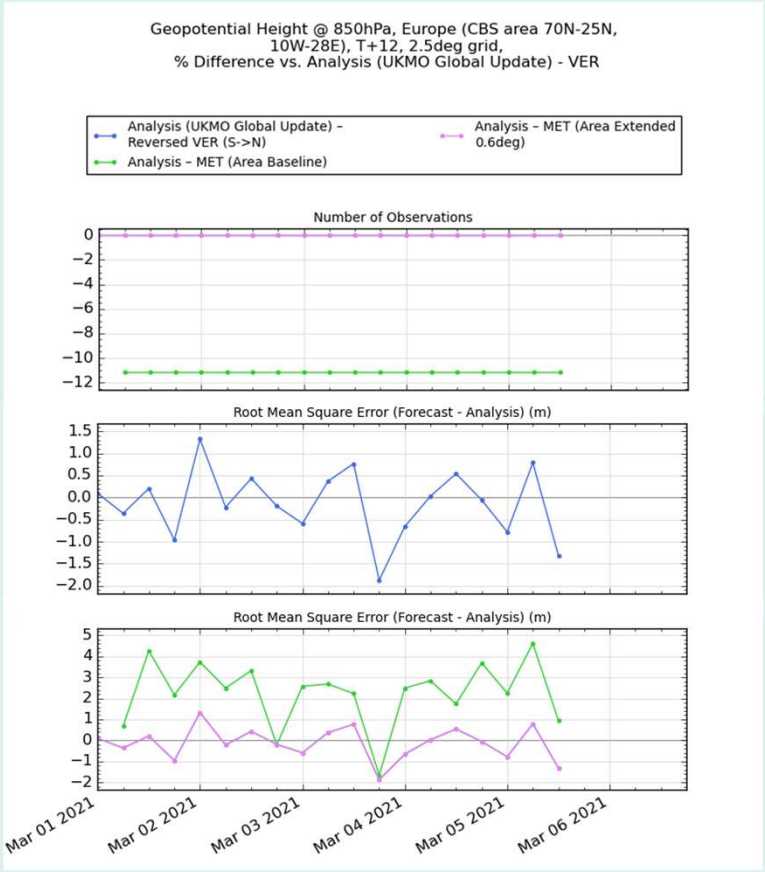
Opposing Orders of Processing

On inspection of raw data from VER and MET discrepancies between them were clustered around certain latitudes.

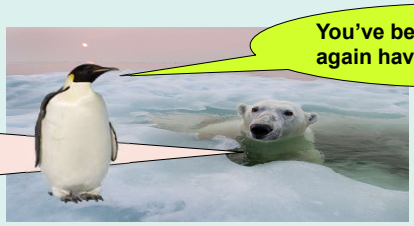
Latitude				
59.859:	1579.0	1579.0	1580.0	1580.0
59.953:	1577.0	1578.0	1578.0	1579.0
60.047:	1575.0	1576.0	1576.0	1577.0
60.141:	1573.0	1574.0	1574.0	1575.0

Geopotential heights at 850hPa on Unified Model grid

At 60˚ for example, two points on the UM grid are equidistant from this point. Using the nearest neighbour interpolation method, MET and VER interpolated different points to 60˚ on the 1.5˚ and 2.5˚ grids. MET interpolated the southern point and VER the northern point. This highlighted a systematic difference between VER and MET in the order in which they process points. To assess the impact of this on RMSE, VER was manipulated to run from South to North, the same order as MET. The difference between VER and MET running in the same order is negligible.



To extend or not to extend the WMO CBS areas? That is the question for METplus implementation.



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