

Weather Forecasting at Dronning Maud Land – a problem of NWP-Model-Mix

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Each NWP-Model is not good enough by half to meet the forecaster requirements. So it must improve such as post processing, statistic methods or comparing with other models. For weather forecasting at Droning Maud Land the last one is carried out.

The forecaster uses a NWP-Model-Mix with a normalized equation like this:

$$\text{forecast} = a * M1 + b * M2 + c * M3 + d * M4 + \dots$$

with M1, M2, M3, M4, ... = model parameter
a, b, c, d, ... = weighting functions

The weighting functions are functions of scale, forecast time, consistency, systematic error, model tendency, model product etc. Some (e.g. model errors and tendency) are well known, other unknown, some are influenced by other etc. The problem to define the functions is enormous.

At Dronning Maud Land generally the results of following 3 models are received:

ECMWF and EPS of ECMWF
AMPS
GME of DWD

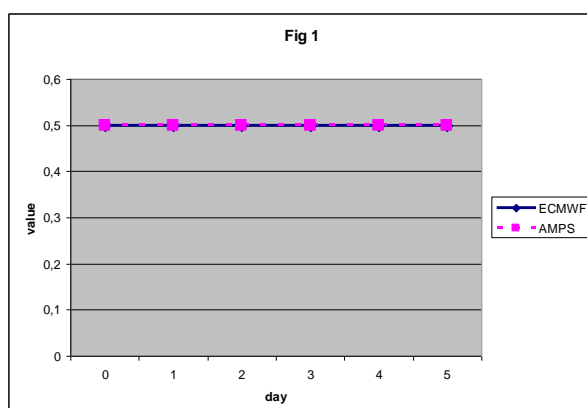
In the best case, that means models are of same quality and the results are similar the proportional values of the functions are the same.

In our case are the values of the weighting functions must be $a = b = c = 0.33$

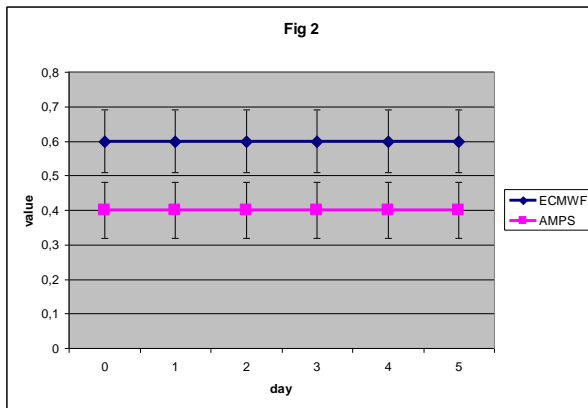
Please consider that the following pictures, values and variability are only examples and for demonstration the principles.

We all know that we never meet the best case and must change the values. Except two meteograms we have no regional or local forecasts by the GME-model and from experience we know that it is often from minor quality in this area. So we don't use this model in normal cases. But we keep the GME results in mind as an alternate.

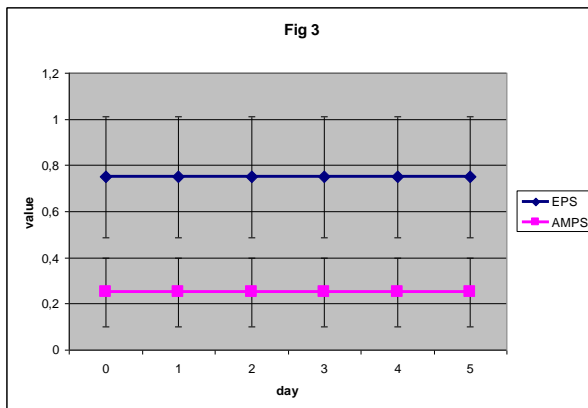
So the weighting functions of EMCWF and AMPS increase to 0.5 each (Fig 1).



From our long experience as forecasters at RV “Polarstern” we also know, that the ECMWF-model in the majority of cases is from better quality than the AMPS. That’s apply for all time periods (Fig 2),

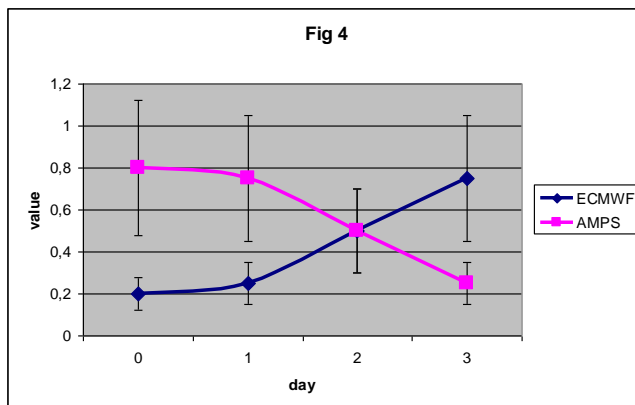


especially in consideration of EPS of ECMWF (Fig 3).

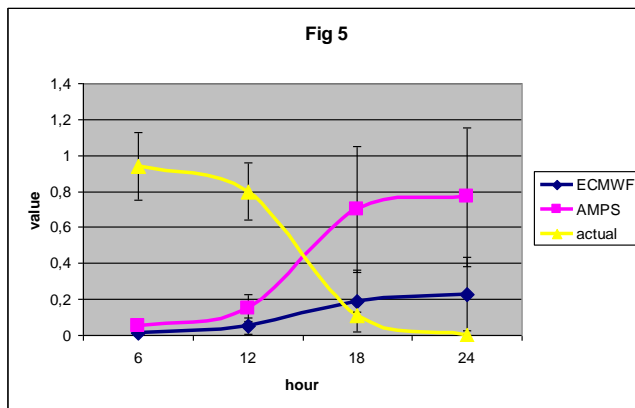


Now we look to the short period forecasts below 3days.

If AMPS is nearly similar to ECMWF the values of the functions changes again. Because of the better resolution and the detailed output the value of the AMPS-model increases with decreasing forecast time while the ECMWF proportion decreases (Fig 4).



For nowcasting, that is the interesting time scale for flight operations, the actual weather, esp. satellite images predominate to all model results (Fig 5).



If the results of AMPS and ECMWF are not similar, than the model with the best consistency predominates to the other up to 80 or 90 percent. Also the GME-model may have some influence.

The consistency check is carried with previous model runs, the **Experimental Antarctic Ensemble System** of the CAWCR (Centre for Australian Weather and Climate Research) and other models e.g. GFS if available. This is a question of data link capacity.

To define realistic weighting functions for each model run twice a day is an enormous problem and we have no hard- and software to do this. So it must be done with our brain.

This is a labour and time intensive job for the solo forecaster at Dronning Maud Land. So we deploy only meteorologists/forecaster with accurate education in synoptic and numeric meteorology and with long experience in polar weather forecasting.

To formulate the forecast report itself **that's mere child's play**.