Third SRNWP Workshop on Mesoscale Verification

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Report on the main scientific issues discussed

1. Verification of the precipitations of km-scale models (Δx = 1-3 km)

It has been re-affirmed that short-range NWP has taken the road of the non-hydrostatic km-scale models. Such models - with horizontal resolutions of say 1-4 km - are under development in all the Consortia or are even already operational (Met Office with 4 km over the British Isles).

Everywhere the same experience has been done with these models: the results of the verification of the precipitations are less good than for models with lower resolutions when the standard verification method is used. (The standard verification method is characterised by one-one correspondences between grid points and rain gauges and by the computation of scores from the associated contingency table).

2. How should we verify the precipitations of the km-scale models?

It has been strongly affirmed that there is no point to verify convective precipitations with stations at the scale of these models. This would only produce erratic and inconsistent results due to the hazardous realizations of the events (the showers) in space and time.

An up-scale is indispensable.

To which scale do we have to upscale?

We could not find a unique answer to this question.

One opinion was to upscale up to the scale of the predictability of the event. But this is not uniquely defined as the predictability for a given scale is a function of the forecast range.

Another opinion was that a "general verification" is not meaningful: verification must be made "à la carte", that is must be defined according the need of the user or must be adapted to the information which is requested from the model by the user.

3. Justification of the km-scale models

As the standard verification methods give for the km-scale models - at least for the precipitations - less good results than for lower resolution models, how can we justify the development and the operational use of the km-scale models?

We can justify the use of km-scale models only if they are better than models with lower resolutions.

If we have to compare the precipitations of a 2-km model with the ones of a 10-km model, we must first, as already written above, upscale the 2-km precipitation fields to the 10-km resolution and compare the fields at that latter resolution only. If the upscaled fields are better than the native 10-km ones, it is justified for a NMS to run operationally the 2-km model. But the precipitation fields must be disseminated in their 10-km upscaled version only.

Suppose now that the upscaled precipitation fields are less good than the native 10-km fields. Is the use of the 2-km model version still justified?

If after upscaling to 10 km the results coming from the 2-km model are not better, this does not mean that the 2-km model is not necessary.

Reason: one of the motivations for developing km-scale models is the hope to better predict severe and damaging weather. Severe weather is characterized by very high values of some standard parameters like wind and precipitation.

Km-scale models have the ability to produce locally large values for these parameters, something that models with significantly lower resolutions cannot (we exclude of course numerical instabilities and aliasing) due to the absence of short waves.

When very high values in wind or precipitation occur in a forecast, they are a strong signal for severe weather. It remains nevertheless true that place and time of these events could be forecasted with error.

4. Quality of the severe weather forecasts

As we have just seen it, km-scale models seem to be the best tool to indicate the possible occurrence of severe weather and also of extreme weather, in a deterministic as well as in a probabilistic way. If we accept this statement, we have to ask the following question:

Which is the quality of the model forecasts for severe weather and for extreme weather?

A verification of the extreme weather model forecasts has been attempted at the Meteorological Office. This attempt has led to a clear conclusion: it was impossible to produce statistically significant results because these events are too rare.

Thus we have to use an indirect way.

It has been suggested that we should specifically verify events with strong winds (say 50-60 km/h) or strong precipitations (say 8-10mm/6h) which are much more frequent that the extreme weather events and would probably yield verification results which would be statistically significant. If the model is good at forecasting these high values, we can hope that it will not be too bad for extreme values. But it is not more than a hope!

See also the Recommendations.

For the report:

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