DANGER OF TOO HIGH OUTPUT RESOLUTION

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1. INTRODUCTION

Weather information flows in the chain Model-Meteorologist-Customer. An average meteorologist sees the model as a black box and doesn't know how the forecast is made. Likewise, the customer sees meteorologist as a prophet and doesn't know how his forecast is made.

Customer wants high resolution and long forecasts. Model could give high resolution and long forecasts. Meteorologist filters the flow of information and that may look (to the customer) as he were withholding information or (to the model designer) be a harmful bottleneck in the flow of information.

Customer thinks meteorologist knows the future. He can't distinguish forecasts of different parameters, different length or different scale. The two last have a connection which I call the DSR-criteria: the longer the forecast, the bigger the area. (Analogy to CFL-criteria of models: the shorter the timestep, the denser the grid)

Excample: We can tell a low is coming to Southern Finland next weekend but because we can't tell if it goes north or south of a particular town, we shouldn't say much about wind direction - or temperature in that point. In this case the problem of the meteorologist is: How to tell the customer, that we can't do that ? Or should we just pass the model forecast ?

2. WHAT DO THE METEOROLOGISTS THINK ?

26 Finnish meteorologists, 13 at National Weather Service, (averaged experience 13.5 years) and 13 at Southern Finland Regional Office, (averaged exp. 7.6 years) were interviewed. Regional office is concentrated in forecasts valid two hours to two days, National WS one to ten days. To find a parameter common to both types of forecasters, questions were asked about forecasting rainshowers with help of ECMWF products.

First question was about which ECMWF products were used for forecasting rainshowers. Fields of Z500, T500 were used by 100% of the interviewed, interpreted symbols by 85%, K-index by 50%, and vertical profiles by 46%. There was no difference in used products between the two offices.

Next the forecasters were asked to imagine a customer on Friday morning who wants to know if it is more likely to get rainshowers in Turku or in Helsinki. (Distance between the two towns is 160 km, both located at coast.) About what day would the forecaster be able to tell him ? Some forecasters at regional office would hesitate even about the same day (Friday), while most of them would talk about Saturday or Sunday. At NWS Saturday is the minimum, Monday maximum. About probable rainshowers in a bigger area, like Southern Finland, the opinions differed more: some NWS forecasters would (on Friday) talk about Sunday, some about Friday next week, average being between Monday and Tuesday. At regional office forecasters beleaved in remarkably shorter forecasts, variance Saturday to Tuesday and average between Sunday and Monday.

3. FORECASTER'S SURVIVAL STRATEGIES

To survive the conflict between what he thinks is possible and what he is asked to do, a forcaster needs a strategy. Here are some of the most frequently used:

Blame the computer.

"This is how the computer has seen tomorrow's weather..." Perhaps the customer doesn't think your stupid but the computer is - but will he buy more products of such a stupid computer ?

Tell about the synoptic situation .
"Depends on the speed of this low pressure if we get the clouds on Tuesday or the following night..." Fine, but editors hate this (you're supposed to just tell what the weather is).
Don't tell them your final answer.
"Yes, today it seems like this, but yesterday we thought like that, so who knows about tomorrow, you had better to phone again later..." Unfortunately the customer has to make his decision long before the D-day.

4. TWO WAYS TO SOLVE THE BOTTLENECK PROBLEM:

4.1 **Education**

Meterologist tries daily to compare model's accuracy to sharpness and predactibility to wanted products. So he needs information on accuracy and predictability often, readably, and fast. Manuals and verification results should be published in an easy-to read form.

Updating training should take place regularly: All forecasters know, that the NWP:s have became better after they studied numerics, but very few forecasters know, how much better. Over- and underestimations are equally dangerous.

Training of the "professional customers" (farmers, road maintenance staff etc.) could include a lesson about use and accuracy of numerical products. Suitable training material is needed.

4.2. **Forecast product design**

If the forecast product consist a picture and text, customers prefer the picture. Pictures are deterministic, no graphic equivalents to words "perhaps, mostly, locally" are yet invented. As it was said about ensemble forecasts, we need fuzzy pictures to illustrate probabilities. Animation techniques could be one solution. (On Finnish TV the animation goes so fast, that you can't read exact timing of fronts.) Different scale map for different forecast length highlights the difference between short and medium range forecast. (This is used on Swedish local TV.) In a small scale like a town forecast, a map can seldom illustrate synoptic scale differences. Instead there is mesoscale climatology and chances during a period which could be better illustrated in a horizontal section (coast-land) or a symbol picture.

5. CONCLUSIONS

In addition to weather information, meta-information (information on information) should move in the chain Model-Meteorologist-Customer.

If the meteorologist knows how good the model products are now, why they are what they are and when they are more unreliable than normally (and that could be promoted by education); if the customer learns that some forecasts are better than others, predictability is limited and lying and withholding information isn't our goal (and that could be promoted by product design) the customer could be safer and happier - and that is why the forecasts are made.