What kind of developments are needed to improve RW Forecasting ?

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General Topics of discussion

Phenomena : snow amount, freezing wet roads
Time ranges : reaction time, strategic planning
Types of forecasts : general RW Forecasting (covering sub-synoptic or specific point or sections of roads)
What kind of models : 3D models coupled with 1D (point) or 2D (section) models, statistical models, neuronal ?
Accuracy : what precision is needed, what objective verifications are used

Minutes of discussion

What is the biggest challenge today i.e. what parameters are critical ? Cloud cover seems to be n°1. Freezing rain is another.

About cloud cover

4D assimilation of radar & satellite data. New Meteosat 8 satellite will improve results. Extrapolation of nowcasting tools, additional mesoscale analysis are other possibilities of improvement The SAF Nowcasting Eumetsat program has certainly some good products in the making to meet supplemental assimilation requirements.

RW stations can be used for post-processing (bias statistics and MOS) but do not prove to be of any use for global assimilation. There's a debate over meso-scale model assimilation of RW data and we have to be very careful because inconsistencies in model and boundary initialisation are a risk to forecast quality.

Metadata use is essential if you want to know if your data has the same quality as WMO-type "synoptic met" data.

Is all non standard RW data (like saline concentration, traffic data, etc…) assimilated or used in any way ? Not really

Short-wave radiation is not measured enough, but is a real factor in road temp forecasting. Sensor needs to be heated but more data is really needed.

About High resolution modelling

Implementing 4 or 5KM resolution is now reality (or very close).

Are NH models ready for full operation in the near future : Germany has plans, France is for 2007. NH will bring better convection forecasting and therefore improve rainfall & snowfall forecasting. NH models will generally improve cloud cover forecasting and therefore improve overall RST Forecasts.

About low-level clouds : great difficulty is found in forecasting stratus and fog formation and dissipation times especially in valleys and narrow midland. This is a research topic and vertical resolution improvement is necessary. Some results using topographic boundary layer modelling are promising (CH)

General purpose Met models have 3 hour time resolution which is not adapted to early morning RW forecasting and decision making : 1 hour resolution is needed for operators.

Nothing on blowing snow modelling applied to RWIS (but research has good results for avalanche prediction that uses blowing snow modelling). The United States' DOTs are asking research to look into a probabilistic approach.

About Freezing rain

In the US an Ensemble Prediction System (probabilistic forecasting) is being used for this type of forecasting and even though horizontal resolution increases with mesoscale modelling vertical resolution still has to be improved for this type of phenomenon to be correctly forecast.

Radar polarization has a bright future but is expensive : the US and France are looking into this technology for better rainfall estimates and rain/snow discrimination. Norway and Switzerland have shown that simpler techniques can be used to discriminate between rain and snow fall.

Some countries use hybrid techniques (combination of simple nowcasting + HIRLAM fields) for radar image forecasting.

About RW Data issues in general

Data exchange issues (including parameters like visibility) are still real in some countries.

Some countries have good quality control of RW stations (e.g. Sweden) but also have algorithms to eliminate data that is considered erroneous.

Are people generally satisfied with winter precipitation measurement ? How do we use liquid equivalent (if available). These issues have no straightforward answers.

About MOS issues and RW Maintenance Service operators

RST Forecasting : no one says what simplification assumptions are being used in section forecasting products (iso-altitude is one assumption).

Frost forecasting is difficult simply from model outputs of Td T2m forecasts because we don't know the real physics (surface layer modelling) and there's barely no validation data.

Visibility forecast is important for safety.

Kalman filtering gives good average results for RST (SW) but sometimes gives catastrophic results (with more than 10°C difference).

Placing instruments (starting with GPS) on maintenance vehicles (done in SF, DK), patrol cars with IR sensors is a possibility of getting more data and better control of operations.

Optimisation of the amount of spreaded salts and optimisation of timing operations is a real issue (SF) : can this be verified and can work be reported accurately, can work load and schedule be forecasted more precisely (esp. to sub-contractors)?

Is there too much information given to the operators : training is the key but some operators prefer raw data.
It is generally said that information is to be given at the appropriate level and this level can be different from one operator to the other.

In SW contractors have to prove they are competent. In DK road authorities have different training policies depending on the county.

There was a debate on the decision making process : all agreed that it should stay in human hands because it is expert based, the toolset used is automated but is guidance.

Issues about post-processing and customer oriented production : time scales vary, warning period is 3 to 4 hours for tactical intervention. Then there's strategic planning for staffing with 24/36 hour forecast and 7 day forecast for road work planning.

Written by Eric Peterman F, June 18th 2004