Symposium-2 – Towards an optimal combination of numerical prediction and human interpretation

Frédéric Atger, Météo-France

Modern weather forecasting essentially consists in 3 steps:

1 Get the best of numerical weather prediction (NWP)

2 Favour, or at least allow, forecaster/expert interpretation of NWP

3 Offer a wide variety of forecast products for end users

This is often achieved through a weather data base:

1 NWP feeding

2. Forecasters interaction with data base

3. Industrialized end production

Since 1995 Météo-France weather forecasting is based on such a production process:

1. NWP output + post-processed data (MOS, KF) initialise Symposium data base

2. Regional forecasters (100++) update data base several times a day

3. End forecasts automatically produced from data base, under different forms: maps, graphics (meteograms), text, voice

Limitations of Symposium:

- NWP feeding not exhaustive, nor systematic ("NWP on demand")
- Limited range of end products: some parameters/lead times not available, forecasts mostly deterministic
- Central office provides NWP guidance only, no direct database feeding (lack of consistency
- Point wise representation of weather parameters (700++ forecast points) makes forecaster supervision a time consuming, boring task

Symposium-2 features:

- Extensive use of numerical analyses and forecasts, including ensemble products, post-processed data, nowcasts, etc
- Automatic elaboration of a wide spectrum of forecast end products, including probabilistic forecasts for all time ranges
- Central forecasting office feeds database mainly with NWP products, regional offices modify and validate data
- Weather parameters are represented under different forms (point values, fields, objects) in order to facilitate forecasters interaction with the data base

Representation of weather parameters in Symposium-2 data base:

- Point values: observation style (MOS/KF feeding – Perfect when local effects are essential, eg temperature... but not clouds
- Gridded fields: model style (DMO feeding - Perfect when HR models perform well, eg wind... but not precipitation, fog, etc
- Weather objects: forecaster style (Forecaster drawing, partly NWP post-processing - Perfect for weather: cloud cover, precipitations, visibility

Symposium-2 data base:

- All probabilistic: probabilities of occurrence (eg thunderstorm), quantiles of pdf (Q10 to Q90, Q1 and Q99 when required)
- From yesterday to medium range: as long as human interpretation makes sense
- Direct feeding with observations, numerical analyses (satellite, radar, lightning), nowcasts (radar extrapolation), NWP (including ensembles), post-processed products (MOS, KF)
- Time step 1h or more, flexible

Interaction with probabilistic database:

- Quantiles + probabilities (millions of data
- Most modifications in deterministic mode (Q50), eg temperature, cloud cover, etc
- Probabilistic component modified through shortcuts leading to predefined quantiles: weather description (eg “spare showers”), intervals (eg “1-3 mm/hour”), specific probabilities (eg “prob T<0”)
- When required, possibility to interact with full pdf (quantiles) and full range of probabilities: contour of weather objects, precipitation amount

Updating rules for sharing objects/fields:

- Real weather objects (fronts, fog areas) move through domain boundaries: forecasters in charge of contiguous domains must cooperate
- Forecasters have to publish (= make known) any modification they plan to introduce in data base in order to inform their neighbours
- Assumption: when aware of inconsistencies forecasters naturally tend to come to an agreement
- Convergence is faster under time constraint... increasing efficiency and reactivity

Future:

- Increase reactivity by frequent updating
- Take advantage of very high frequency, very high resolution NWP
- Make probability content reflect relative performance of NWP vs forecasters