

Symposium-2

Towards an optimal combination of numerical prediction and human interpretation

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METEO FRANCE
Toujours un temps d'avance

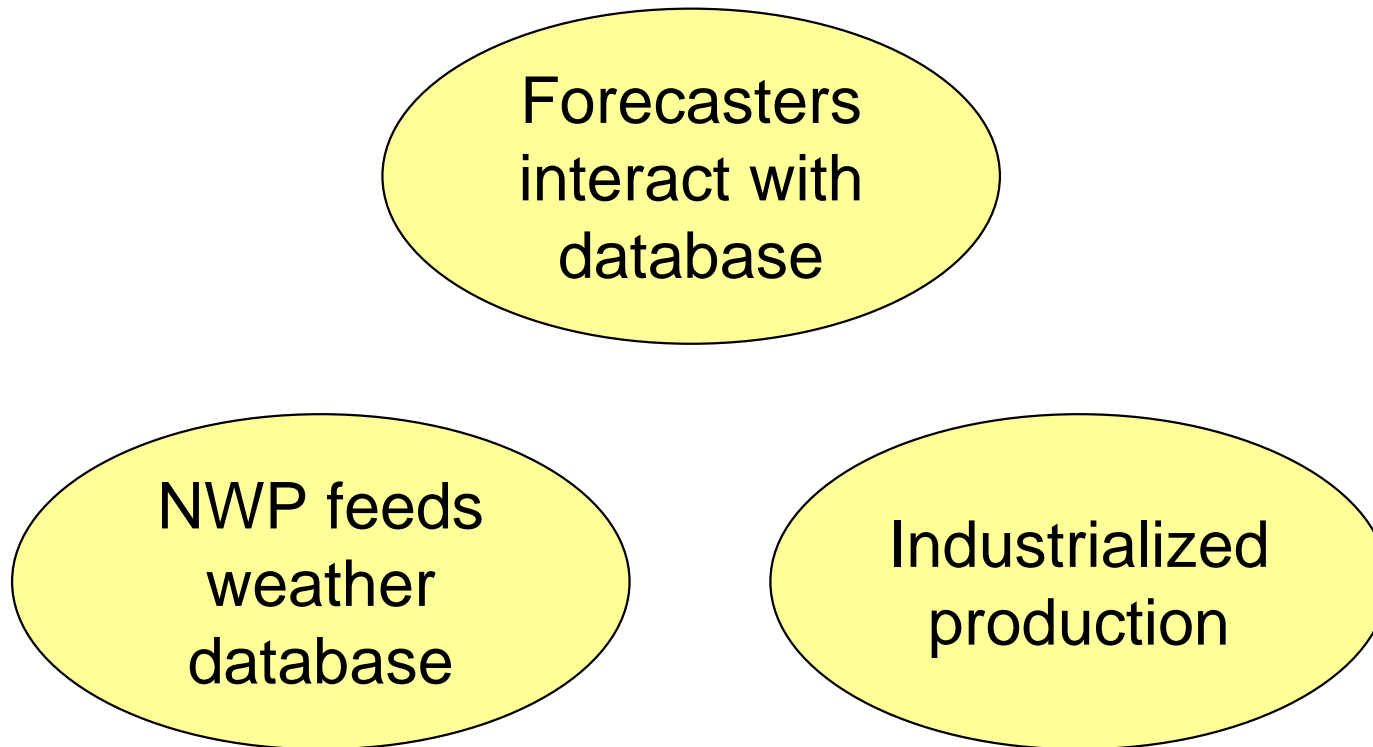
Modern weather forecasting

Allow/favour
forecaster
interpretation

Get the best
of numerical
prediction

Offer a wide
variety of end
products

Modern weather forecasting

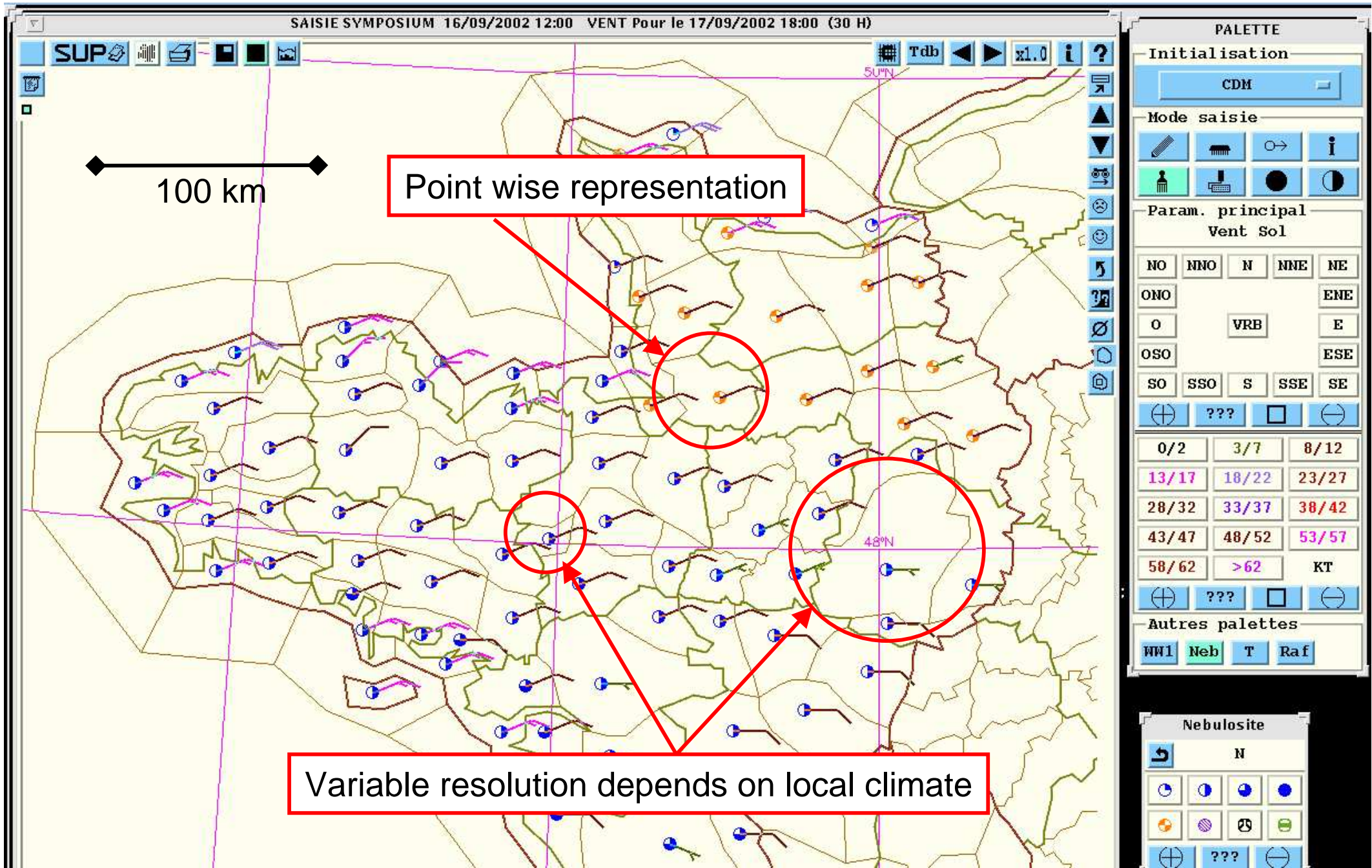


Symposium

(from συμπόσιον ~ party, feast)

- **SY**stème **M**étéorologique de **P**révision, **O**rienté **S**ervices, **I**ntéressant des **U**sagers **M**ultiples (~ user oriented weather forecasting system for various applications)
- Since 1995 Météo-France regional forecasters (100++) update a database several times a day
- NWP output + post-processed data (MOS, KF) used for initialisation
- Wide range of automatically produced end forecasts

Symposium



Symposium Products



Symposium Products

Météo France Prévision : mini-atmogramme - Microsoft Internet Explorer



Jeudi 27 Novembre 2003



Click on map



Français Español Deutsch

AJACCIO (4m)

Lever du soleil 07:23

Coucher du soleil 17:01

(Heures de Paris)

27/11/2003 - 21:12 loc.

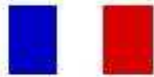
MÉTÉO FRANCE	Thursday 27/11/2003		Friday 28/11/2003		Saturday 29/11/2003		Sunday 30/11/2003	
	07h loc.	16h loc.	07h loc.	13h loc.	07h loc.	13h loc.	07h loc.	13h loc.
Current weather								
Temperature (°C)	13	14	10	15	7	16	5	17
(°F)	55	57	50	59	45	61	41	63

- + de détails
- + de paramètres
- + de jours de prévision

nouveau n° court
de Météo-France
32 50

0,34 € / min

Symposium Products



Office du tourisme et des congrès - Marseille Temps prévu le Jeudi 27 novembre 2003 vers midi

Aujourd'hui jeudi 27 novembre Sur le littoral

Aujourd'hui et en soirée : Pluie et orage en début de journée ; soleil ensuite.
Aux premières heures du jour vent d'ouest à sud-ouest localement assez fort ; après une atténuation, vent s'établissant au déclin du jour au nord-ouest. Rafales atteignant 65 km/h.
Maximales : de 14 à 15 degrés.

Demain en journée : Soleil généreux.
Vent de nord-ouest violent, avec des rafales jusqu'à 95 km/h.
Minimales : 6 degrés.
Maximales : 11 degrés.

Dans l'intérieur

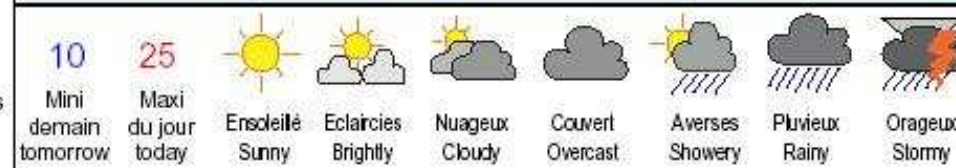
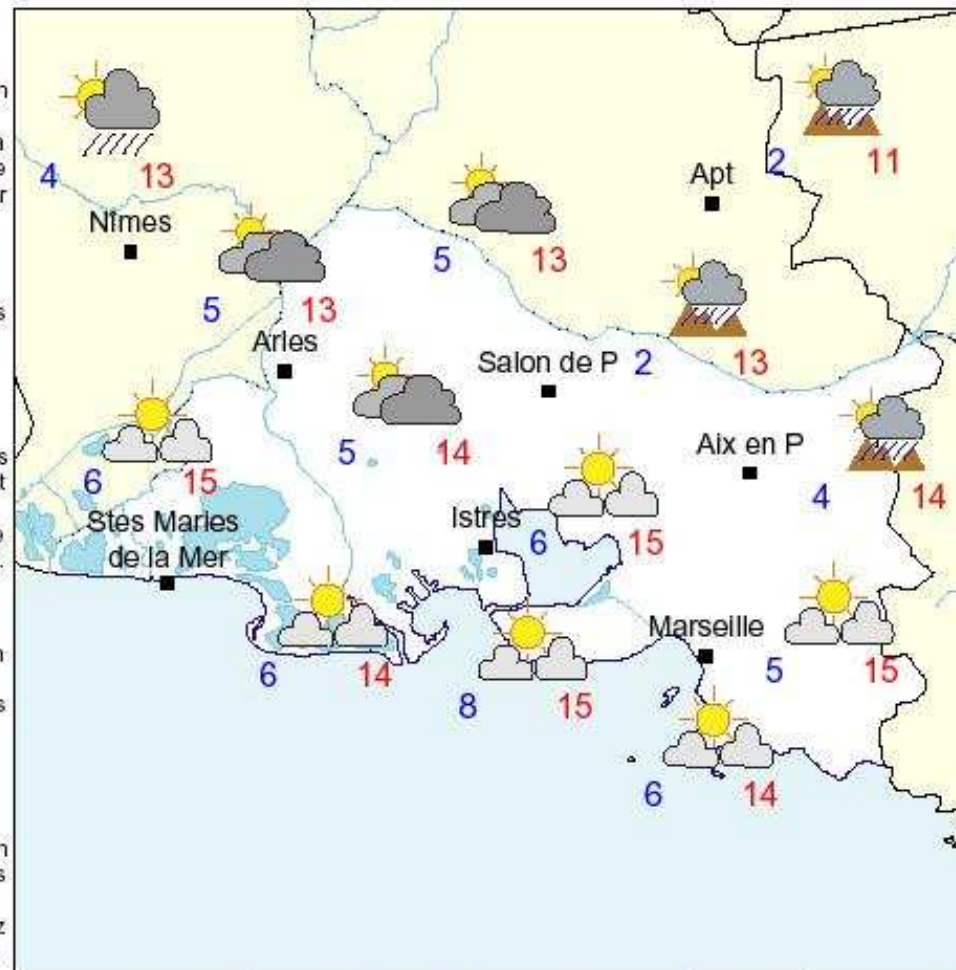
Aujourd'hui et en soirée : Ciel nuageux, puis retour des éclaircies ; pluie et orage en début de journée.
Vent soufflant assez fort par endroits : de sud-ouest à l'aurore, de nord-ouest en soirée. Rafales atteignant 65 km/h.
Maximales : comprises entre 13 et 15 degrés.

Demain en journée : Temps sec et bien ensoleillé.
Vent de nord à nord-ouest violent, avec des rafales atteignant 95 km/h.
Minimales : s'échelonnant de 5 à 8 degrés.
Maximales : variant de 10 à 12 degrés.

Sur le relief

Aujourd'hui et en soirée : Pluie et orage en début de journée ; éclaircies de plus en plus larges ensuite.
En soirée vent devenant de nord-ouest assez fort Ste Victoire/Durance, avec des rafales à 65 km/h.
Maximales : comprises entre 13 et 14 degrés.

Demain en journée : Beau temps ensoleillé.
Vent de nord-ouest fort, avec des rafales jusqu'à 85 km/h.
Minimales : s'échelonnant de 2 à 4 degrés.
Maximales : de 8 à 9 degrés.



Today Thursday, November 27th Along the coast

Today and the evening : Rainfalls, some heavier with thunder during the morning; mainly sunny later.
06 Severe enough by places westerly winds; in the evening, north-westerly winds will intensify again. With gusts near 65 km/h.
Maximal temperatures : between 14 and 15 °C.

Tomorrow : Blue sky and sun prevailing.
Violent north-westerly winds, with gusts reaching 95 km/h.
Minimal temperatures : 6 °C.
Maximal temperatures : 11 °C.

Inside lands

Today and the evening : Becoming brighter; rain, thundery by places in the morning.
Severe enough by places winds: south-westerly 06, north-westerly at sundown. With gusts reaching 65 km/h.
Maximal temperatures : from 13 to 15 °C.

Tomorrow : It will be sunny.
Violent northerly winds, with gusts near 95 km/h.
Minimal temperatures : from 5 to 8 °C.
Maximal temperatures : between 10 and 12 °C.

On the hills

Today and the evening : Thunderstorms growing up and rainfall early in the day; then clear spells growing up.
In the evening severe enough north-westerly winds Ste Victoire/Durance, with gusts near 65 km/h.
Maximal temperatures : between 13 and 14 °C.

Tomorrow : The sun will shine.
Severe north-westerly winds, with gusts reaching 85 km/h.
Minimal temperatures : from 2 to 4 °C.
Maximal temperatures : between 8 and 9 °C.

Symposium limitations

- NWP feeding is not exhaustive, nor systematic ("NWP on demand")
- Limited range of products
 - Some parameters/lead times not available
 - Forecasts mostly deterministic
- Central forecasting office provides NWP guidance only, no database feeding → lack of consistency
- Pointwise representation makes forecaster supervision a time consuming, boring task



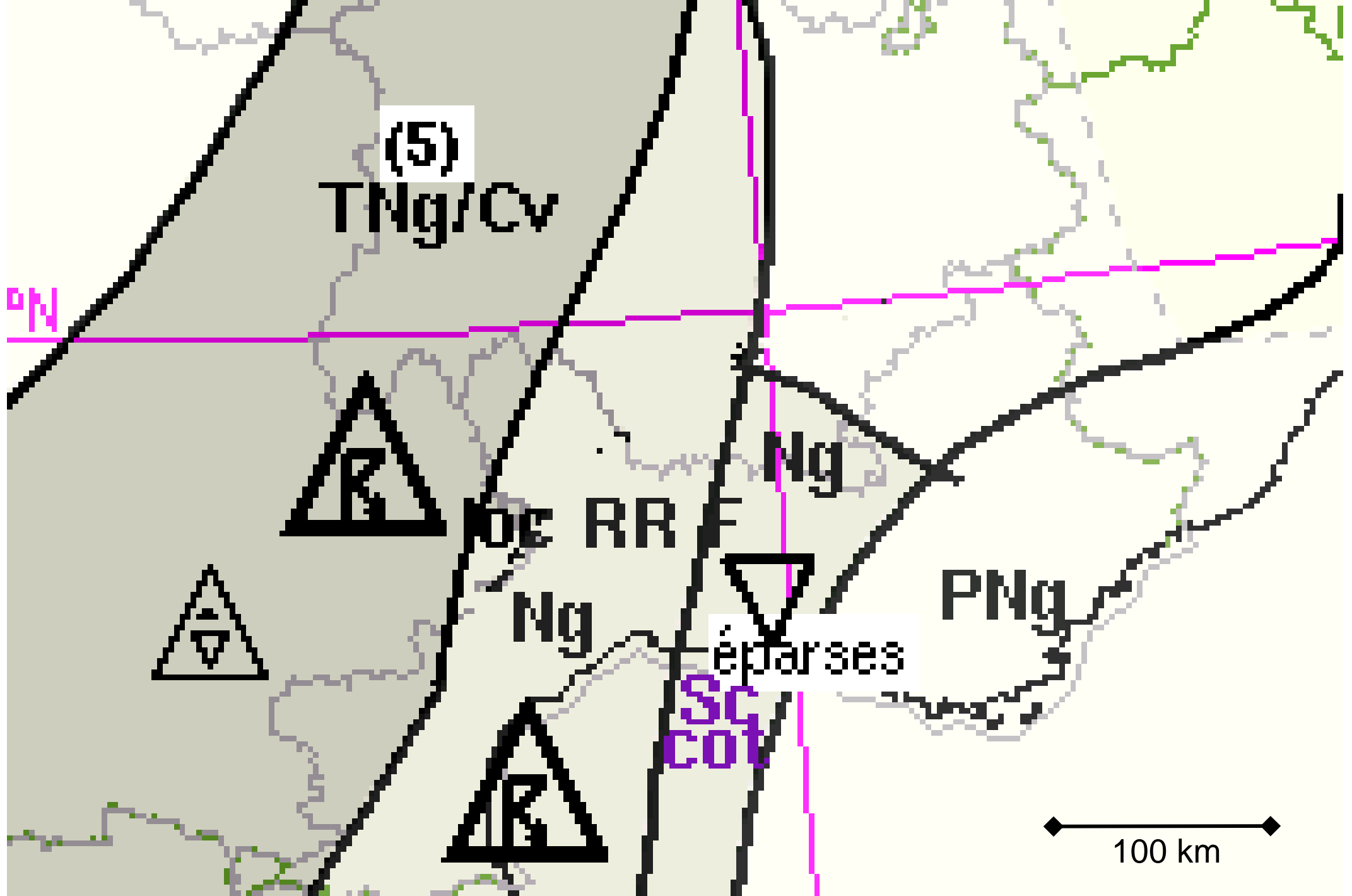
Symposium-2 features

- 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, regional offices modify and validate
- Weather parameters are represented under different forms in order to facilitate forecasters interaction with the data base

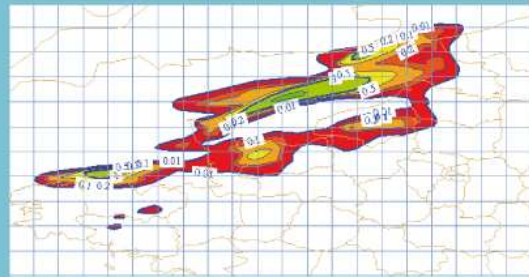
Representation of weather parameters

- Point values
 - Observation style → MOS/KF feeding
 - Perfect when local effects are essential (eg temperature - not clouds)
 - Easy to modify... a small number of point values
- Gridded fields
 - Model style → DMO feeding
 - Perfect when HR models perform well (eg wind - not precip, fog, etc)
 - Easy to modify... when space variability is low
- Weather objects
 - Forecaster style → Forecaster drawing... or NWP post-processing
 - Perfect for weather (cloud cover, precipitations, visibility)
 - Easy to modify... with appropriate tools, at the appropriate scale





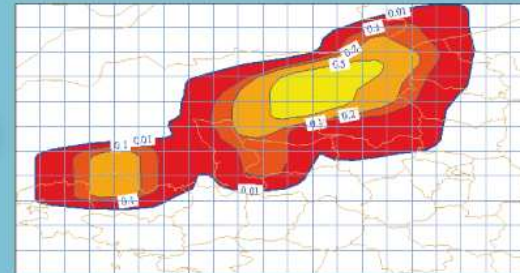
Phase 1 : Identification des objets



Cumul 1h original

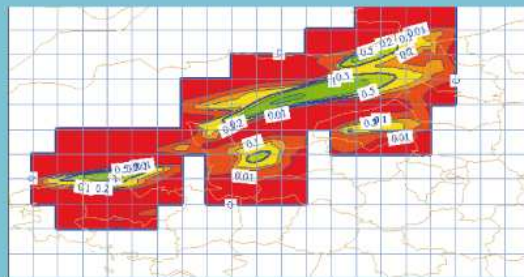
Convolution

Rayon de convolution



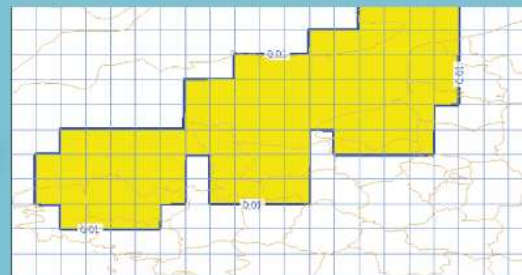
Cumul 1h convolué

Seuillage
Seuil



Cumul 1h objet

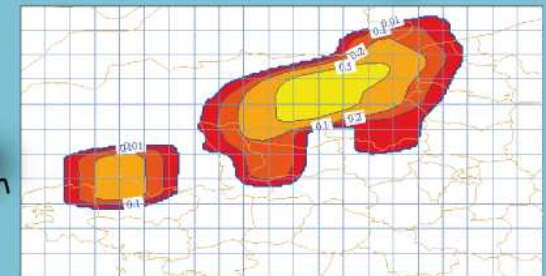
"Remplissage"



Cumul 1h pixellisé

"pixellisation"

Rayon de pixellisation



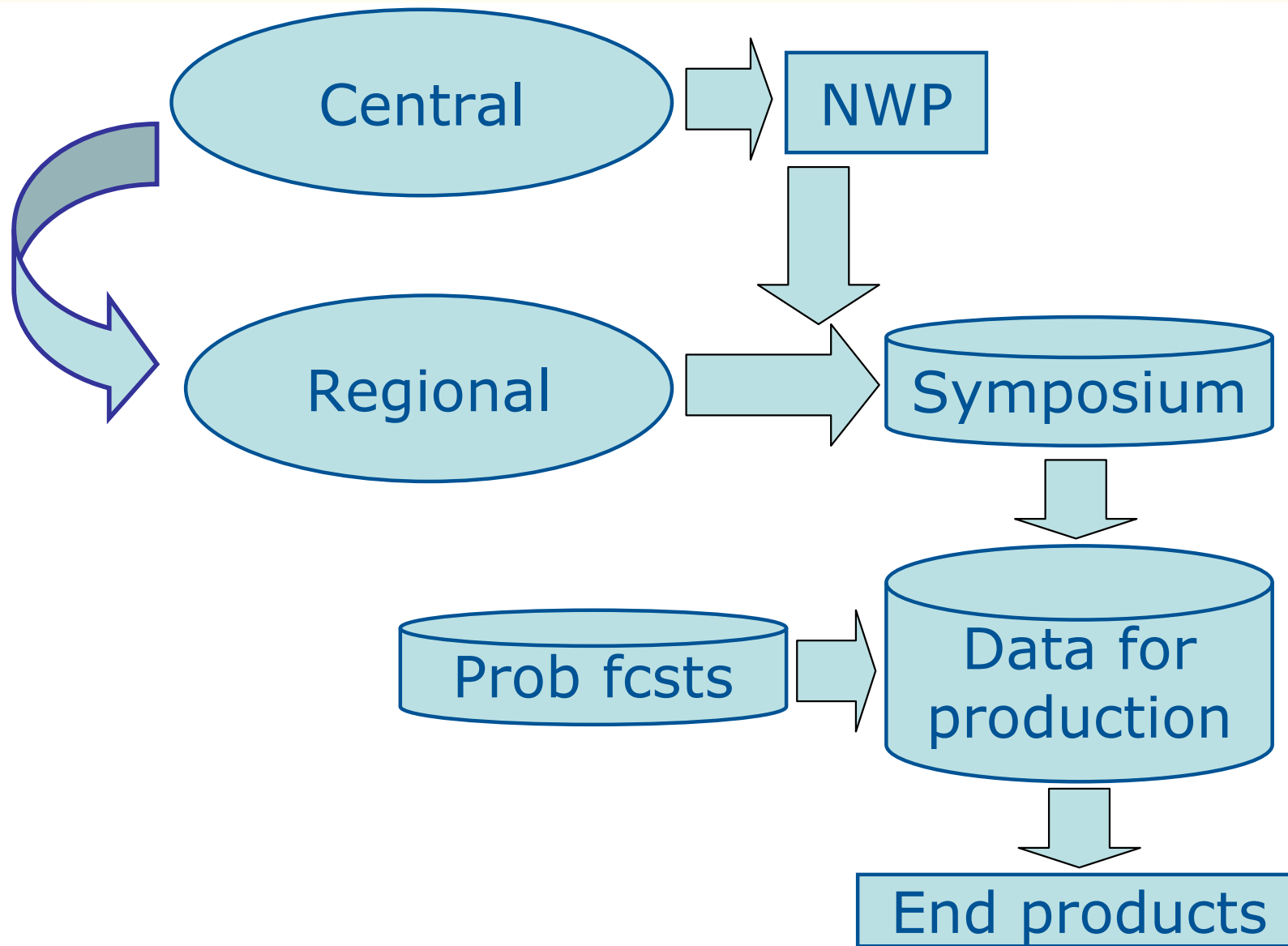
Cumul 1h seuillé



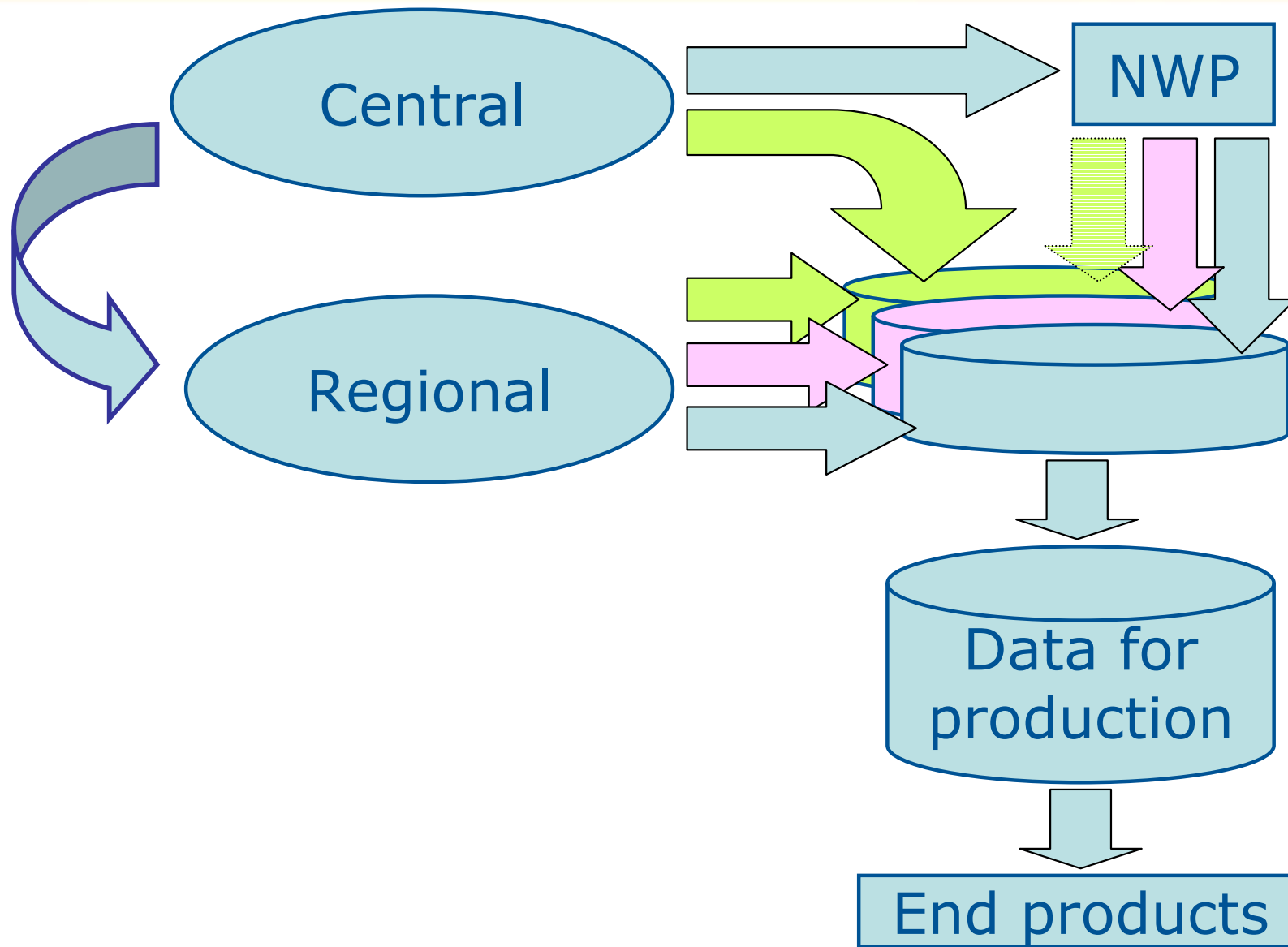
Symposium-2 data base

- Point values (eg temperature), gridded fields (eg wind) and weather objects (cloud cover, precipitations, visibility)
- All probabilistic
 - Probabilities of occurrence (eg thunderstorm)
 - Quantiles of the pdf (Q10 to Q90, Q1 and Q99 when required)
- From yesterday to medium range
 - Forecast range: as long as interpretation makes sense
 - Direct feeding with observations, numerical analyses (satellite, radar, lightning), nowcasts (radar extrapolation)
- Time step 1h or more, flexible
- France and around

Symposium



Symposium-2



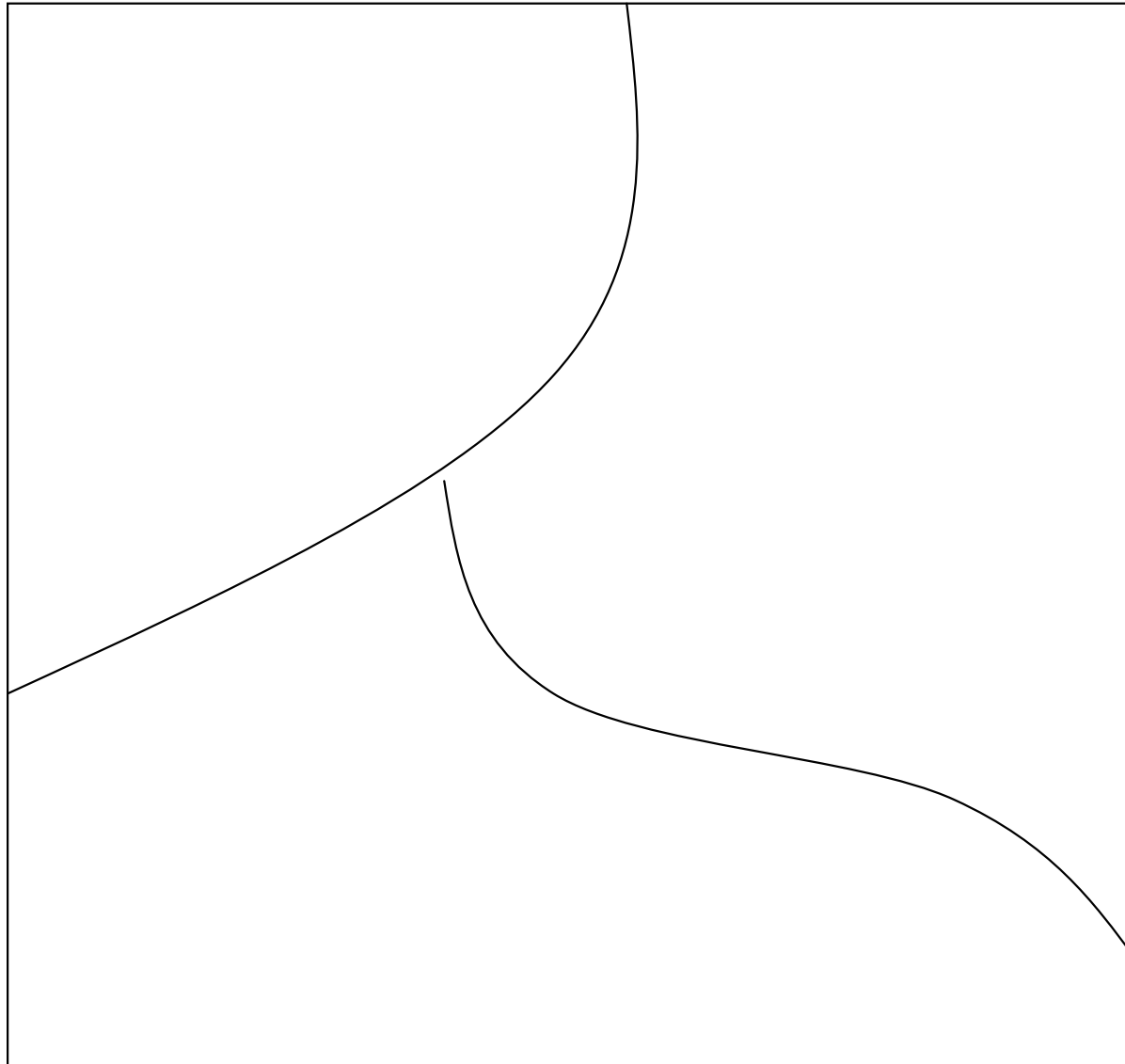
Symposium-2 challenges

- Forecasters interact with probabilistic database
 - Realistic?
- Forecasters in charge of contiguous domains share weather objects (and fields)
 - Consistency?

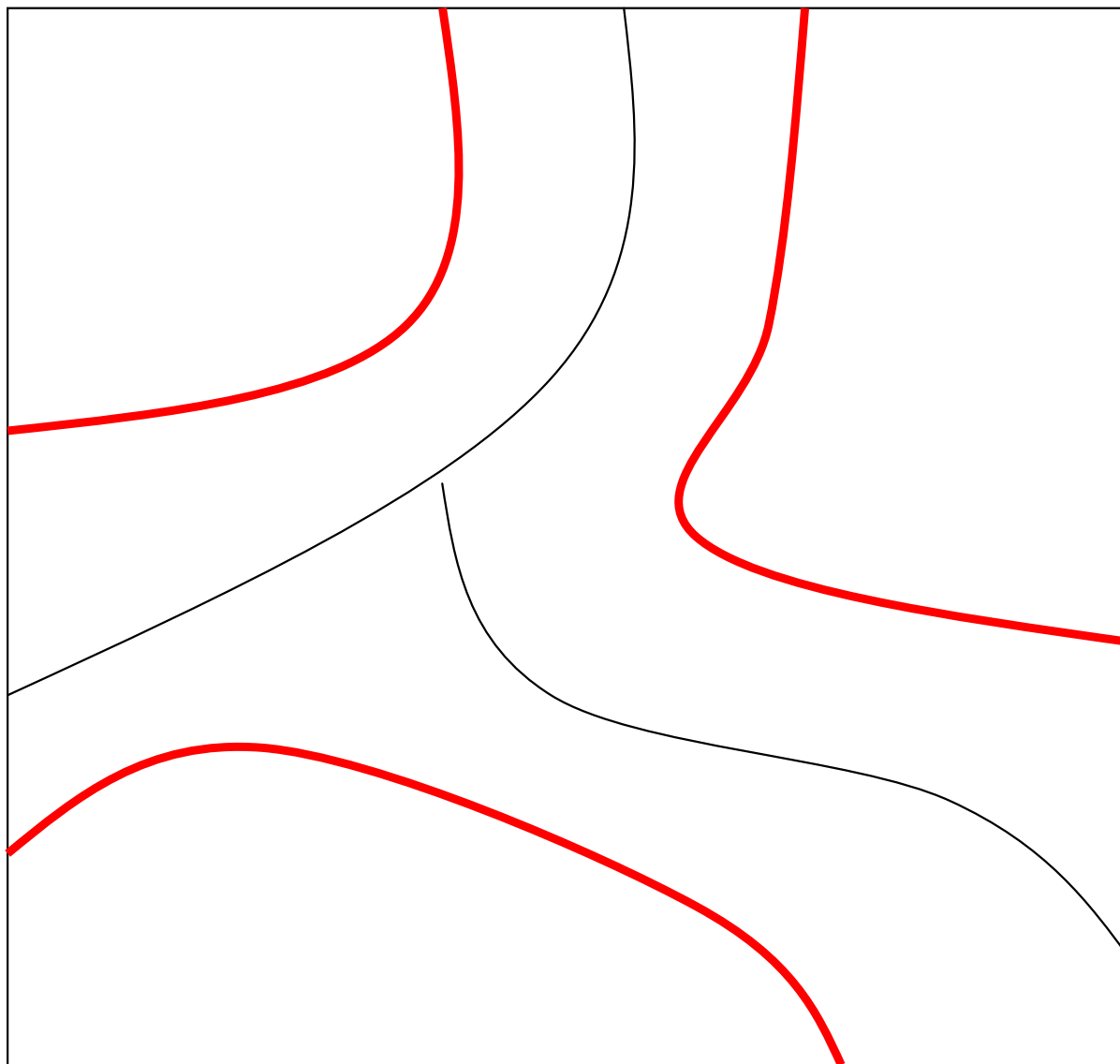
Interaction with probabilistic database

- 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 "sparse 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
- Examples:
 - Contour of weather objects
 - Precipitation amount

Weather objects – initial contouring

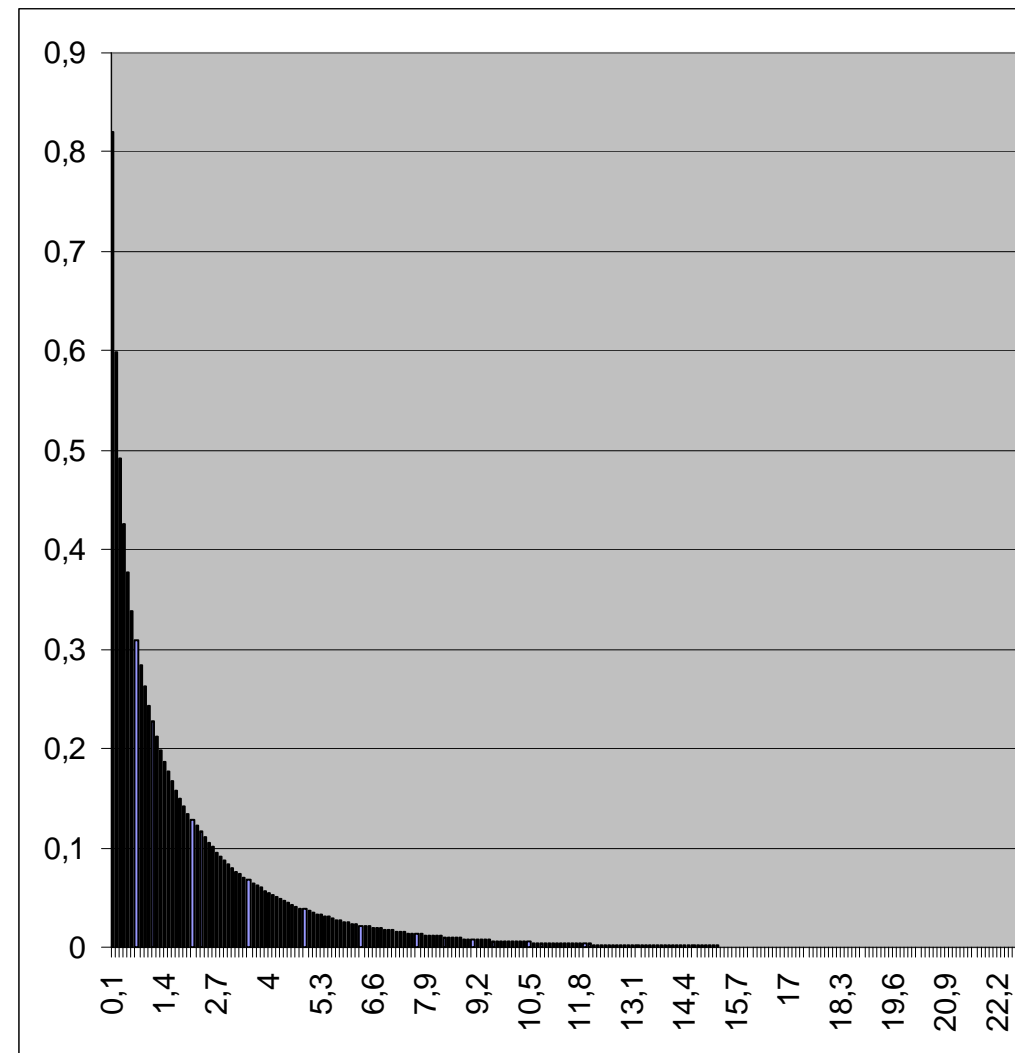


Weather objects – cellular representation



Modification of rain amount

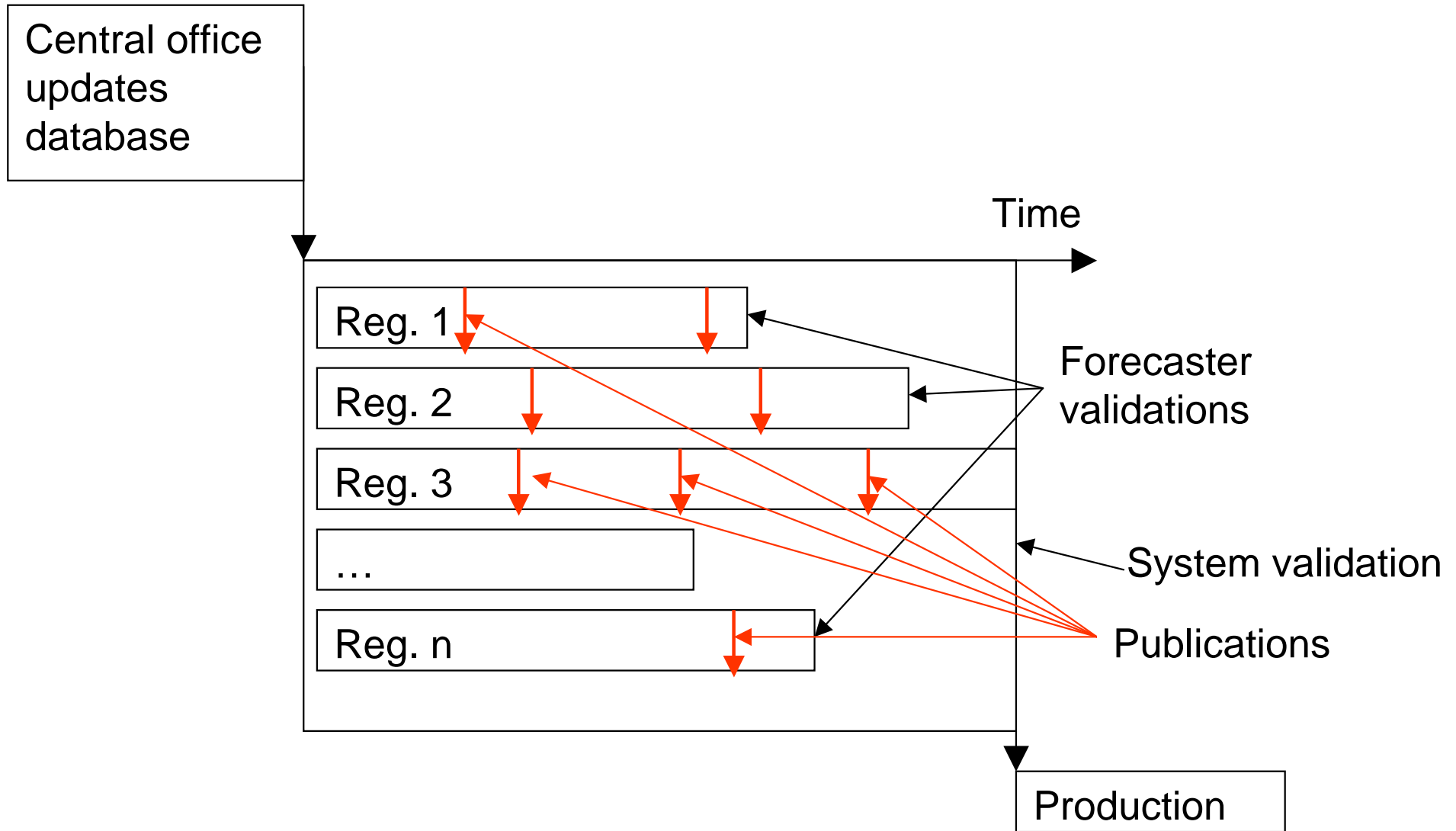
- Deterministic style: 1mm, max 5mm locally
- Probabilistic translation : Q50 = 1mm, Q90 = 5mm
- System modifies pdf accordingly:
 - Q20 = 0.2mm
 - Q80 = 3mm
 - Q99 = 11mm
- Other possibilities:
 - Forecaster modifies an interval
eg Q20-Q80 = 0-2mm
 - Forecaster modify Q99 only



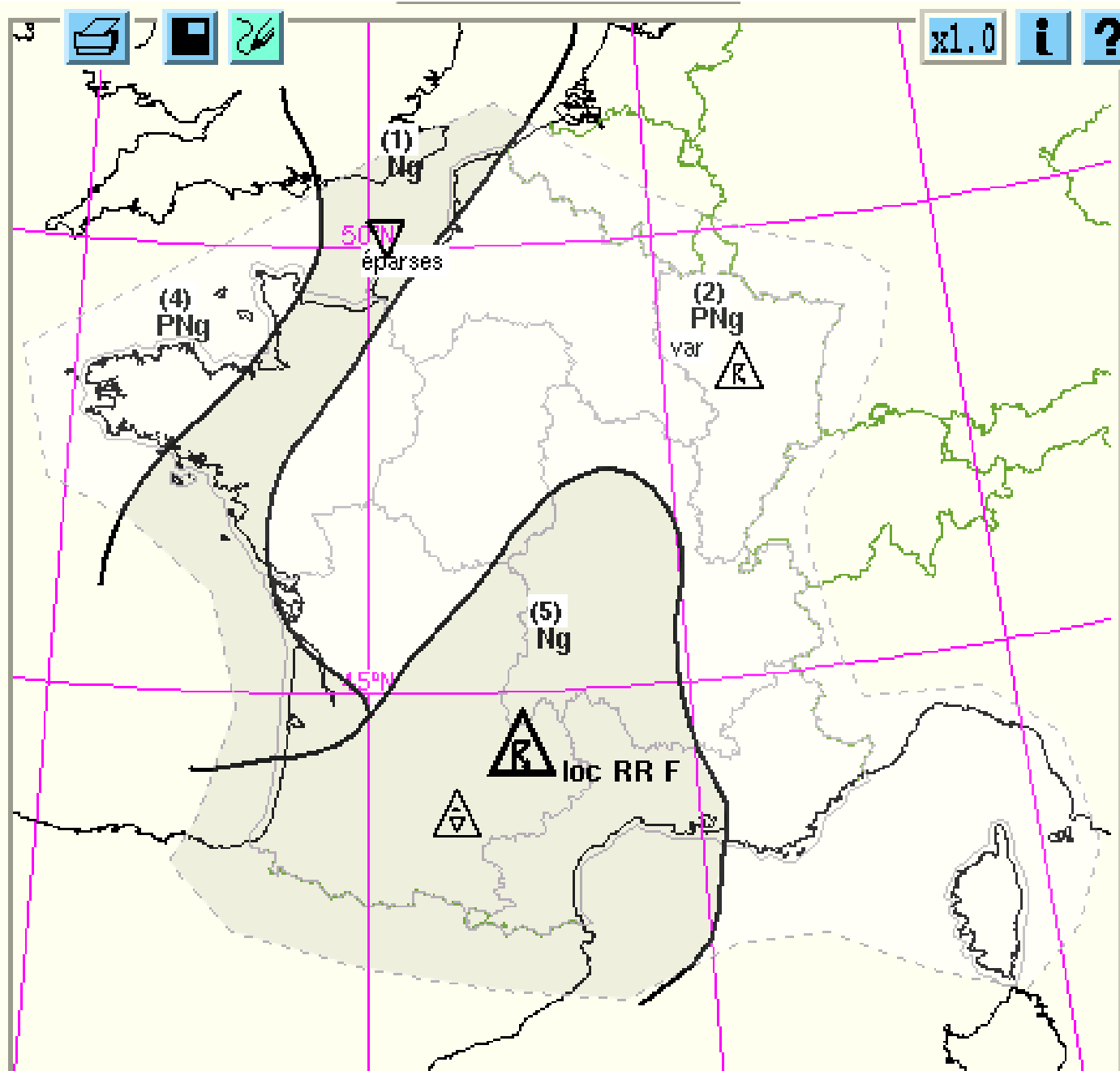
Sharing objects

- Real weather objects (fronts, fog areas, convective cells) move through domain boundaries
- Forecasters in charge of contiguous domains must cooperate, otherwise weather objects will not exist in the database
- Similar feature with fields
- Updating rules help cooperation:
 - Forecasters have to **publish** (= make known) any modification they plan to introduce in the database in order to inform their neighbours
 - Assumption: when aware of inconsistencies forecasters naturally try to come to an agreement
 - Convergence is faster under time constraint... increasing efficiency and reactivity

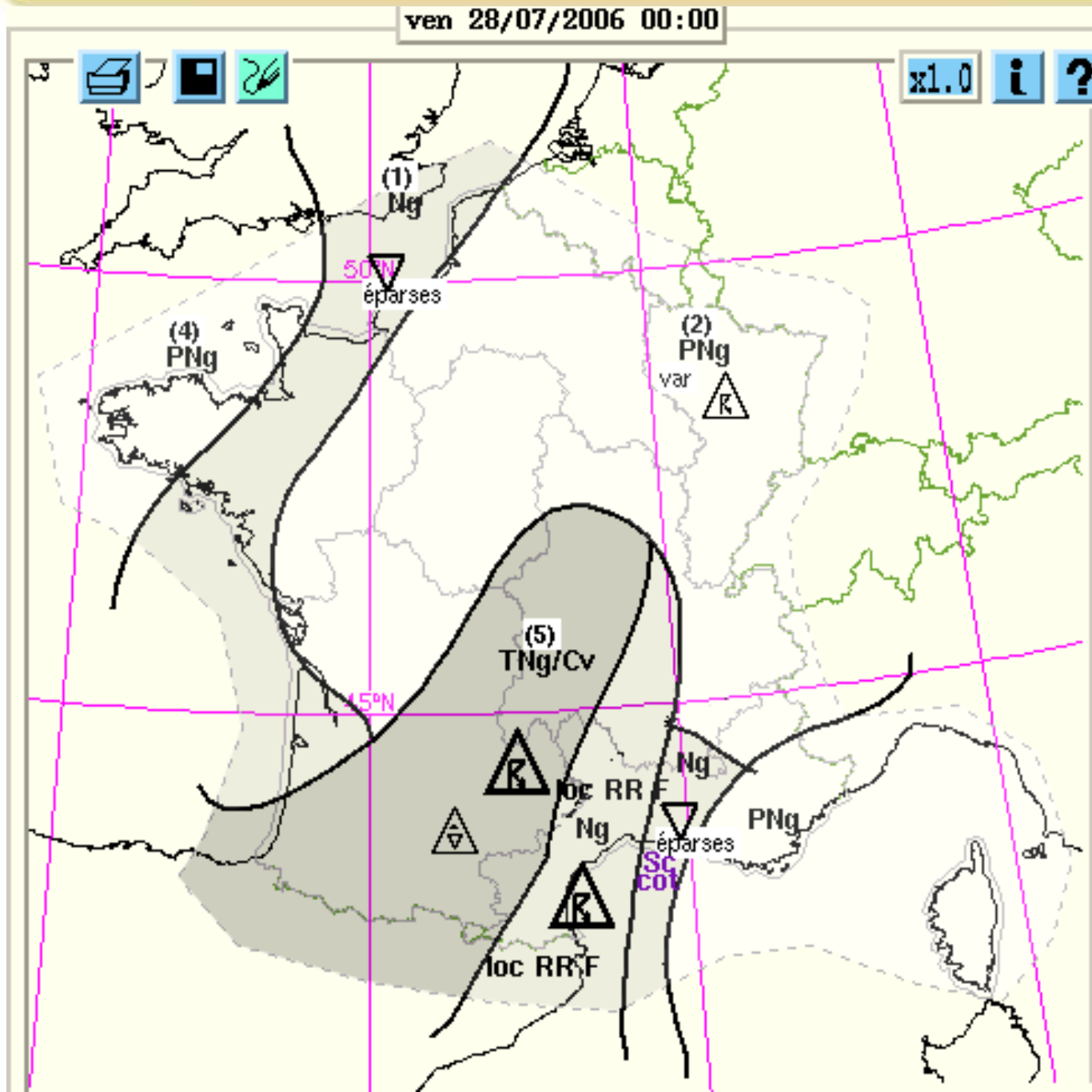
Cooperation



Cooperation experiment – central level



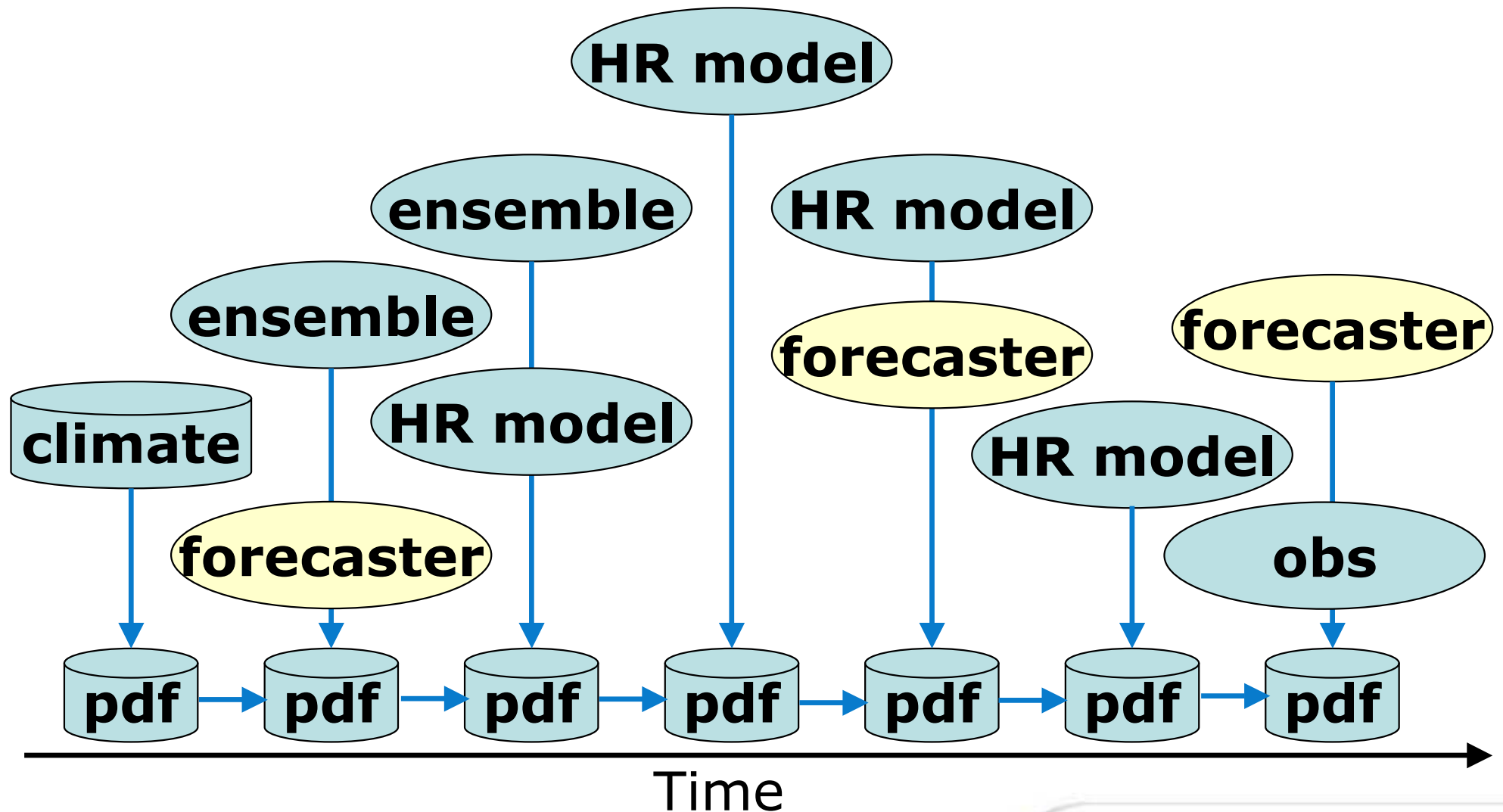
Cooperation experiment – regional level



Future

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

Continuous probabilistic updating



Symposium-3 ?

