EXPLOITATION of ECMWF FORECASTS in Belgium

RMIB

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A. Objective : an operational exploitation of EPS data by the forecasters

WHY?

The operational exploitation by the forecasters of “deterministic” high resolution NWP forecasts is not satisfactory enough at medium ranges (D2 to D10).

-too large unconsistencies are very critical for small regions (as Belgium area)

-no information on the uncertainties (evaluation of risk)

-an operational use and training on EPS exploitation is needed

HOW?

A project has been elaborated in 2008 and is applied from mid-2008 at RMIB to help forecasters to produce operationally medium range forecasts (from D2 to D10) based on EPS data.

-a methodology has been proposed to the forecasters : helpful ?

-no statistical treatment of EPS data are applied

-EPS verifications are very welcome in a near future

B. EPS data operationally available at RMIB

-Ensemble Mean (EM) : a few parameters disseminated
(Z500,T850) + standard deviation

-Plumes for a few upper-air and weather parameters

-Probability charts for a few weather parameters :
e.g. precipitation amounts for two periods (12 and 24 hours)
and 4 thresholds (0.1, 1, 5, 10 mm), not yet for longer periods

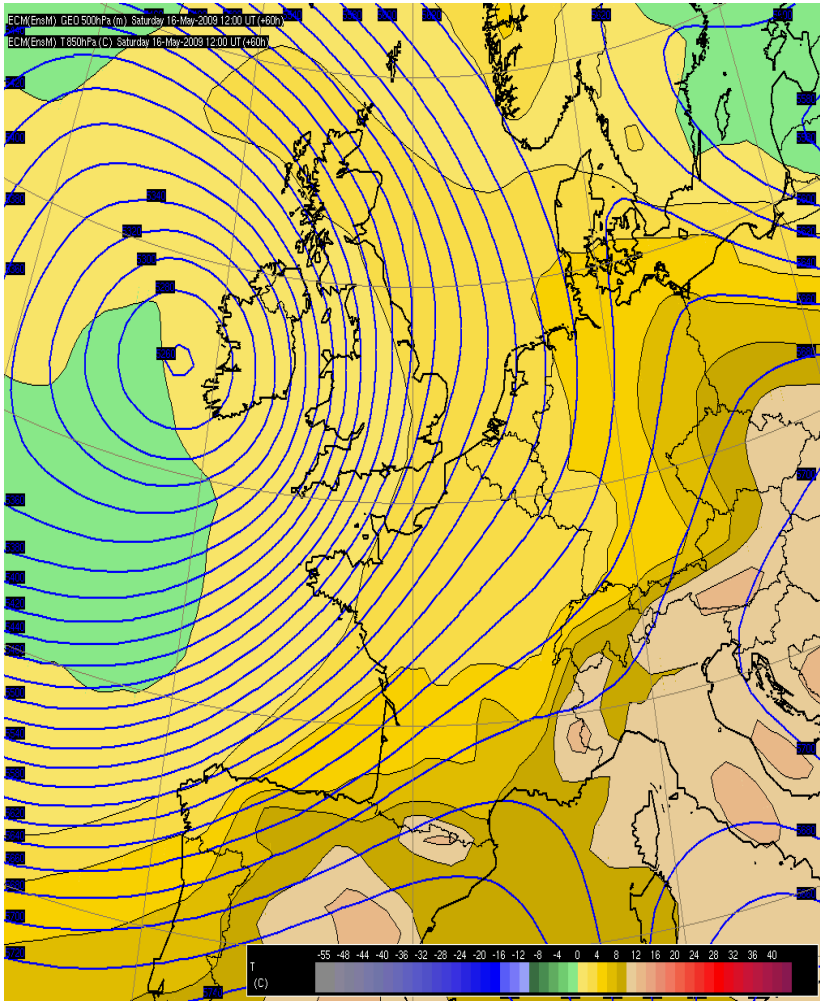
-EPS-grams for a few weather parameters : selected percentiles and median

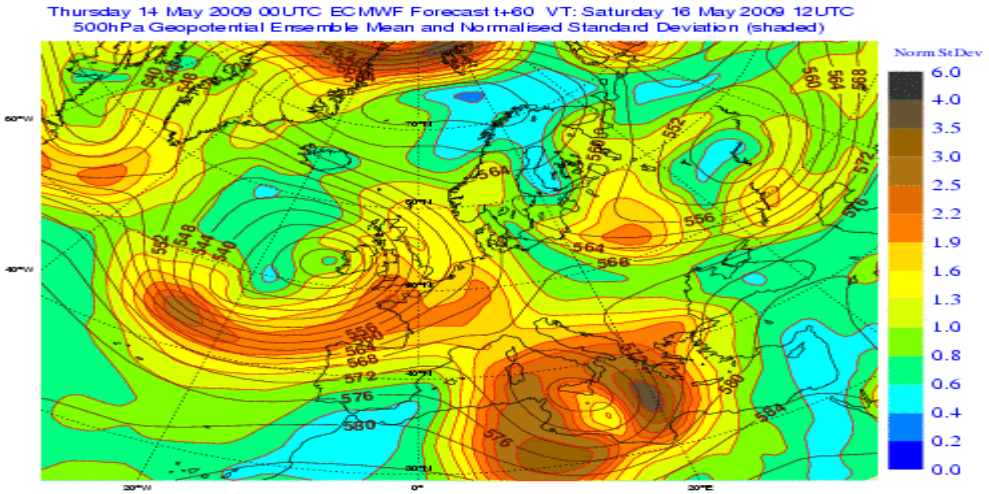
-EPS probability distributions for a few weather parameters :
two successive EPS runs – PDF (Prob. Dist. Function) and CDF (Cumul. Dist. Function)

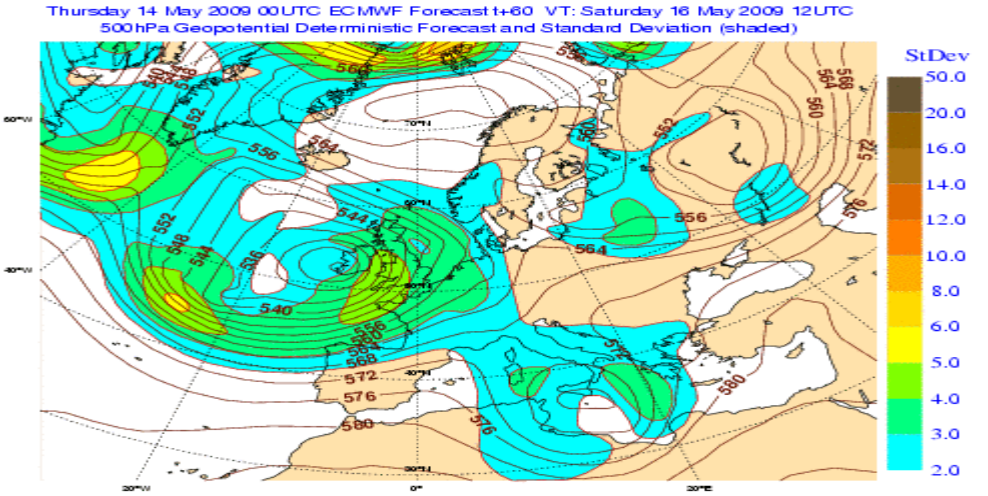
Up to now the amount of dissiminated EPS data is still limited or not always adapted for our requirements

Ensemble Mean (EM) : a few upper-air parameters

(Z500,T850) date 14/5/09 00hZ + 60h Z500 + standard deviation



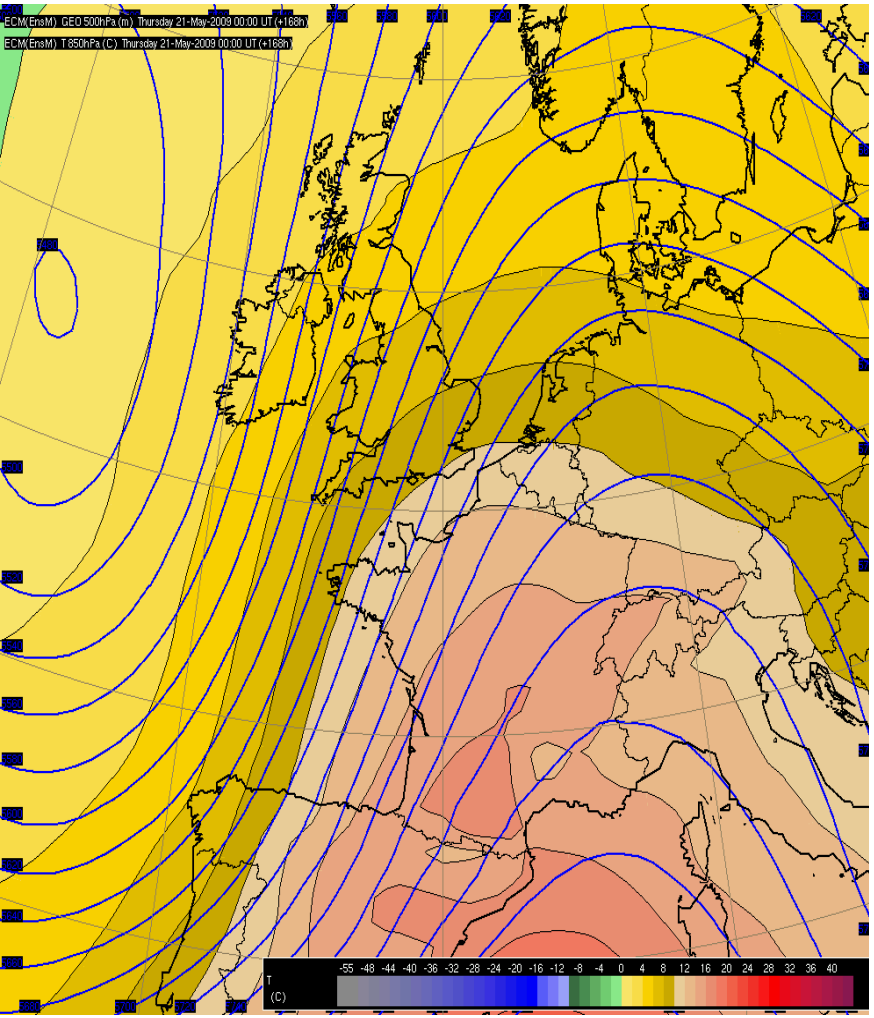


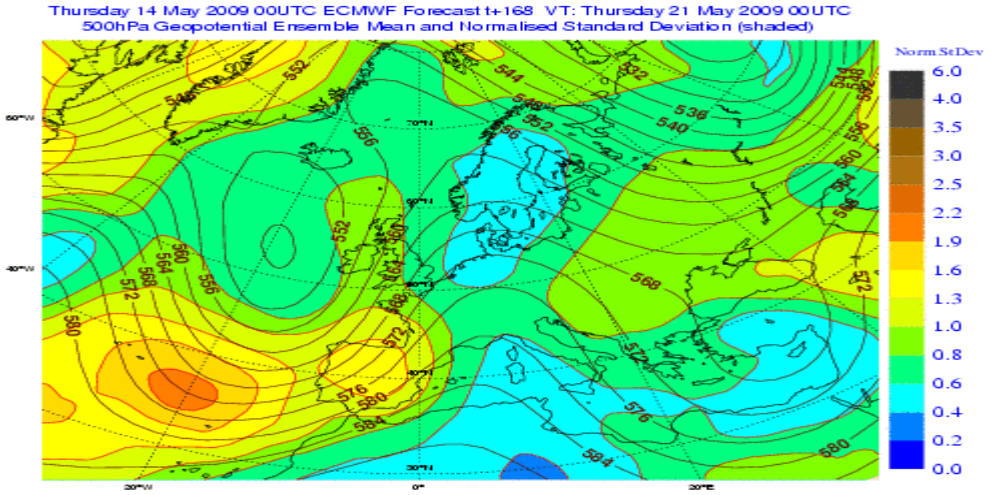


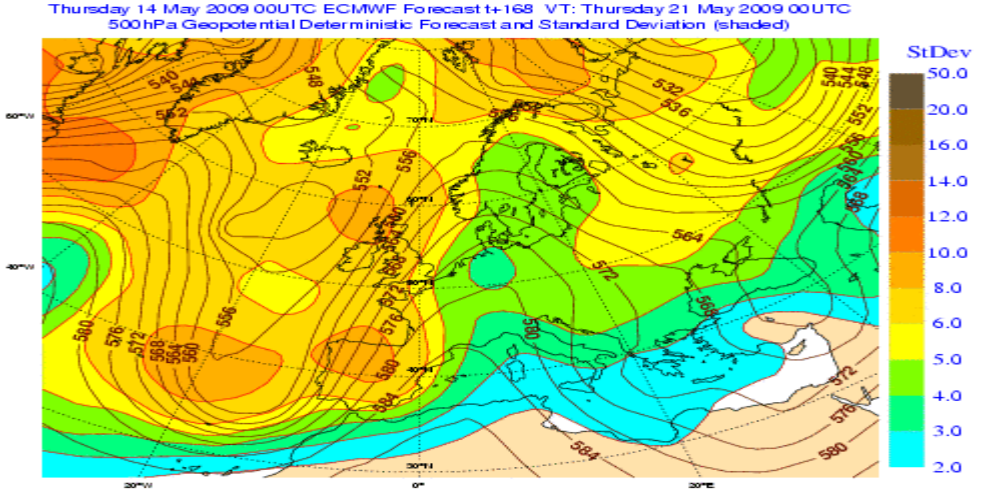
Helpful to identify the main elements (CMs) of the weather situation and their dispersion : here a larger dispersion attached to a main element - a Large Scale near-Atlantic trough

Ensemble Mean (EM) : a few upper-air parameters

(Z500,T850) date 14/5/09 00hZ + 168h Z500 + standard deviation



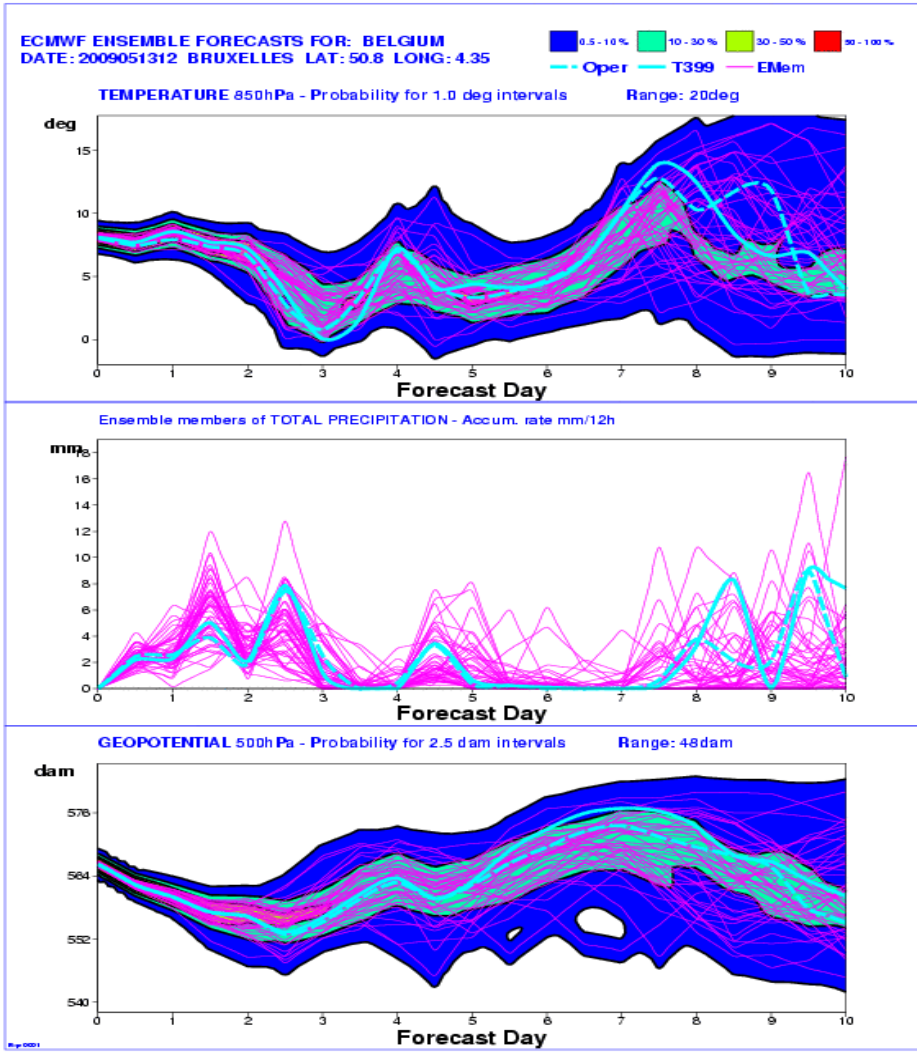


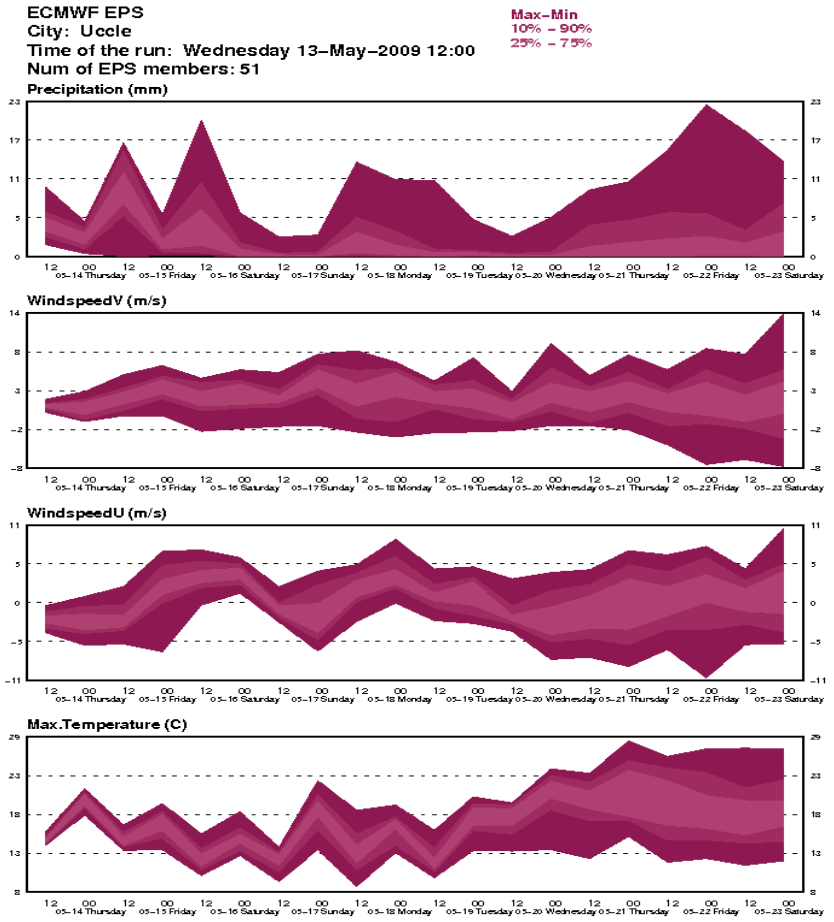


Dispersion can be smaller at longer ranges :
here two main elements (CMs) - near-Atlantic trough and ridge over Central Europe

Plumes for upper-air and weather parameters

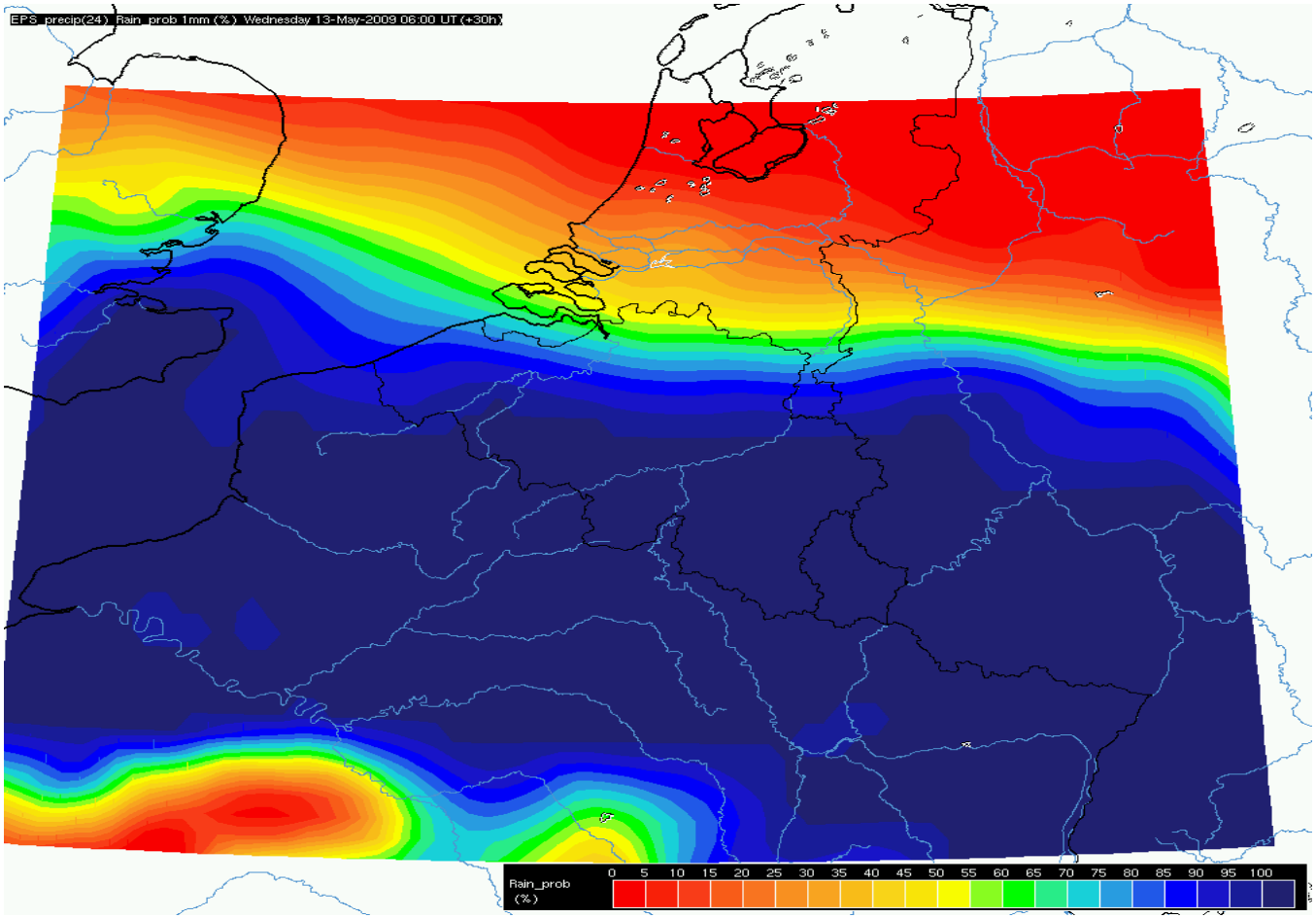
T850 – 12h R - Z500 date 13/5/09 12H00Z Weather parameters





Helpful to correlate the dispersion of local plumes to the dispersion associated to the main elements identified in the weather situation (CMs)

Probability charts for a 24h amount of precipitation > 1mm

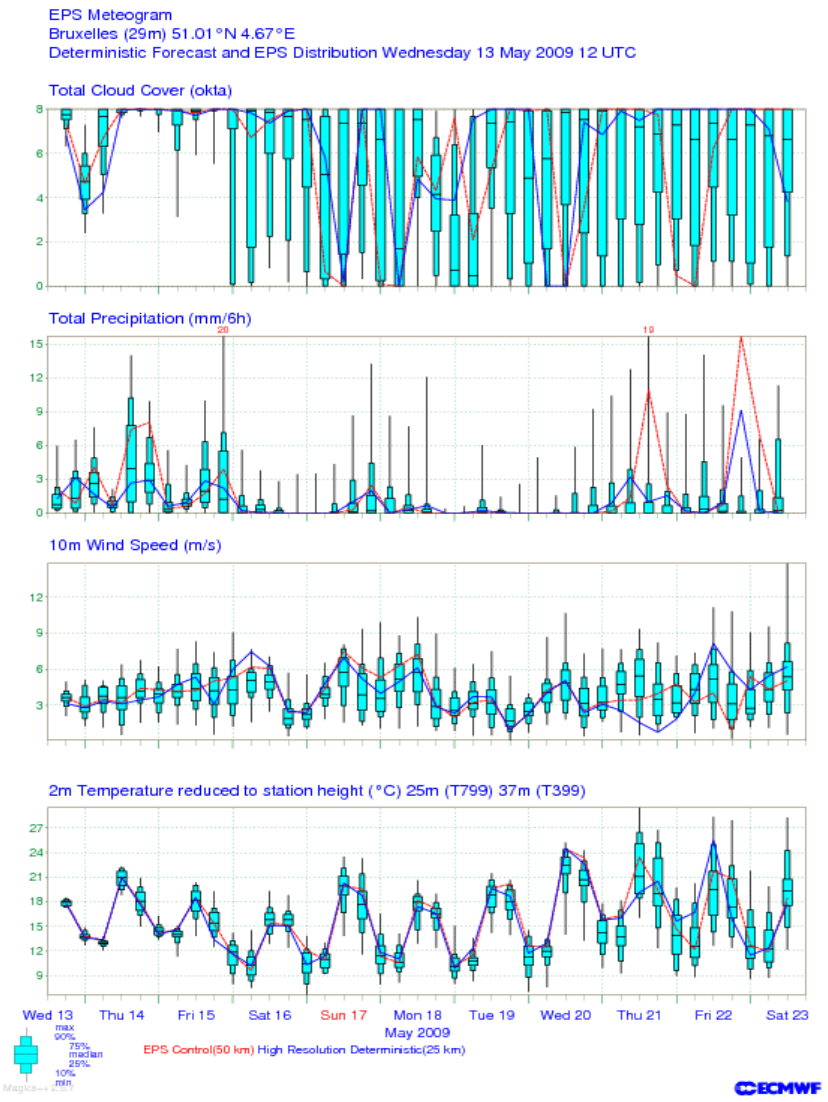


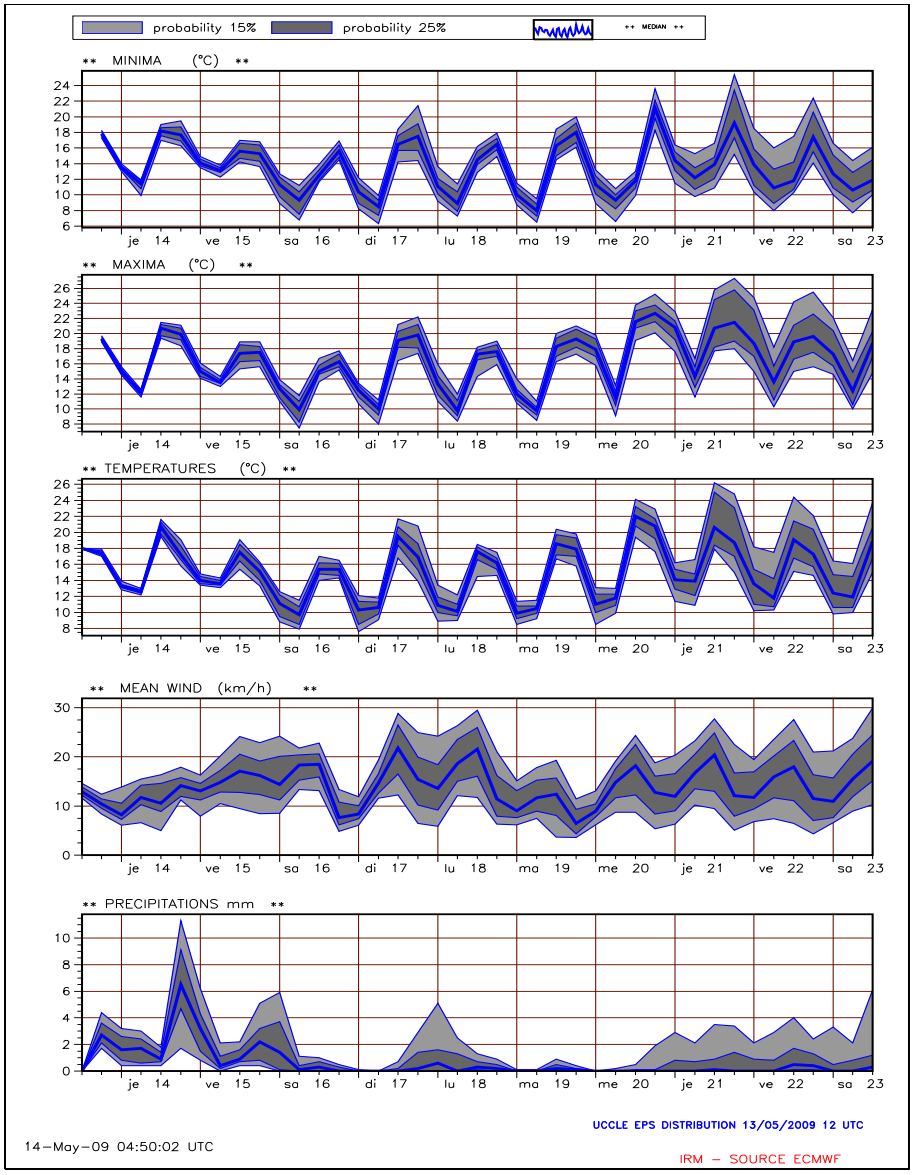
Probability charts built from EPS weather parameters : Red <10% - Green ~60% - Blue > 70%

Helpful for a first estimation of a risk : spatial distribution – choice of threshold

(a 24 hour period could be too short – how to choose the thresholds)

EPS-grams for a few weather parameters

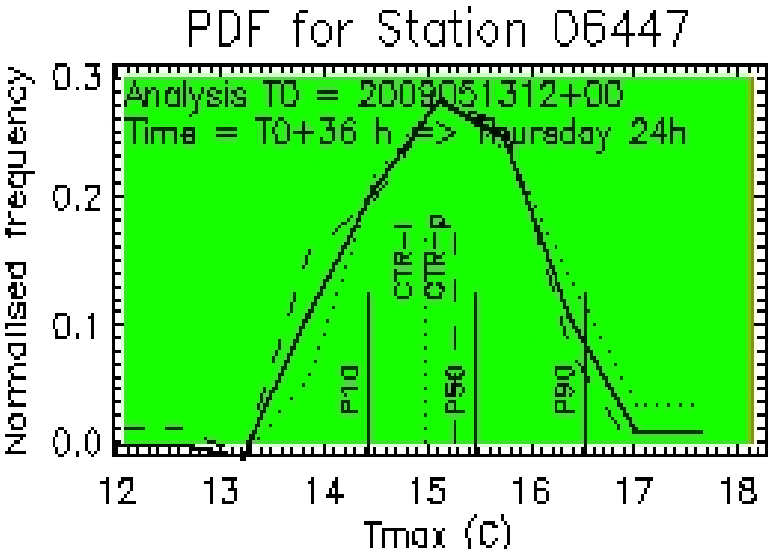


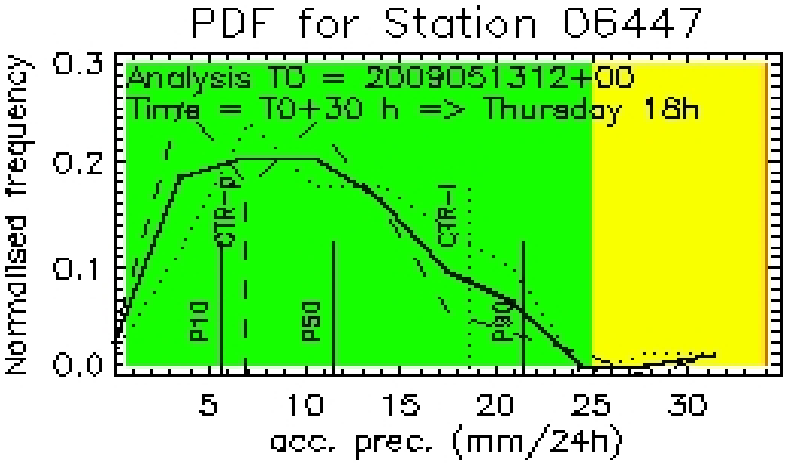


Helpful to estimate an interval of most probable values (if EPS data are consistent)

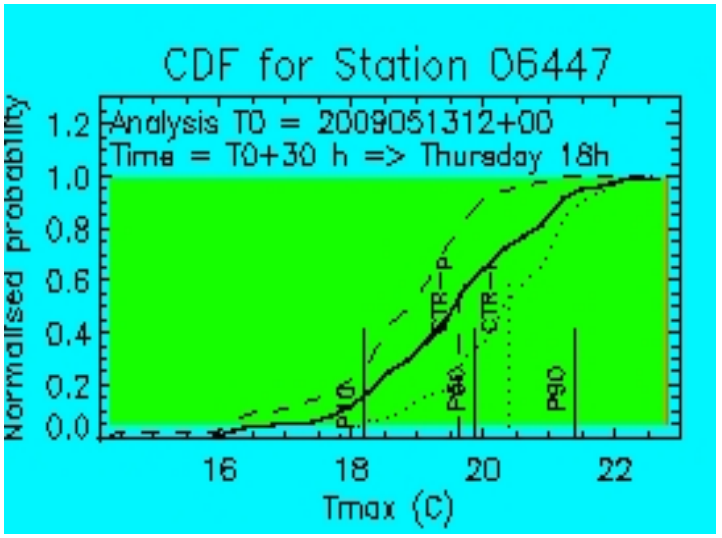
EPS probability distributions for a few weather parameters as Tmax, Precipitation

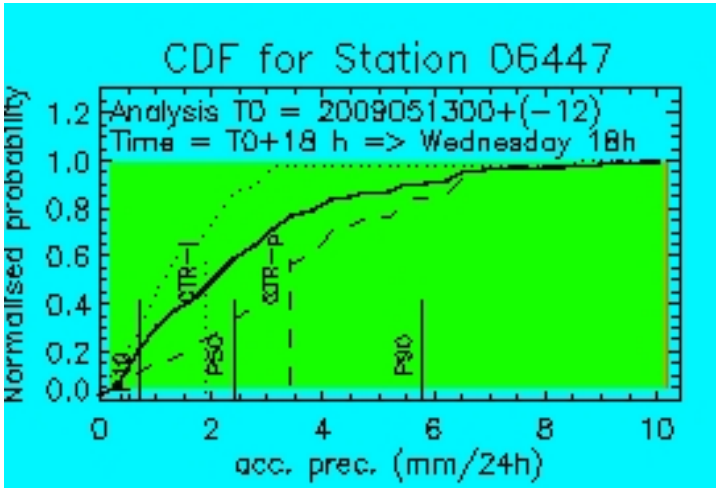
Probability Distribution Function





Cumulative Distribution Function





Helpful to estimate the more probable values and the risks ; even extreme events ?

C. Exploitation of these data at medium range

<u>Two different approaches for the future role of forecasters</u>

either they simply interpret the EPS figures
in terms of probabilities, anomalies, mean return periods,
…for different weather (surface) parameters
or

they try to elaborate a most probable weather scenario (“weather regime”)
linking upper-air and surface major elements (to build CMs)
with indications on their scale and reliability (uncertainties)
the evaluation of risks
the trends in the evolution

But the best solution would be to mix these two approaches to promote more responsabilites and knowledge for the forecasters.
It depends on their formation in meteorology.
It avoids a very damaging automatic approach relying on machines.

Is it relevant to elaborate a more probable scenario ?

a methodology is tested and a few texts are produced operationally

The dispersion on upper-air parameters (Z,T,…) is small
(see EM + small standard deviation, see grouped members
in plumes + consistency with previous runs) :

→ main elements (CMs) are identified : e.g. H/L, troughs, ridges, advections...
→correlation between parameter trends are strong at upper-air and surface levels
→the more probable values of the weather parameters are estimated
→the risks can be estimated

EXAMPLE OF SITUATION

advection of dry and cold continental air associated to the
building of a large scale High pressure which tends to be stationnary
over our areas at medium range

A more probable scenario can be described on the period or a part of it

but on the opposite with a large dispersion…

-EM is no more representative of the evolution
-unconsistencies can be high
-major scales can be small (mesoscale situation)
or large variabilities in the synoptic “regime”
…
It’s very difficult to elaborate a more probable scenario
(large uncertainties on a “weather regime”, trends, timings,…
impacting the most probable values of the weather parameters)

EXAMPLE OF SITUATION

a convective situation associated to a complex depression
or
successive frontal systems associated to dynamic depressions

Is it relevant to add alternative scenari

The tests show that it's difficult to build another scenarion an "objective" way.
Nevertheless comments relative to the variability of the situations can be reflected in a text to bring more nuances to the most probable scenario (a confidence index).

-if the dispersion is large clustering and tubing are not satisfactory enough (except a "nice" bifurcation)

-even if the dispersion is small different scenari are possible and cannot be easily discriminated

In these situations the expertise of forecasters can be helpful (if the successive EPS data are consistent enough).

The nuances can be reflected in a confidence index associated to the most probable scenario.

an exchange of more “technical” information is organised

Forecasters take advantage of this “technical” information to discuss their choice of a most probable scenario and their evaluation of the attached confidence index :
-choice of more relevant EPS data to build the most probable scenario
-sources of uncertainties (timing, localization, amplitude,…)
-their estimation of a confidence index

This discussion is reflected in a technical text.

It is very helpful to communicate this information to keep a continuity between the successive forecasts (different teams of forecasters) and to elaborate an objective verification of the EPS

Building of an EPS table

The elaboration of quantitative medium range forecasts for a few weather parameters and a limited number of stations has been tested.

-period D2 to D10
-TN, TX, (mean) Wind, precipitation probabilities (binary: yes/no)
-3 stations : Oostend – Bruxelles – Saint-Hubert
at a mean distance of 100 km
respectively close to the seaside, in a rather flat central area
and in a higher and more hilly area

A median value and an interval of more probable values are given by the forecasters for each day of the D2 to D10 period.
These values must be consistent with the more probable scenario.

Is it still relevant to keep a “deterministic” table (1 value) for medium range forecasts even if some users ask for it

D. Perspectives - comments

a “home” treatment of a set of EPS data must be elaborated for the forecasters for our regions (at relevant scales) :

-for weather parameters (probability charts, …) not only on a daily base but also for longer periods

-for a better estimation of the dispersion ; e.g. around the Ensemble Mean (EM)

-for a better discrimination of a sequence of “weather regimes” (first to be identified)

-for meteorological warnings (pre-alerts)

-to start an objective verification of EPS products (direct products and products elaborated by yhe forecasters)

Main Question : to which extent can the forecasters interpret the EPS data and commentate on the EPS to give additional information