Prévision d'ensemble

- le chaos atmosphérique
- modélisation stochastique
- applications
- prévision saisonnière

Prévision d'ensemble

But : produire une prévision stochastique (=qui reflète nos incertitudes)
Prévision d'ensemble: échantillonage discret de la loi de probabilité de prévision. On lance *q* prévisions perturbées en parallèle (*q*~50)

Par exemple avec $A=L\,L^T$, si l'on tire aléatoirement u suivant la loi Gaussienne, alors la prévision perturbée $v=x_a + Lu$ suit la loi de probabilité d'analyse impliquée par A (matrice de covariances d'erreurs d'analyse)

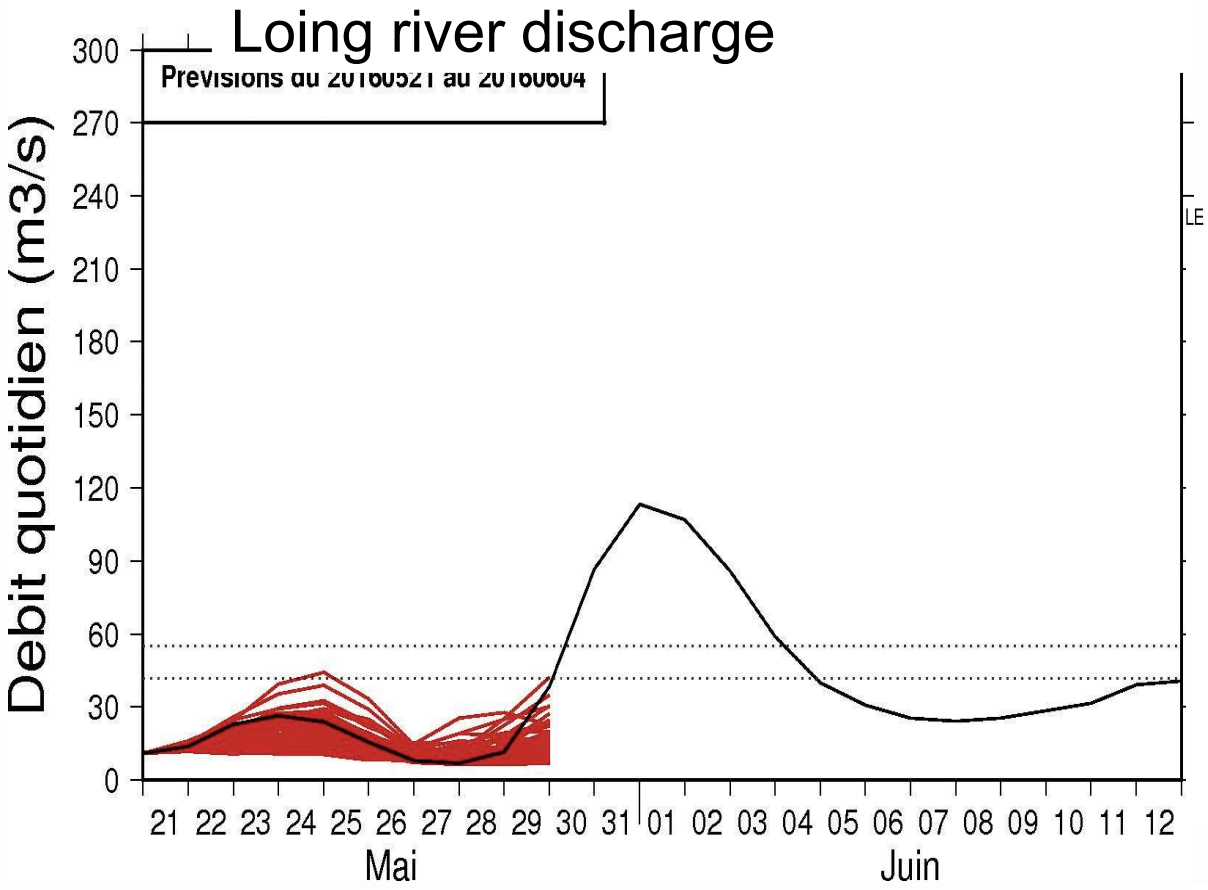
donc M(v) suit approximativement la loi de probabilité des erreurs de prévision

Le calcul d'un petit ensemble $M(v_i)$, i=1...q coûte q fois la prévision d'un modèle.

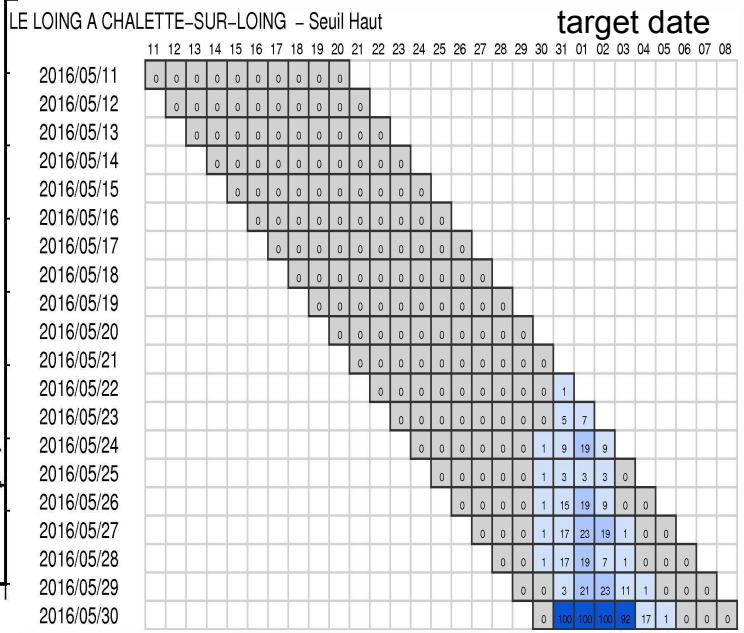
Uncertainty in slow-flood prediction

flood forecasts, 10 days ahead

hydrological model forced by atmospheric ensemble



Location-specific impact forecasts



Uncertainty in flash-flood prediction

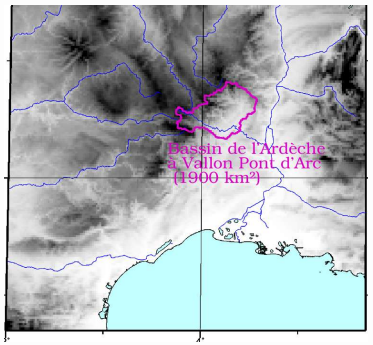
various hydrological models, forced by atmospheric ensemble

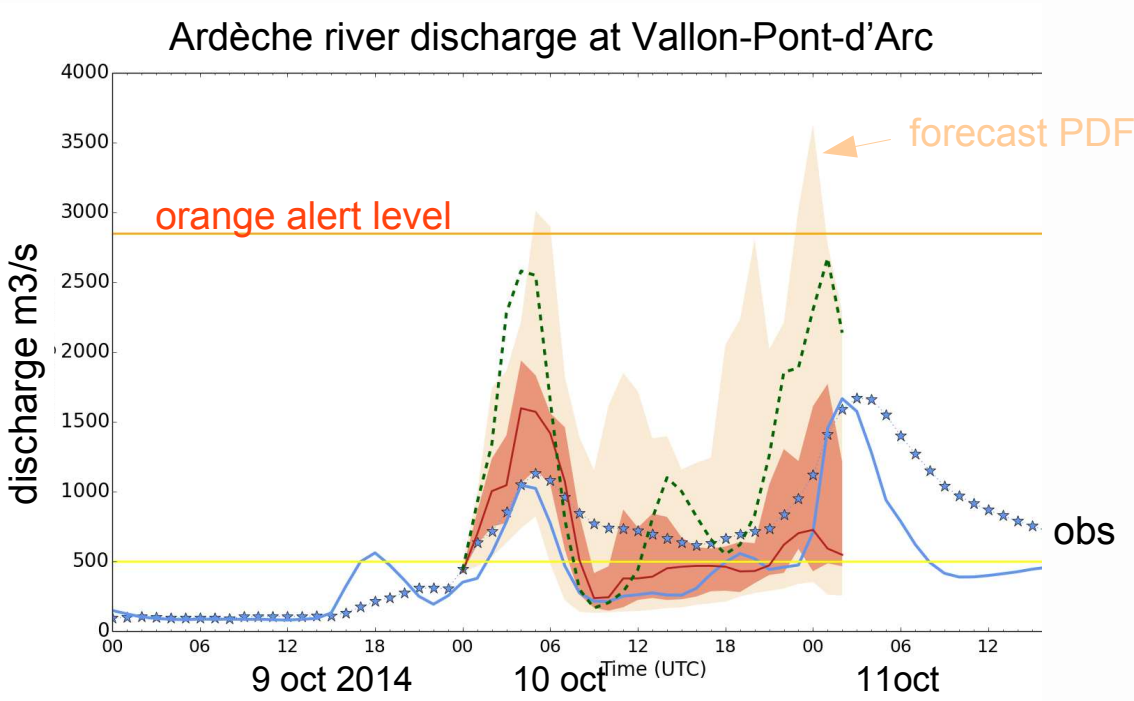
Arome-EPS
meteorological
ensemble prediction

rainfall ensemble

ISBA-TOP
surface-hydrological
flash flood
ensemble prediction

perturbations to parameters
of the hydrological model





measured discharge

deterministic ISBA-TOP simulation driven by radar

deterministic ISBA-TOP driven by Arome-France

ISBA-TOP ensemble median, driven by Arome ensemble

ISBA-TOP ensemble 25-75 % quantiles

ISBA-TOP ensemble min-max

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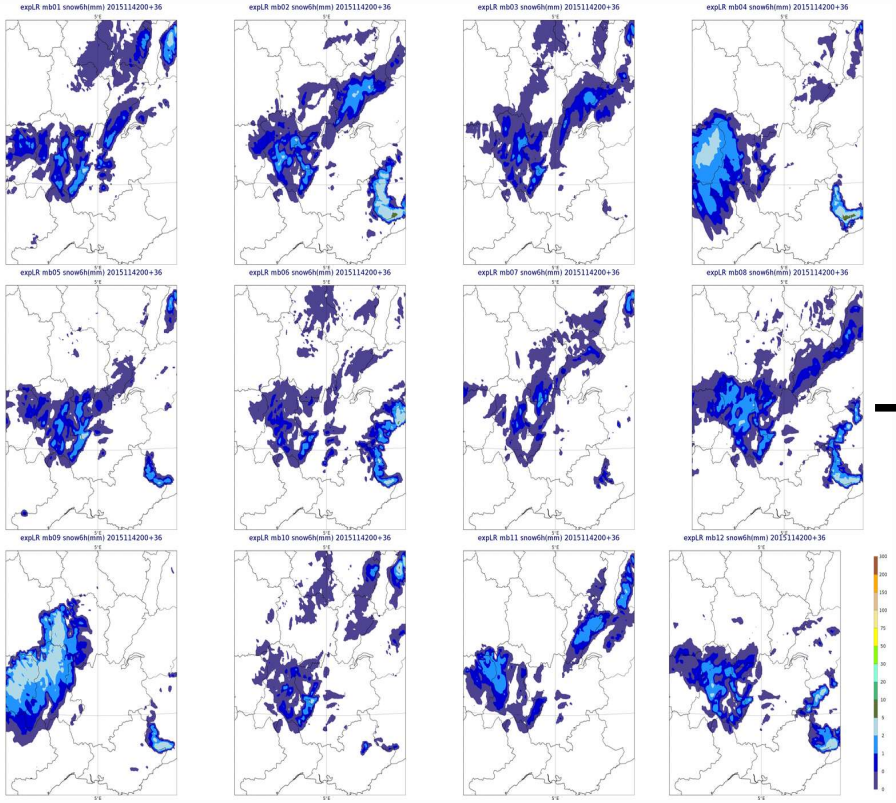
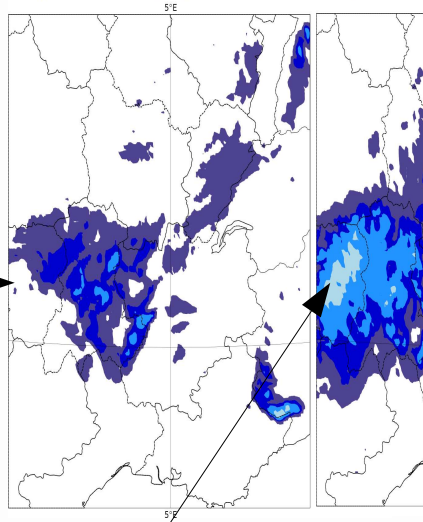
Arome-EPS : sample snow forecast

raw ensemble: 12 members

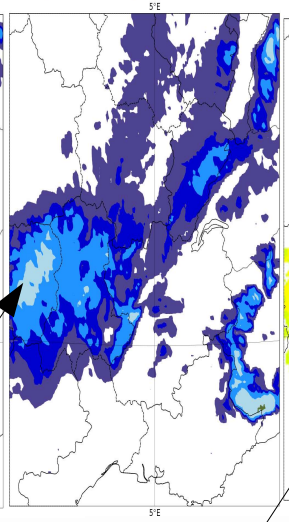


probability maps :

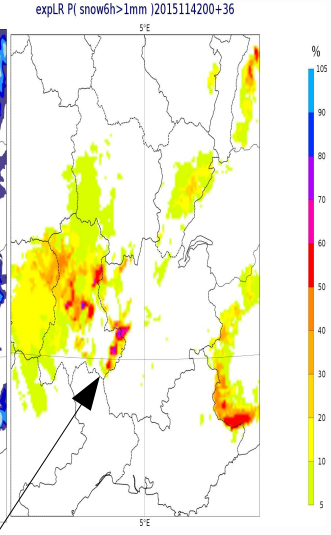
median,



Q85,



prob(x>a)



small probability
of heavy snow

high probability
of light snow

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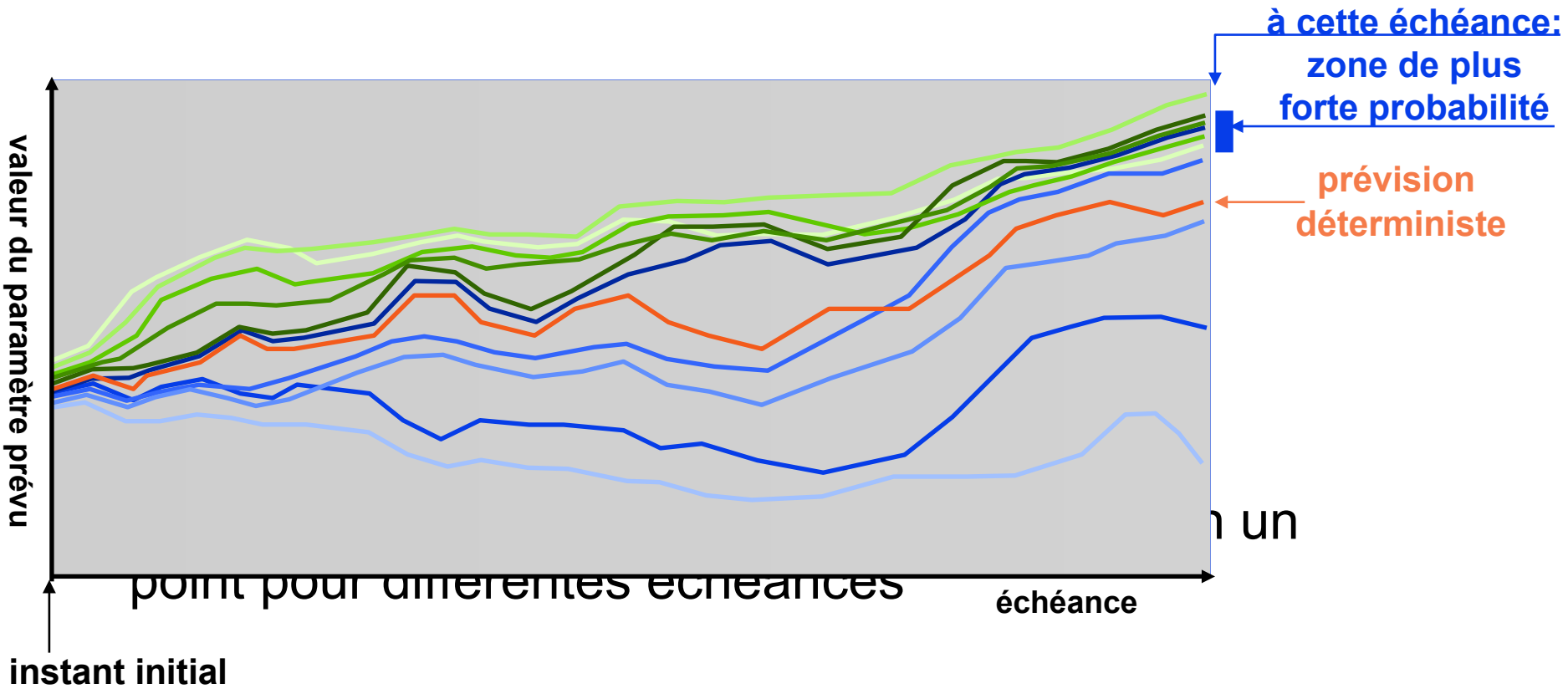
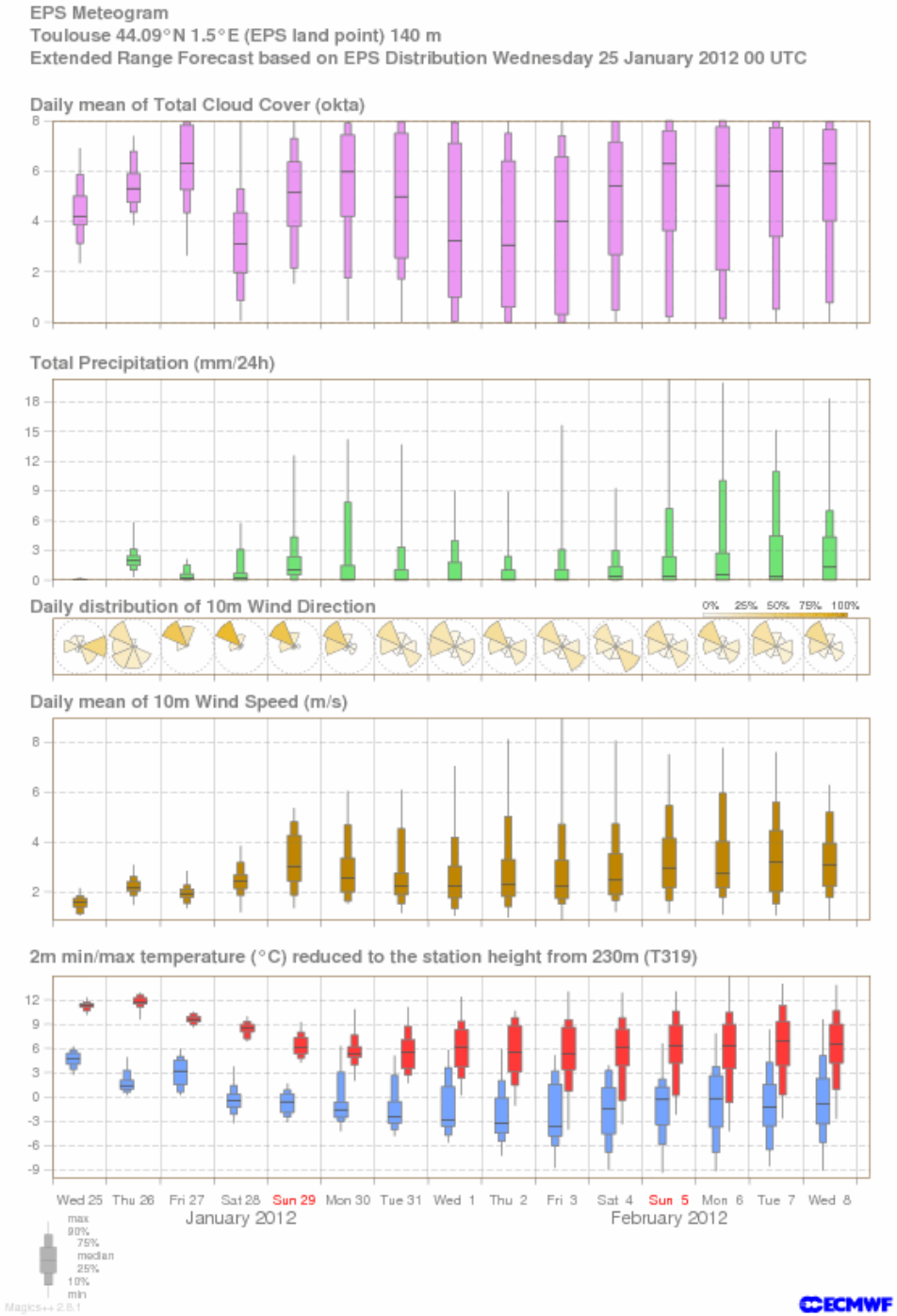
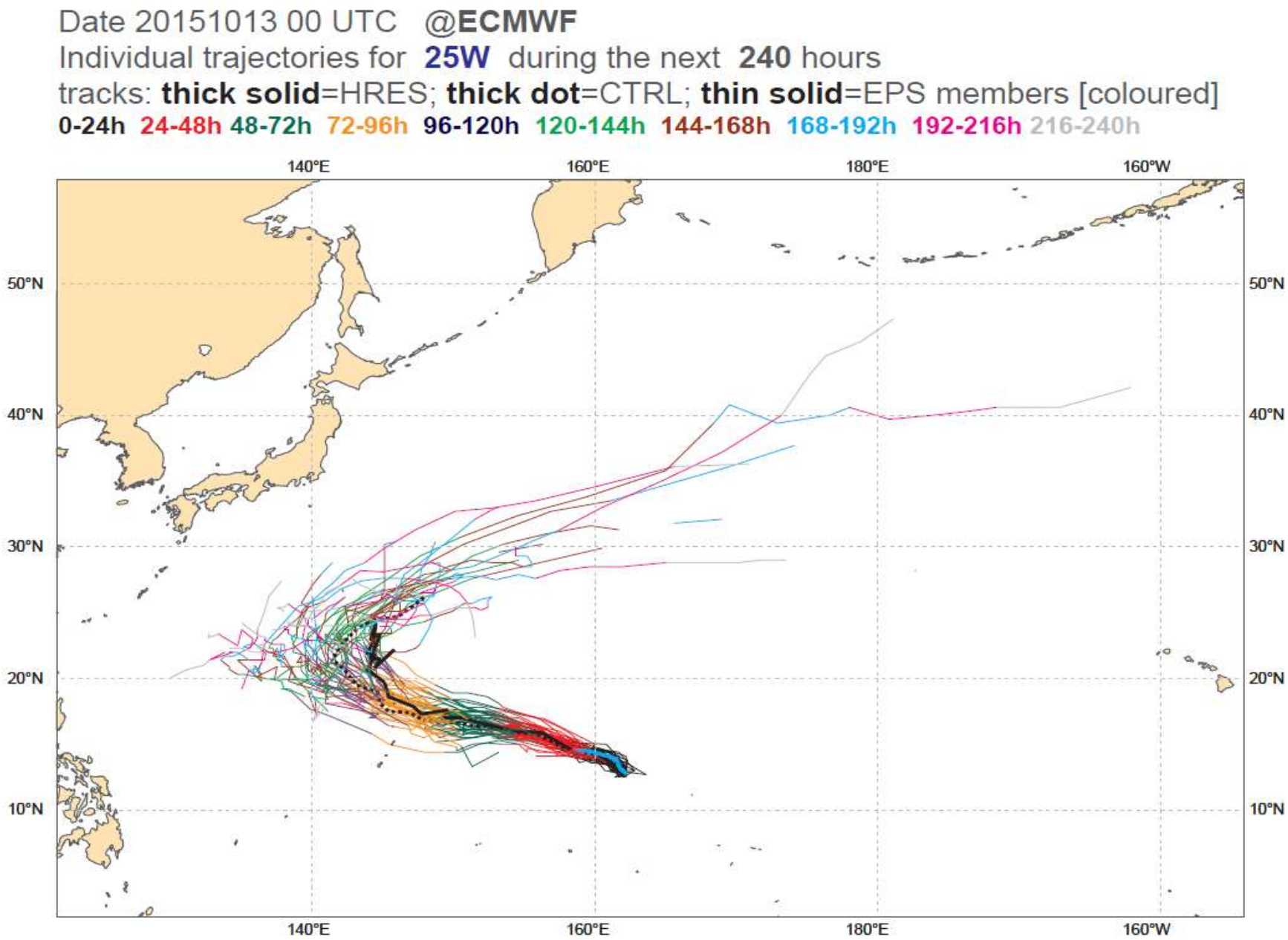
exemple de produit de prévision d'ensemble



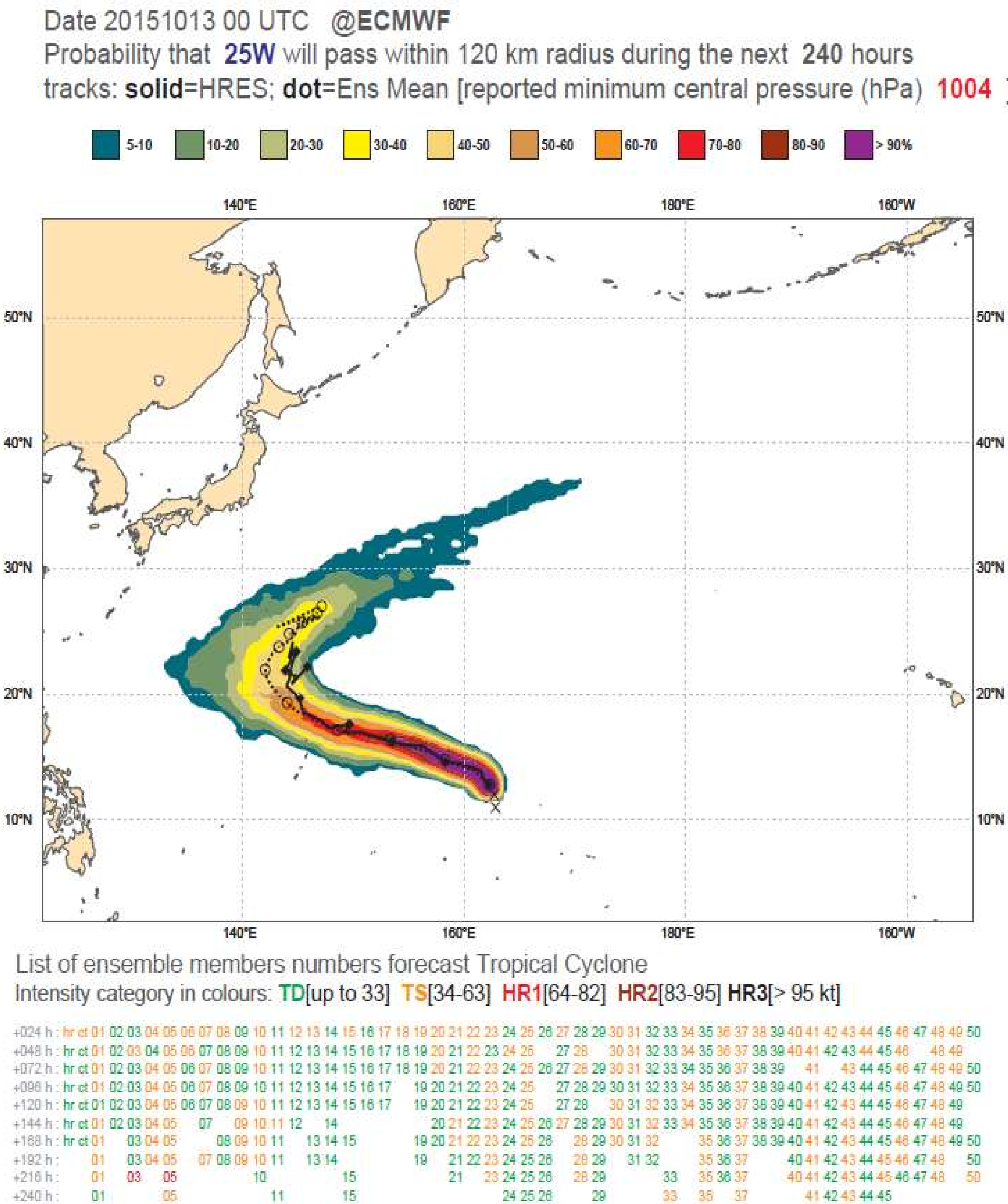
exemple de produit de prévision d'ensemble

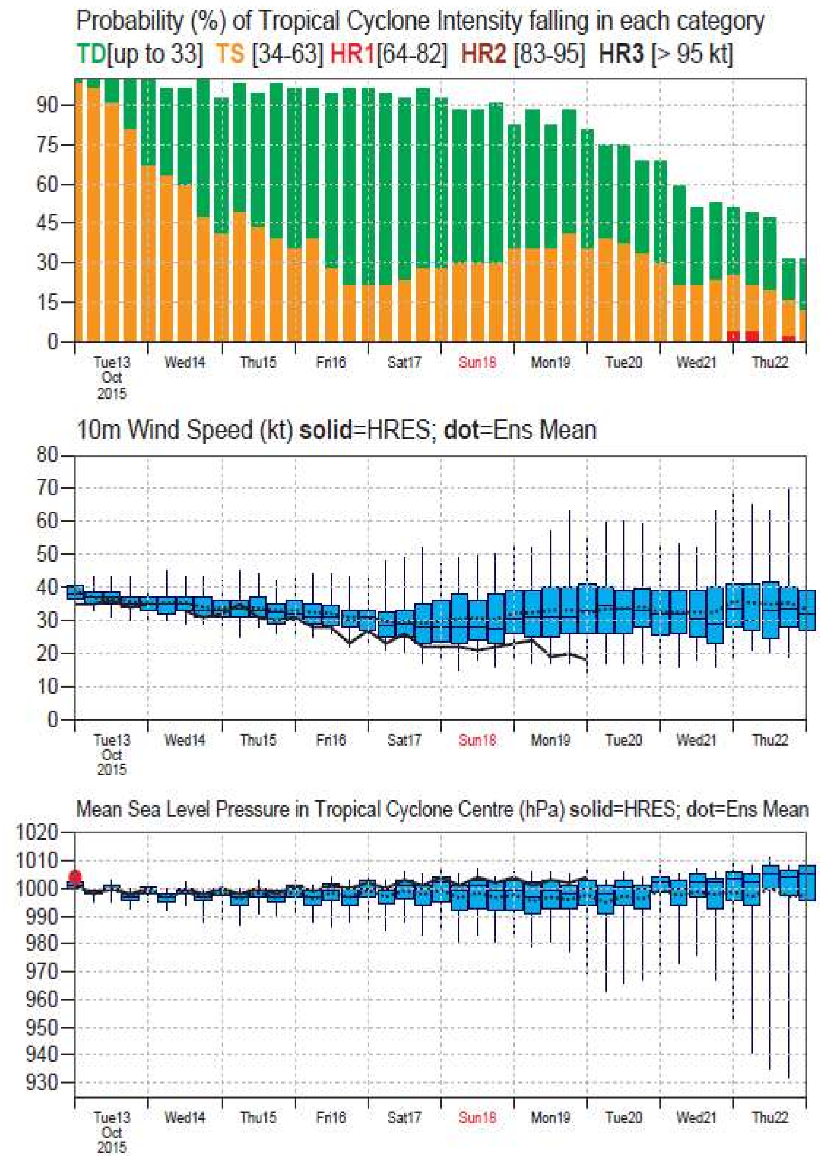


prévision cyclonique par un ensemble



prévision cyclonique par un ensemble

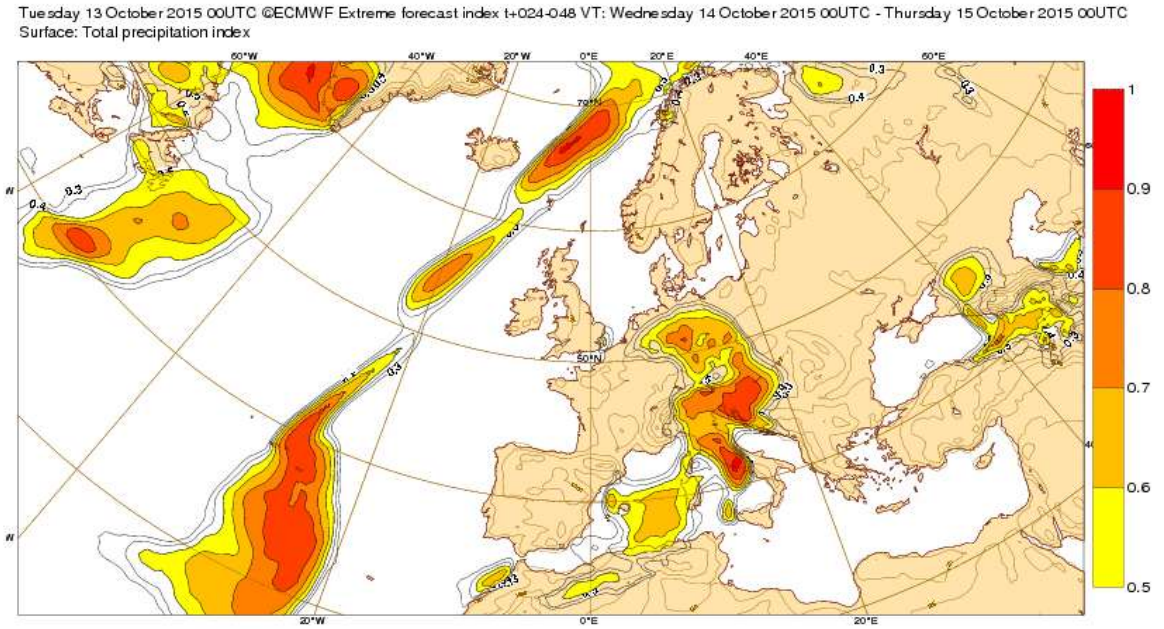




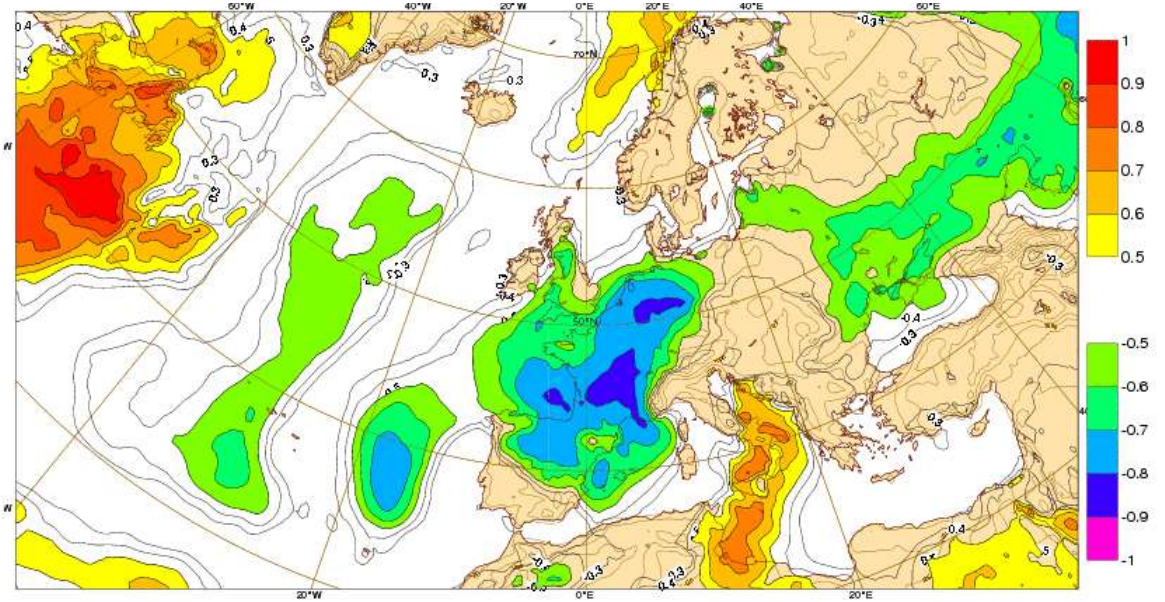
prévision d'extrêmes climatiques par des ensembles

probabilité que la prévision soit dans un quantile extrême du climat en chaque point

pluies

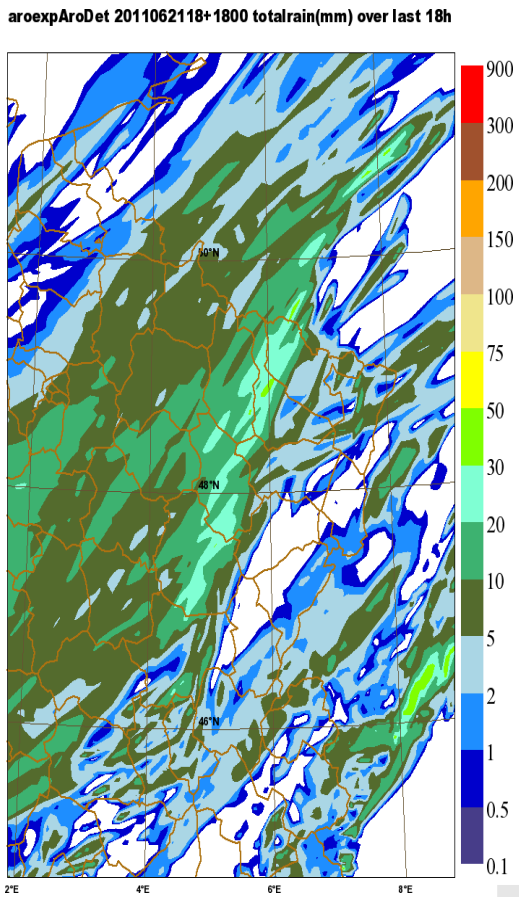


température

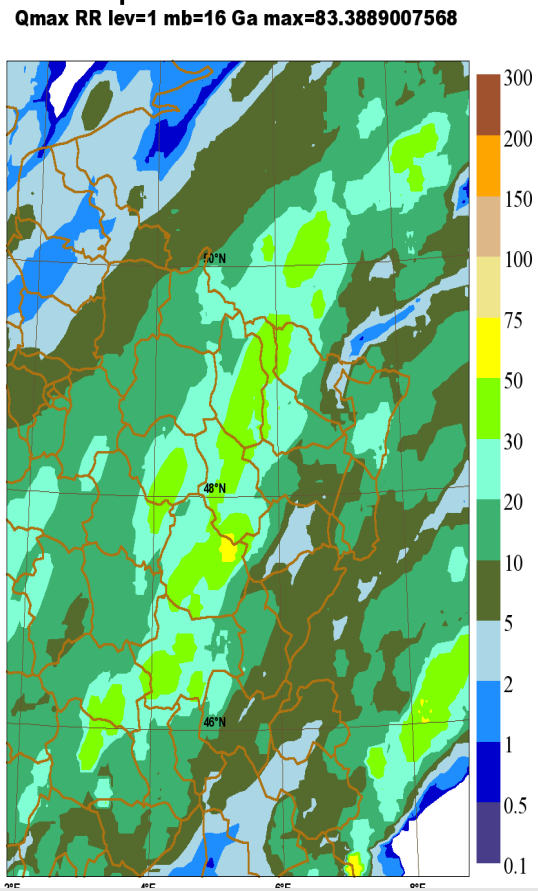


Exemple: probabilités de pluies en chaque point un jour d'orage: phénomène intense, mais localisation peu prévisible

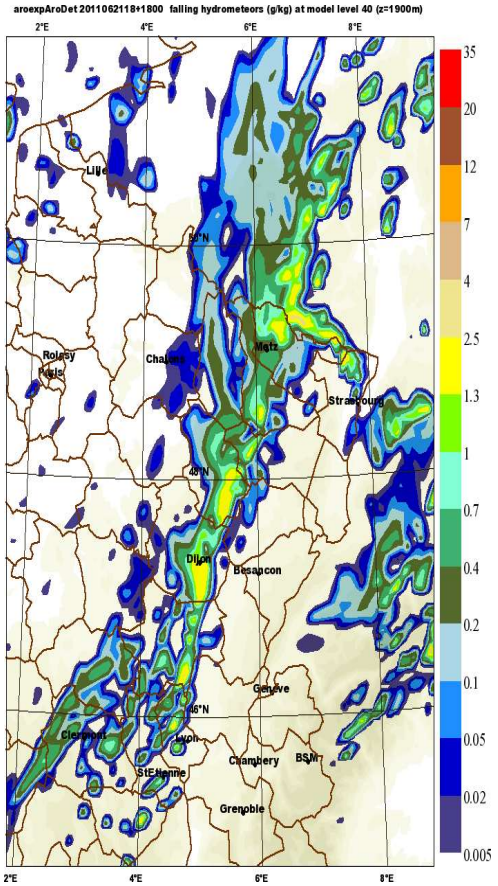
cumul sur 18h déterministe



cumul sur 18h proba>10%



précip instantanée



quantile Q90 de la distribution de la prévision d'ensemble

Arome-ensemble research: warnings of dangerous small-scale events

case study :

small-scale intense raining cells with high spread

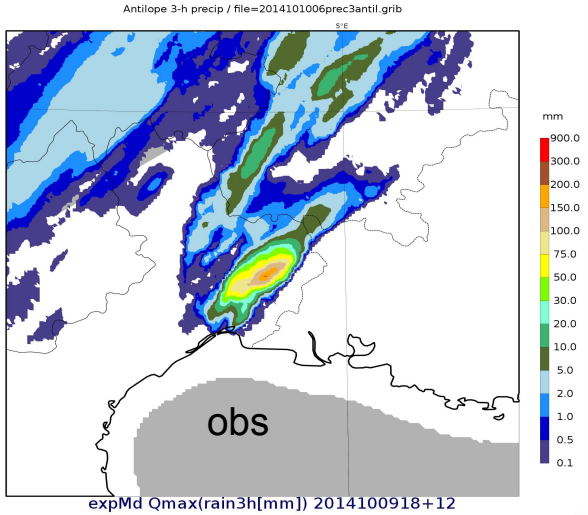
location/timing uncertainties can hide probabilities

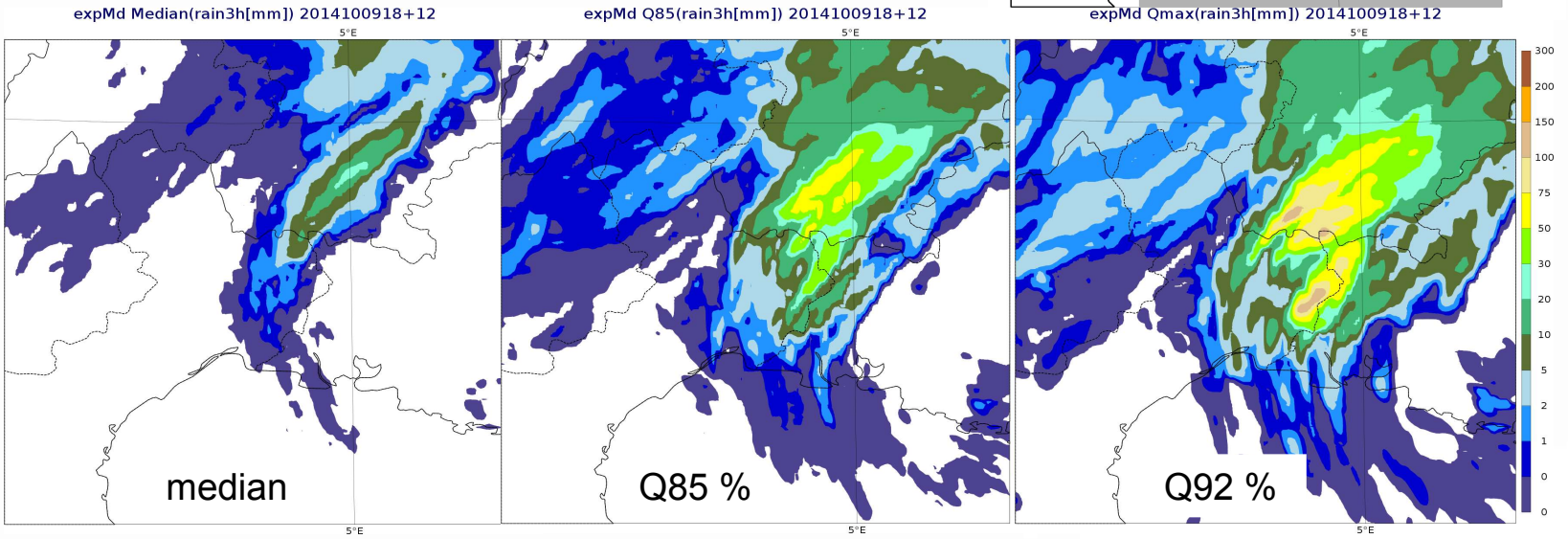
decision-making needs to choose a cost/loss ratio (~false alarm tolerance)

the most likely forecast is not the most useful !

Three points of view

on the same rain event :





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Merci pour votre attention

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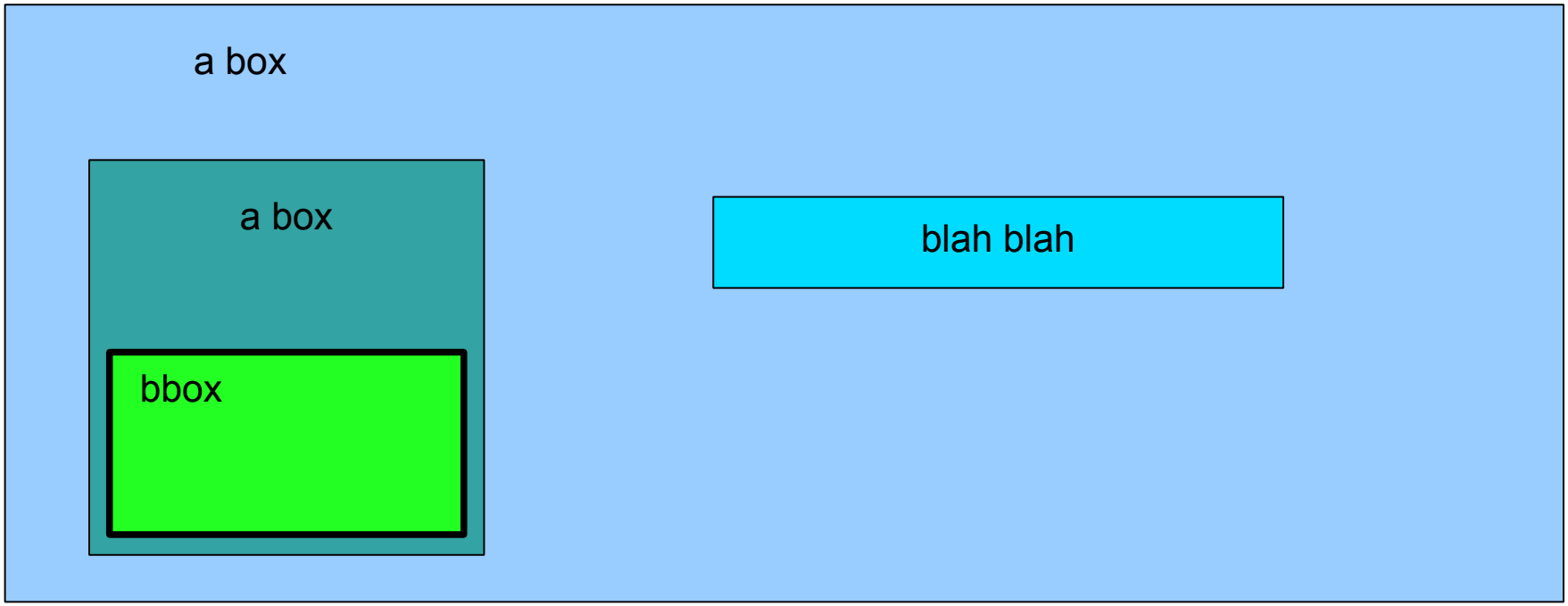
some text



more text

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