Recent activities related to EPS (operational aspects)

Chiashi Muroi

5-9 Nov. 2012, Toulouse

WGNE-28

Outline

- Global EPS activities and verifications
- Regional EPS activities

Operational global (weather) EPS

Center	Resolutions	FC Range	Members	Initial perturbation	Model Uncertainty	B.C.
ECMWF (Europe)	TL639L62 TL319L62	10d +5d	51	SV(Total energy norm) + EnDA	SKEB and Stochastic physics	N
Met Office (UK)	~60kmL70	15d	24	ETKF (Ensemble Transform Kalman Filter	Random Parameters (RP2) and Stochastic Kinetic Energy Backscatter (SKEB2).	N
Meteo France (France)	TL538(C2.4) L65	4d	35	SV (Total Energy Norm)+ EnDA	different packages, randomly used	N
HMC (Russia)	T85L31 +T169L31, +0.72x0.9L28	10d	13+1+1	?	?	?
NCEP (USA)	T254L42 T190L42 <- T190L28	8d +8d	45	Ensemble Transform with Rescaling	stochastic perturbation to account for random model errors	N
Navy/FNMOC/NRL(USA)	T159L42	16d	20	local ensemble transform with transform performed in 9 latitude bands	N	?
CMC (Canada)	0.9° L28	16d	20	Ensemble Kalman Filter	stochastic Perturbation of Physical Tendencies and stochastic Kinetic Energy Backscatter.	N
CPTEC/INPE (Brazil)	T126 L28	15d	15	EOF-based perturbation	N	N
JMA (Japan)	TL319 L60	9d	51	SV(Total energy norm)	Stochastic perturbation of physics tendency	N
CMA (China)	T213 L31	10d	15	bred vector method	N	N
KMA	~40kmL70	10d	24	ETKF (Ensemble	Random Parameters (RP2)	N

WMO/CBS EPS verification

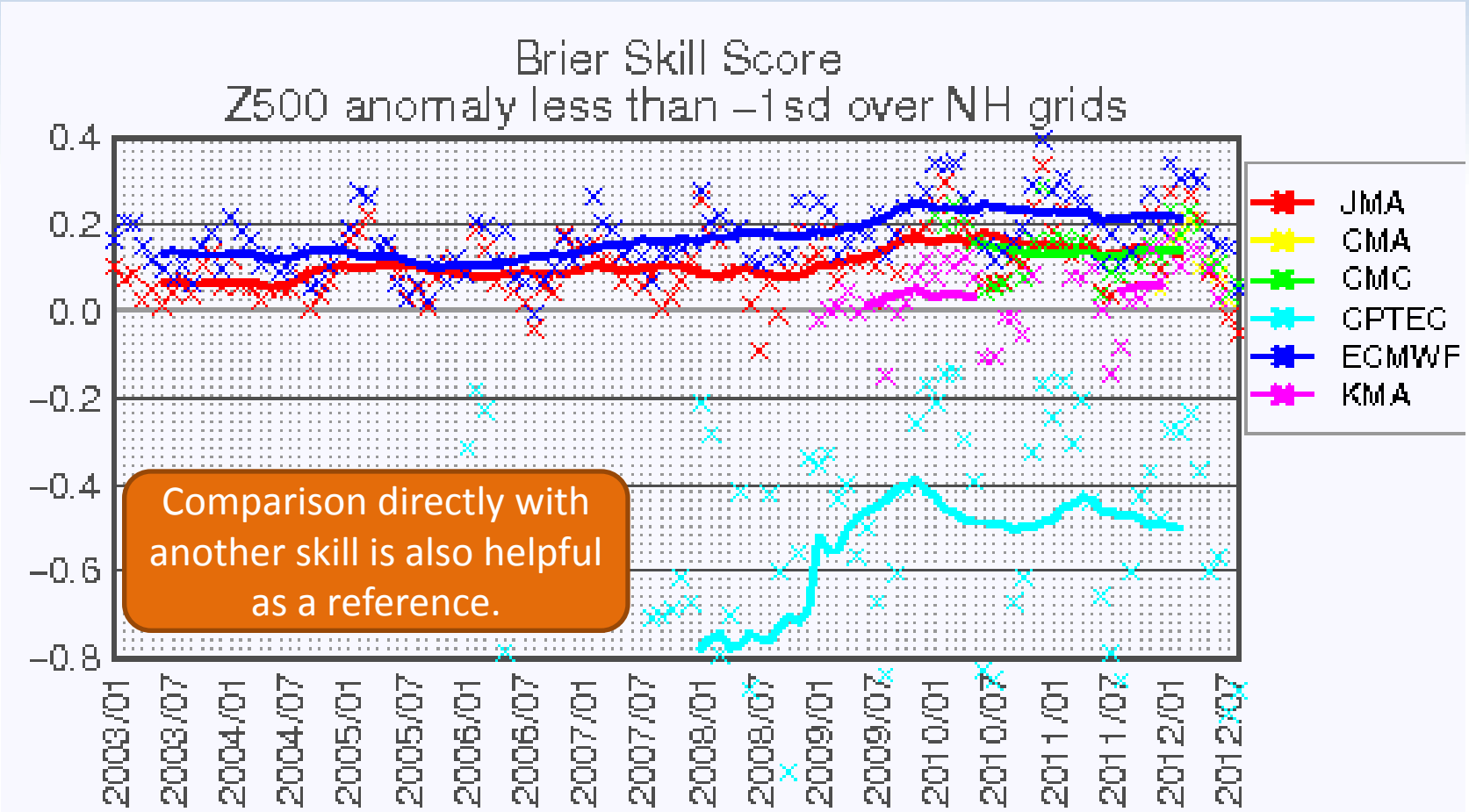
- CBS EPS verification reports are available at http://epsv.kishou.go.jp/EPSv/.
  - The data are published by JMA as the CBS Lead Centre on verification of EPS.
  - The data are based on monthly verification statistics uploaded by eight EPS producing centres:

    CMA (China), CMC (Canada), CPTEC (Brazil) , ECMWF (Europe), JMA (Japan), KMA (Korea), NCEP (USA), and RUMS (Russia)
  - Exchanged parameters are still limited.
  - The exchange of CRPS, which was defined as a new score, has started up quickly.

Published verification parameters

Verification statistics		CMA	CMC	CPTEC	ECMWF	JMA	KMA	NCEP	RUMS
Determinist	Z500 (500hPa geopotential height)	200911 –	•	200601 –	200301 –	200301 –	200901 –	200906 –	•
	T850 (850hPa temperature)	200911 –	•	200601 –	200301 –	200301 –	200901 –	200906 –	•
	PMSL (pressure at mean sea level)	•	•	200601 –	200306 –	200301 –	200901 –	200906 –	•
CRPS parameter	Z500	201110 –	•	201201 –	200301 –	200609 –	201103 –	200906 –	•
	T850	201110 –	•	201201 –	200301 –	200609 –	201103 –	200906 –	•
	PMSL	•	•	201201 –	200301 –	200609 –	201103 –	200906 –	•
	W850 (850 hPa wind speed)	•	•	•	200301 –	200609 –	201103 –	•	•
	U850 and V850 (850 hPa u and v wind components)	•	•	•	200301 –	200609 –	•	200906 –	•
	U250 and V250 (250 hPa u and v wind components)	•	•	•	200606 –	200609 –	•	200906 –	•
	24-hour accumulated precipitation	•	•	•	201001 –	•	•	•	•
Probabilistic parameter	Z500 anomaly ±1, ±1.5, ±2 standard deviation with respect to a centre-specified climatology	201112 –	201001 –	200708 –	200301 –	200301 –	200901–	•	201110 –
	T850 anomalies with thresholds ± 1, ± 1.5, ± 2 standard deviation with respect to a centre-specified climatology	201112 –	201001 –	200708 –	200301 –	200301 –	200901–	•	201110 –
	PMSL anomaly ±1, ±1.5, ±2 standard deviation with respect to a centre-specified climatology	•	201001 –	200708 –	200301 –	200301 –	200901–	•	201110 –
	W850 with thresholds of 10, 15, 25 m s^{-1}	•	201001 –	•	200301 –	200301 –	•	•	201110 –
	U850 and V850 with thresholds of 10th, 25th, 75th and 90th percentile points with respect to a centre-specified climatology	•	201001 –	•	200301 –	•	•	•	•
	U250 and V250 with thresholds of 10th, 25th, 75th and 90th percentile points with respect to a centre-specified climatology	•	201001 –	•	200606 –	•	•	•	•
	Precipitation with thresholds 1, 5, 10, and 25 mm/24 hours every 24 hours verified against observations	•	•	•	201001 –	•	•	•	201010 –

Comparison of EPS verification score using WMO/CBS exchanged statistics



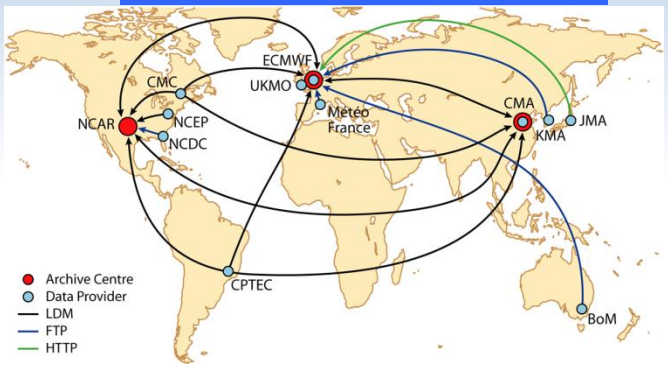
The Brier skill scores for EPS probabilistic 9-day forecasts of 500hPa geopotential height with magnitude less than one climatological standard deviation over the extratropical Northern Hemisphere from January 2003 to August 2012 *(Original data source : WMO/CBS Lead Centre on verification of EPS website)*

- Color separates EPS producing centre.
- Cross marks and line indicate monthly scores and 12-month running mean, respectively.

TIGGE ARCHIVE

Ensemble forecasts are collected in near-real time using a common format at data archive and distribution centres

Data flow



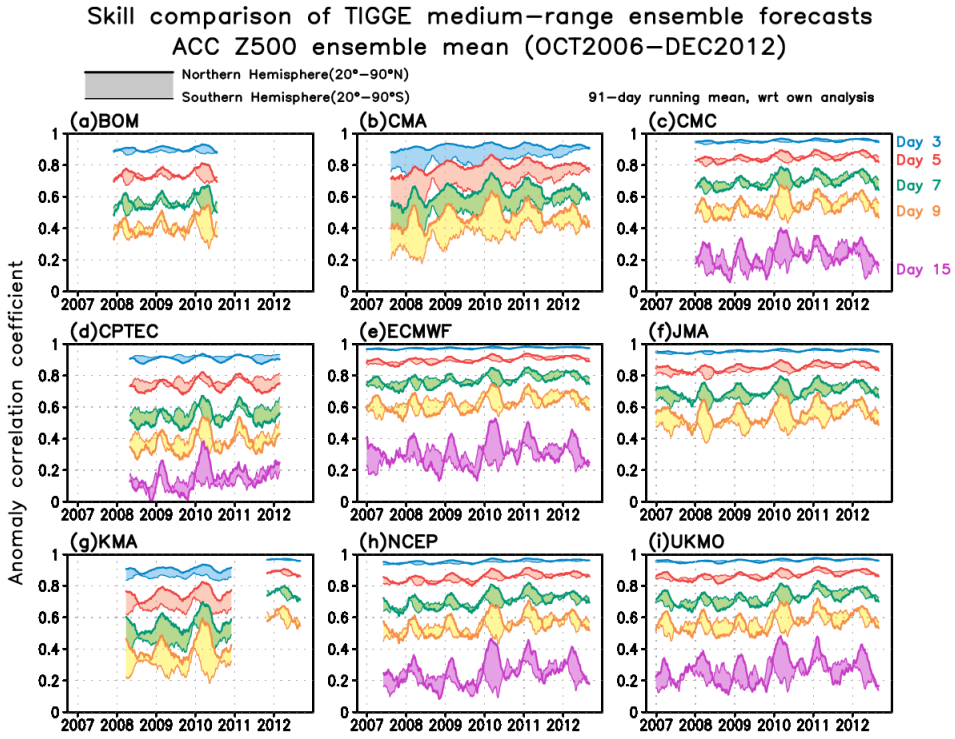
TIGGE Database

Centre	Ensemble members	Output data resolution	Forecast length	Forecasts per day	Fields (out of 73)	Start date
BOM*	33	1.50º x 1.50º	10 day	2	55	3 Sep 07
CMA	15	0.56º x 0.56º	10 day	2	60	15 May 07
CMC	21	0.9º x 0.9º	16 day	2	56	3 Oct 07
CPTEC	15	0.94º x 0.94º	15 day	2	55	1 Feb 08
ECMWF	51	N200 (Reduced Gaussian) N128 after day 10	15 day	2	70	1 Oct 06
JMA	51	0.56º x 0.56º	9 day	1	61	1 Oct 06
KMA*	17	1.00º x 1.00º	10 day	2	46	28 Dec 07
Météo-France	35	1.50º x 1.50º	4.5 day	2	62	25 Oct 07
NCEP	21	1.00º x 1.00º	16 day	4	69	5 Mar 07
UKMO	24	0.83º x 0.55º	15 day	2	72	1 Oct 06

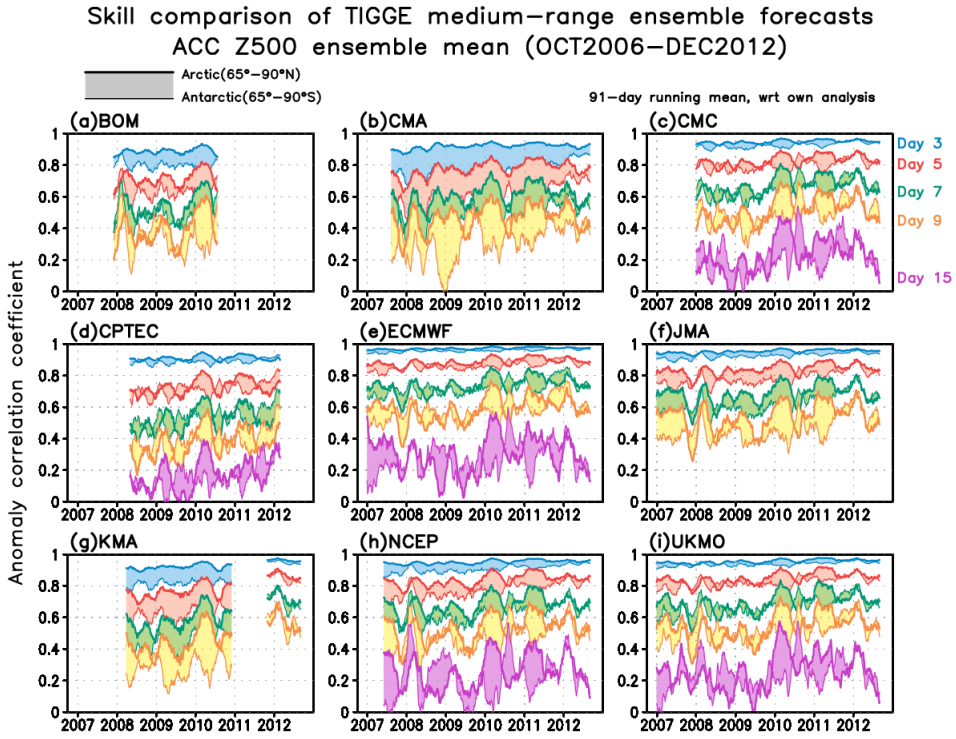
* Delivery of KMA & BoM data currently suspended

ACC, Z500, NH and SH, for +3d, 5d, 7d, 9d, 15d

http://tparc.mri-jma.go.jp/TIGGE/tigge_score_all.html



Hemispheres(20-90)



Polar regions(60-90)

Operational regional EPS

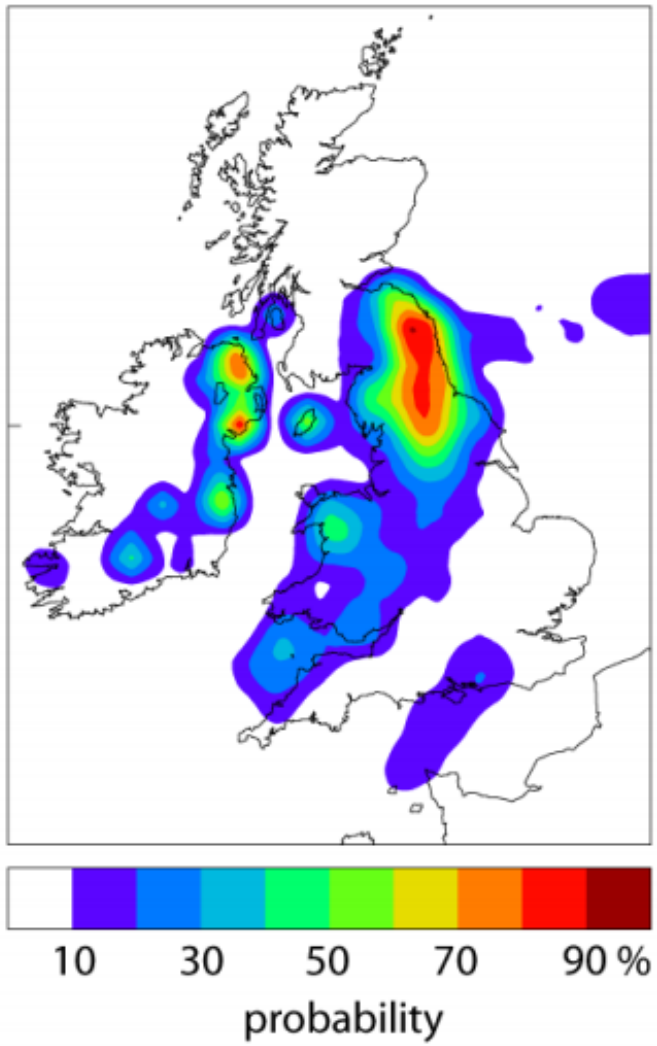
Center	Resolutions	FC Range	Members	Initial perturbation	Model Uncertainty	Lateral Boundary	B.C.
Met Office (UK)	2.2 km	36hrs	12				
Meteo France (France)	15 km	4d	35				
DWD(Germany)	2.8 km	1d	40				
NCEP (USA)	16km	3.5d	21				
Navy/FNMOC/NRL(USA)	27/9 km	3d	20				
CMC (Canada)	"15 km L40	3d	20				
CPTEC/INPE (Brazil)	40 km; 5 km	11d 3d	11 5				
KMA (Korea)	12 km	3d	24				

smaller scales usually possess
shorter life cycles, faster error growth, shorter predictability limits

Typical Regional EPS

- Short-range EPS
  - 10-40km mesh, 3days forecast
  - To serve as weather forecast
- Convective-permitting EPS
  - 2-3km mesh, 1day forecast,
  - To serve probability information as a risk management tool

MOGREPS-UK
2.2km UKV model



- First operational UK ensemble 2012
  - 12 members, 2.2km
- Now running technical trial with 36h forecasts

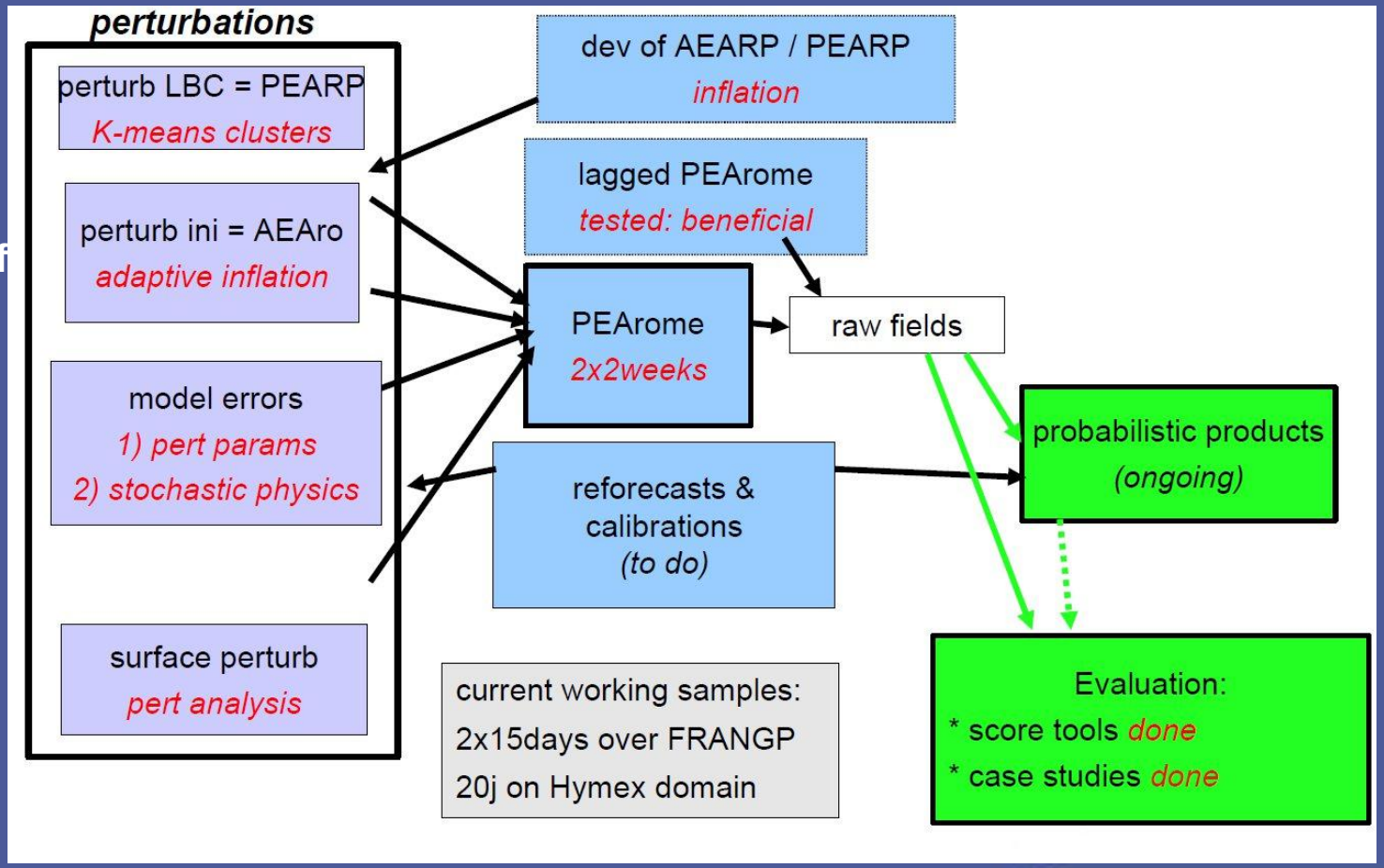
Products will use Neighbourhood Processing to account for spatial uncertainty not covered by ensemble spread

Probability of more than 100 mm of rain in 18 hours within 10 miles of any location

Overview of PEARO: Ensemble Prediction at the convective scale, associated with the AROME model

Global Ensemble prediction

Local Ensemble of assimilation

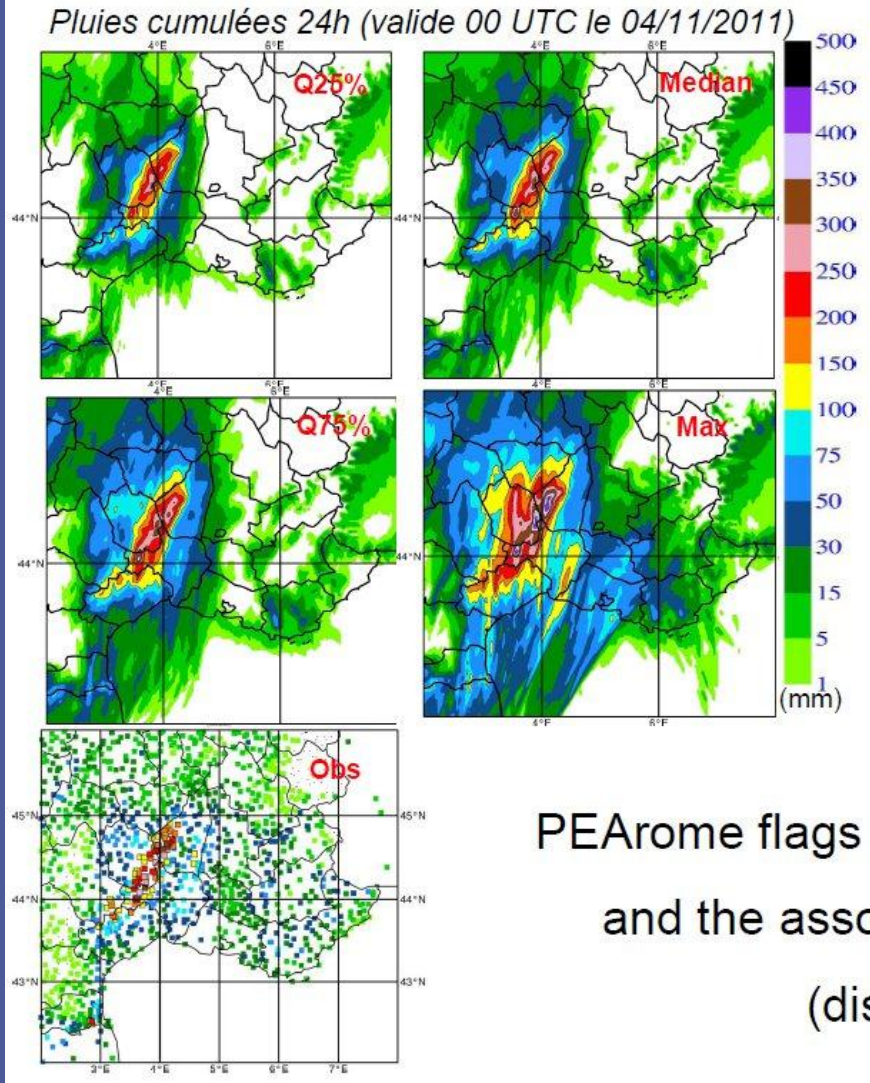


2.5km mesh

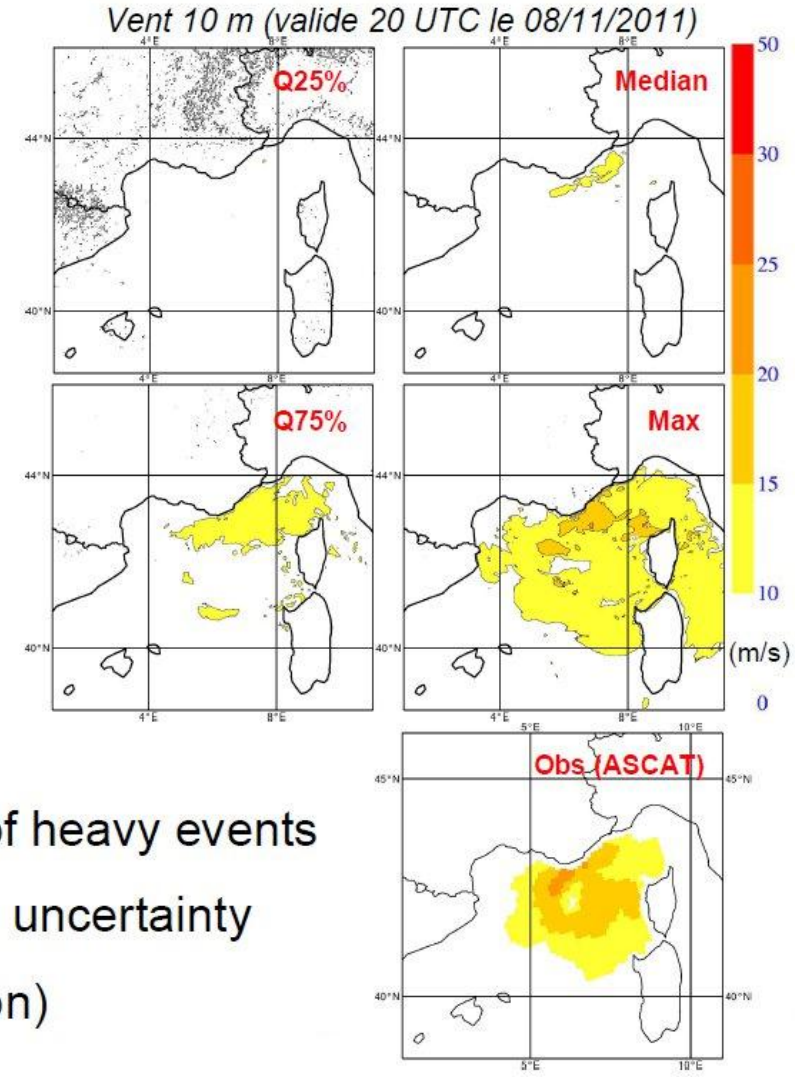
Under development: 6 to 8 members 4 times a day

Examples over a couple of Mediterranean cases

24-hr rain



10m wind



PEArome flags risks of heavy events and the associated uncertainty (dispersion)

Summary of my talk

- Enhancement of computational performance is actually promoting the improvement in resolution and number of members of global EPS.
  - In 2012. the Brier skill scores for EPS probabilistic was reduced.
- New challenges for convective-permitting regional EPS
  - 2-3km-mesh (to avoid gray-zone problem?)