Scoping Meeting
on Mediterranean COFs

Predictability of the Meteo France seasonal forecast model over the Mediterranean basin

J.P. Céron

Météo-France

Jean-Pierre.Ceron@meteo.fr

Madrid – 12 to 14 June 2013

Outline

- ## GPC Toulouse
  - Forecasting suite
  - Products

- ## Which Predictability for the Ocean/Atmosphere system?
  - Seasonal scale – Global (SST)
  - Seasonal scale – Regional (T2m and Rainfall)
  - HPE predictability (at fall)

- ## Which Predictability for the Hydrological system ?
  - Spring (MAM)
  - Summer (JJA)

WMO OMM

AEMet
Agencia Estatal de Meteorología

METEO FRANCE
Toujours un temps d'avance

The Meteo-France Operationnal Suite

- **Coupled Model version 5**
  - Atmosphere : Arpege v5, t127 l31,
  - Ocean : Nemo (31 vertical levels ~10m close to the surface and ~500 m below 3000 m, 1° resolution with 0.25° meridional resolution in the tropics),
  - Coupling : Oasis,
  - Mercator reanalysis : 1991 – 2010, new assimilation scheme using insitu data and altimetry,
  - Hindcast : over the 1991-2010 period, 15 members, 7 month range run,
  - Operationnal : 51 membres, 7 month range run,
  - Availability : since the beginning of 2013

- **Products**
  - issuance at the beginning of the current month

Operationnal Forecasting Suite

- **Arpège model (v 5) - Mercator initialisation (Ocean) :**
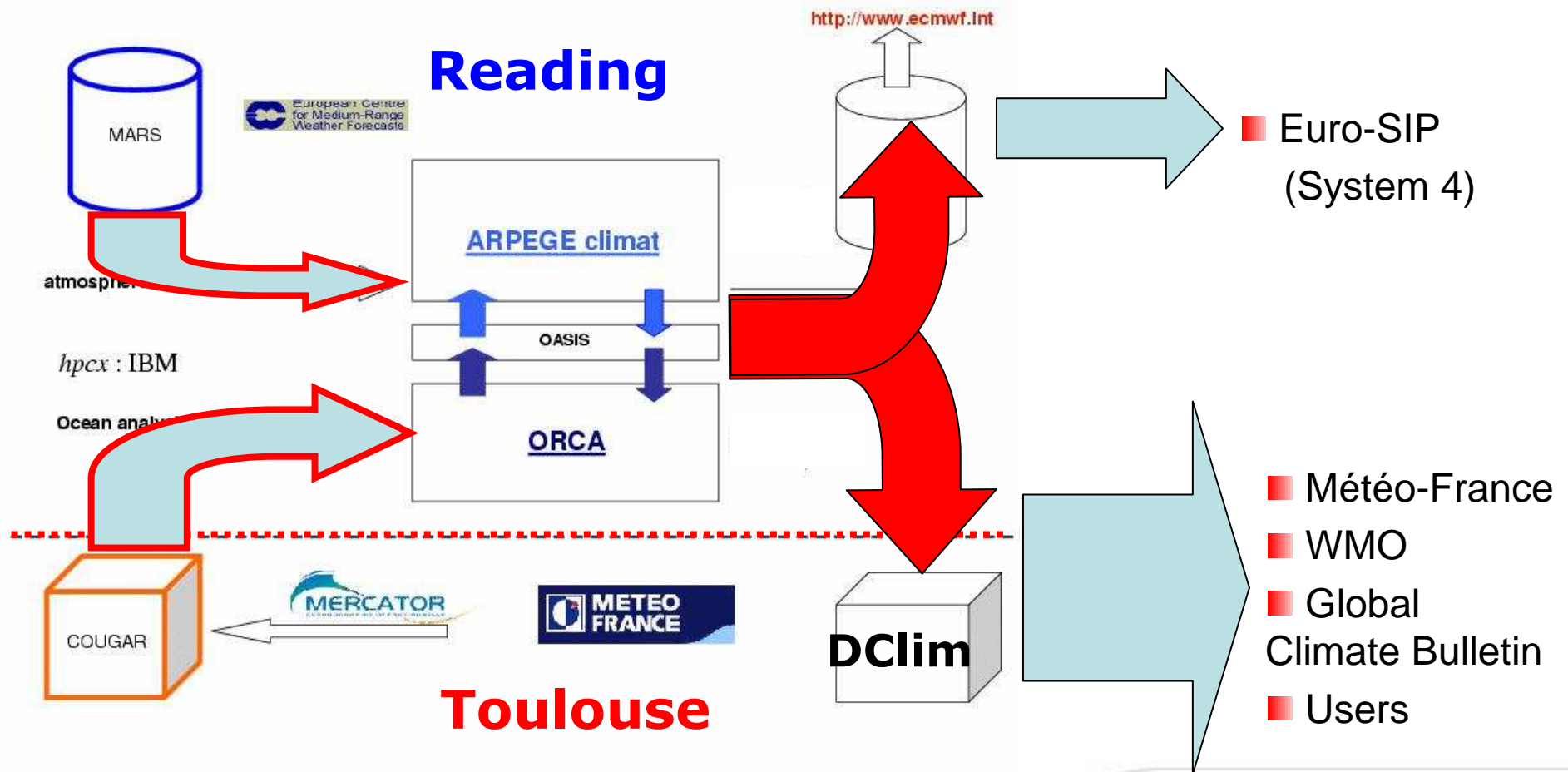
Products

■ **Deterministic products :**

- Ensemble mean : **Anomalies, Indices (Standardized anomalies)** and **recalibrated Anomalies**
- Significance Test (T test)

■ **Probabilistic products :**

- Ensemble Member frequency into the **tercile** categories,
- Ensemble Member frequency into « **extreme** » categories
- **Probabilistic forecast synthesis** (most likely category)
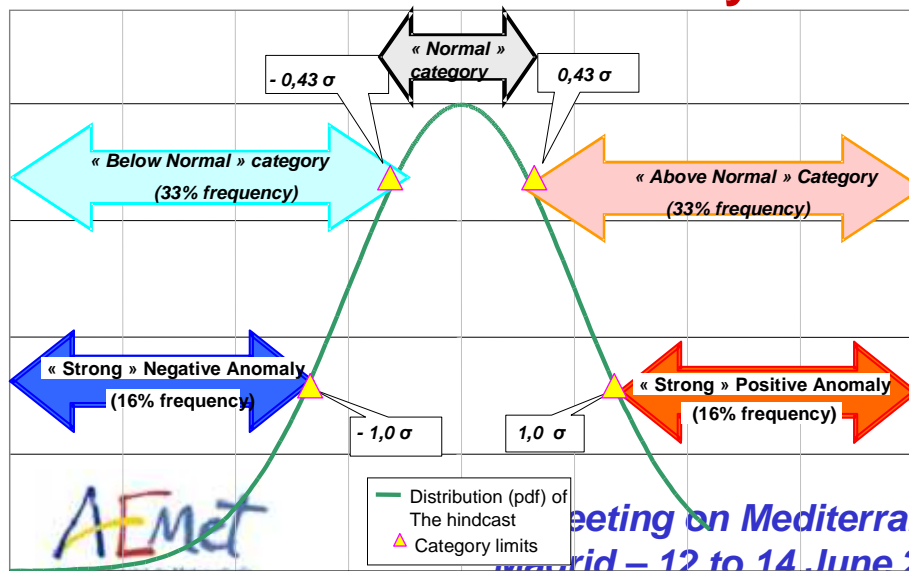
« Normal » category

- 0,43 σ   0,43 σ

« Below Normal » category
(33% frequency)

« Above Normal » Category
(33% frequency)

« Strong » Negative Anomaly
(16% frequency)

« Strong » Positive Anomaly
(16% frequency)

- 1,0 σ   1,0 σ

Distribution (pdf) of
The hindcast
Category limits

Category boundaries computed under gaussian assumption

Frequency computed using standardized anomalies

METEO FRANCE
Toujours un temps d'avance

Extranet dedicated to Seasonal Forecasts

6 Menus

Bulletins

Working Space

Extranet : Forecast access

Scoping meeti...
Madrid - ...

Extranet dedicated to Seasonal Forecasts

Working Space

Madrid – 12 to 14 Jun

Global - Seasonal (Ocean) :

TSOL ARPEGE–COUPLE METEO–FRANCE ROC DJF LEAD=1 terci

TSOL ARPEGE–COUPLE METEO–FRANCE ROC JJA LEAD=1 terci

TSOL ARPEGE–COUPLE METEO–FRANCE ROC DJF LEAD=1 tercs

TSOL ARPEGE–COUPLE METEO–FRANCE ROC JJA LEAD=1 tercs

Predictability of the Ocean/Atmosphere system

Global - Seasonal (Ocean) :

Niño 3.4   TNA   WTIO
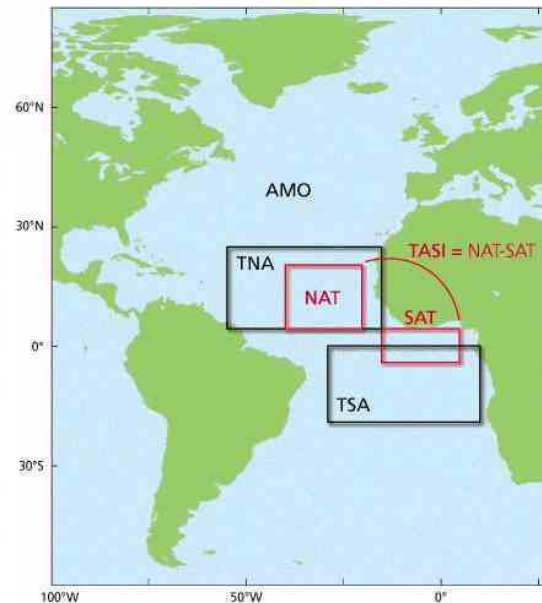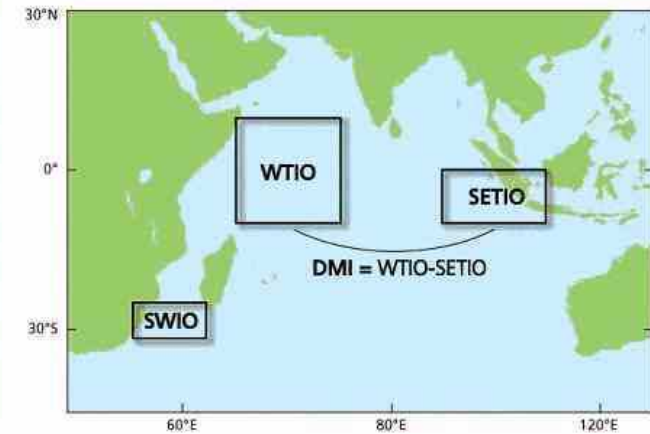
Global - Seasonal (Ocean) :
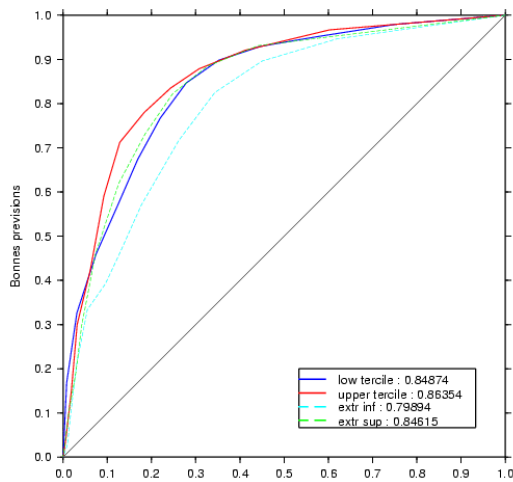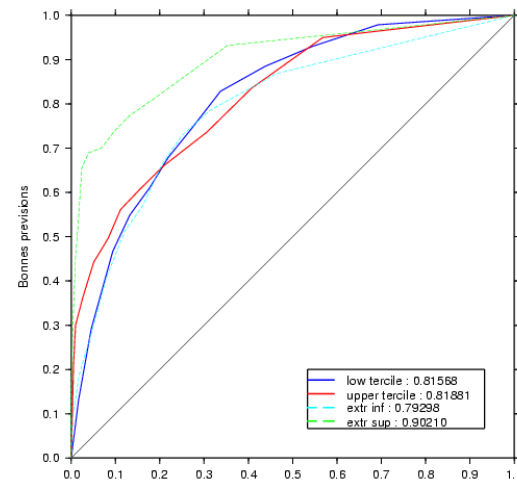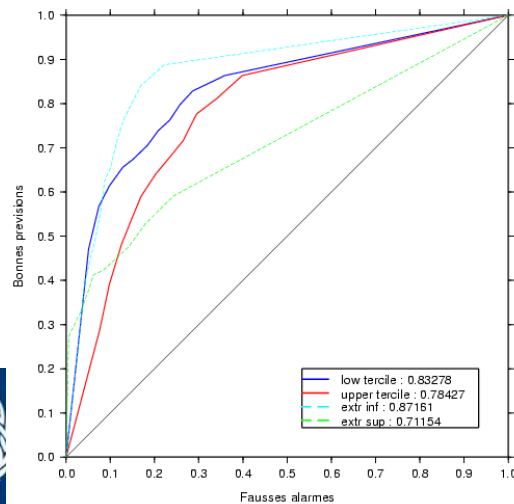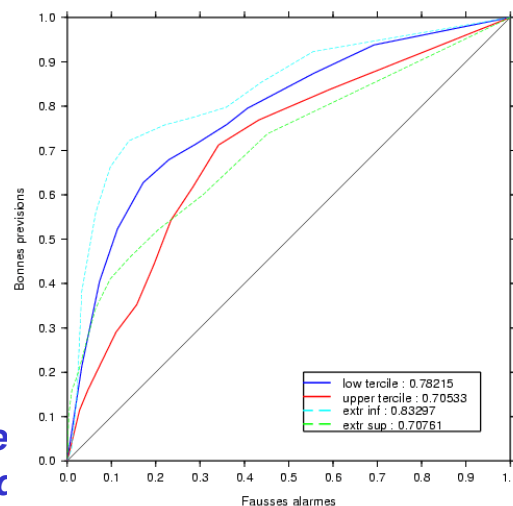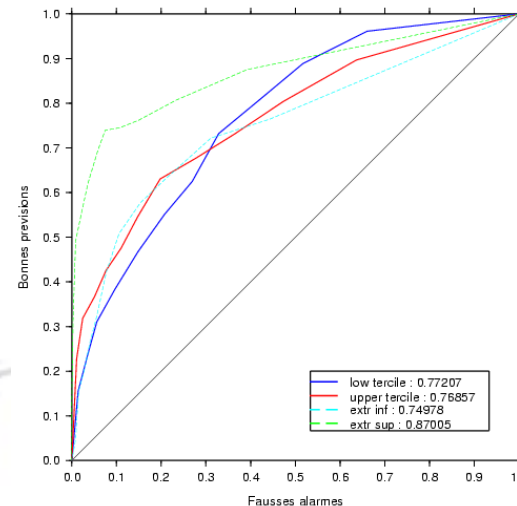
Predictability of the Ocean/Atmosphere system

Regional - Seasonal : T2m
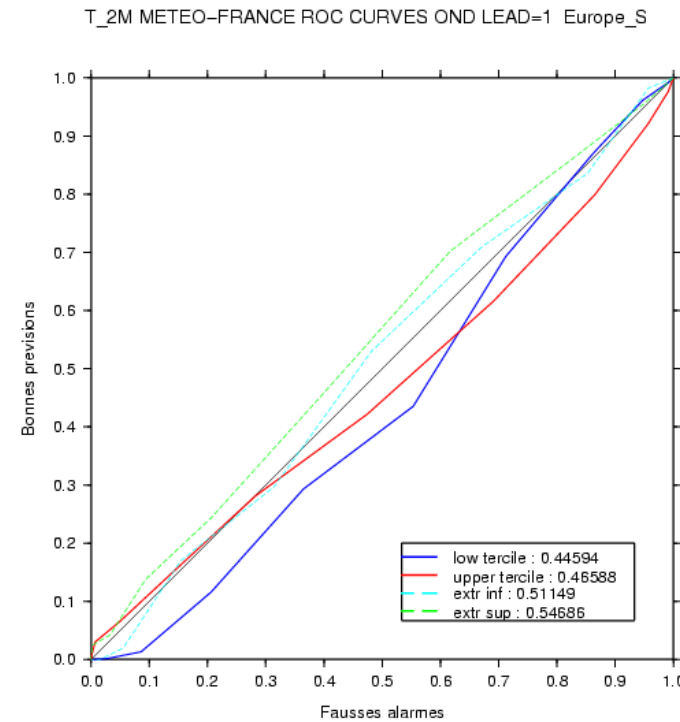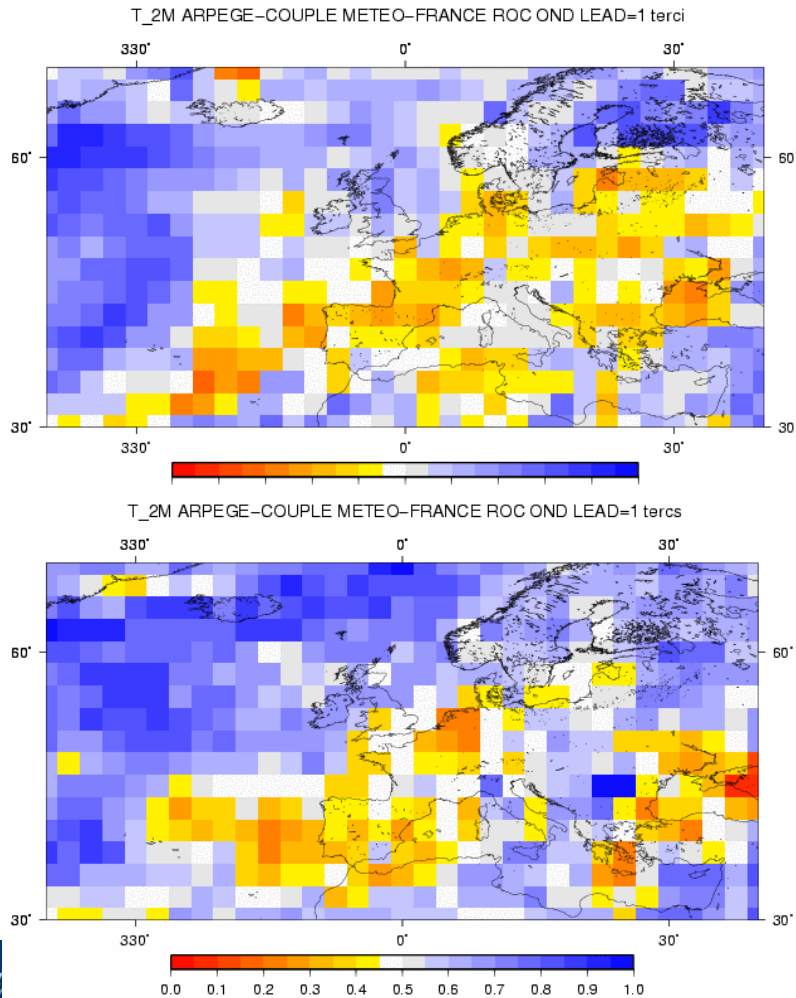
Worst

October-November-December

Predictability of the Ocean/Atmosphere system

Regional - Seasonal : T2m

T_2M METEO–FRANCE ROC CURVES ASO LEAD=1 Europe_S

Best

August-September-October
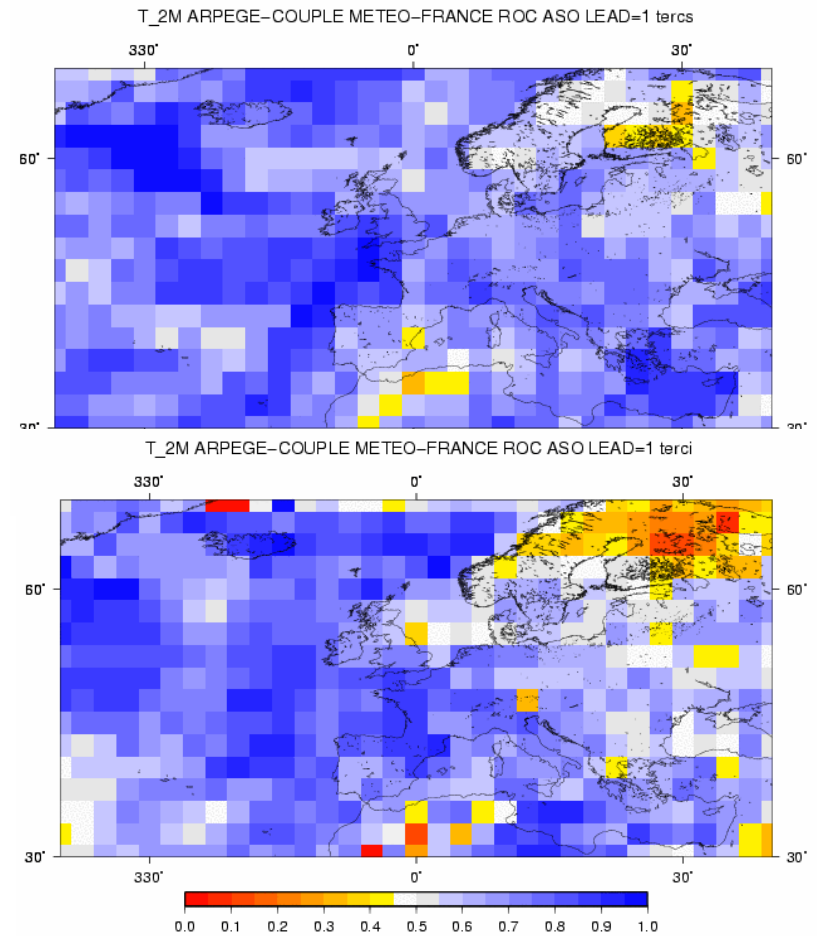
low tercile : 0.68606
upper tercile : 0.70832
extr inf : 0.65450
extr sup : 0.67510

T_2M ARPEGE–COUPLE METEO–FRANCE ROC ASO LEAD=1 tercs

T_2M ARPEGE–COUPLE METEO–FRANCE ROC ASO LEAD=1 terci

Predictability of the Ocean/Atmosphere system

Global - Seasonal (Regional) : Rainfall
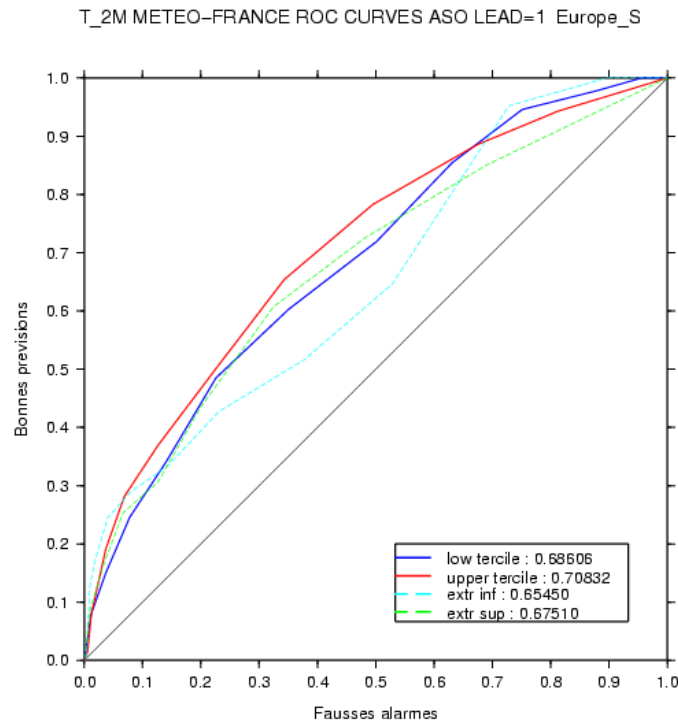

PRET ARPEGE–COUPLE METEO–FRANCE ROC MAM LEAD=1 tercs

PRET ARPEGE–COUPLE METEO–FRANCE ROC MAM LEAD=1 terci

PRET METEO–FRANCE ROC CURVES MAM LEAD=1 Europe_S

Worst

low tercile : 0.51268
upper tercile : 0.44939
extr inf : 0.53289
extr sup : 0.45838
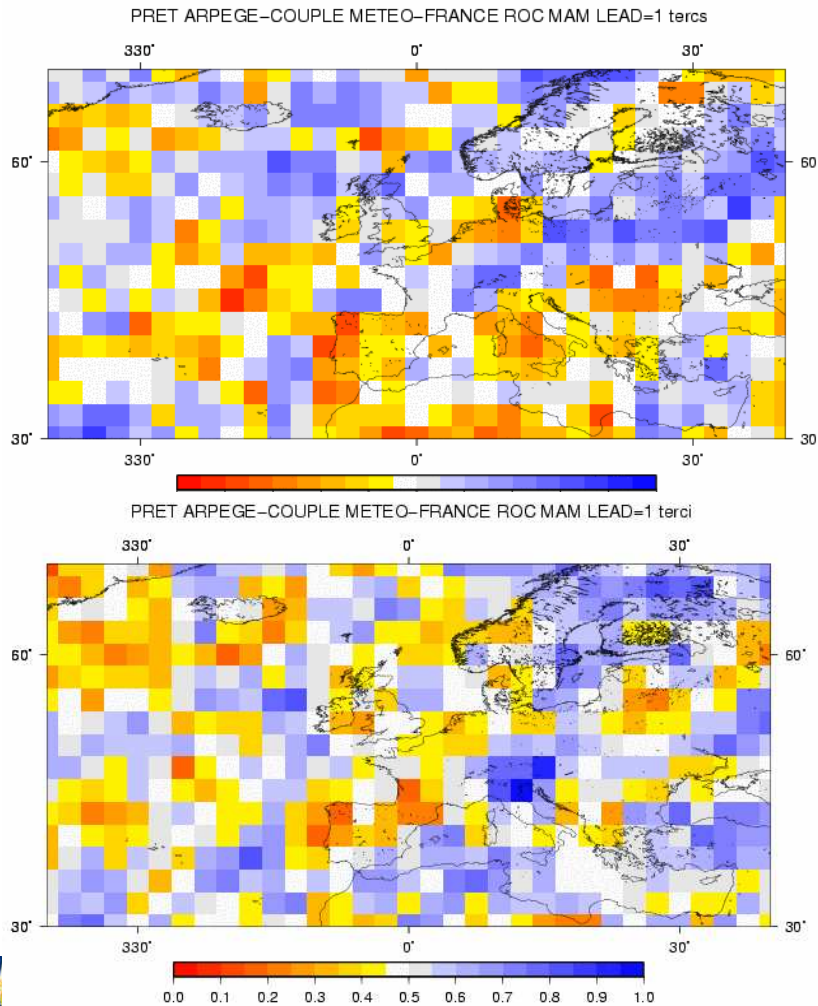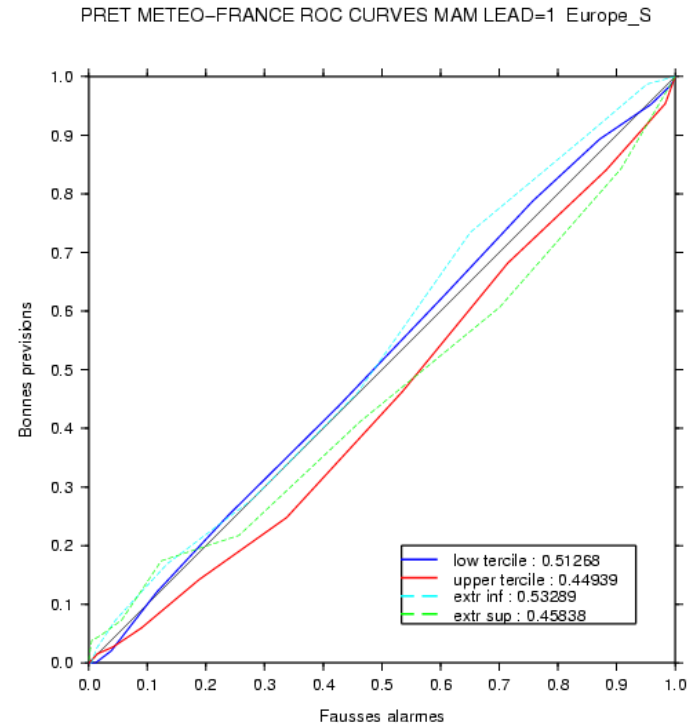
March-April-May

Predictability of the Ocean/Atmosphere system

Global - Seasonal (Regional) : Rainfall

HPE predictability

Predicted event: HPE occurrence > m + 1*σ
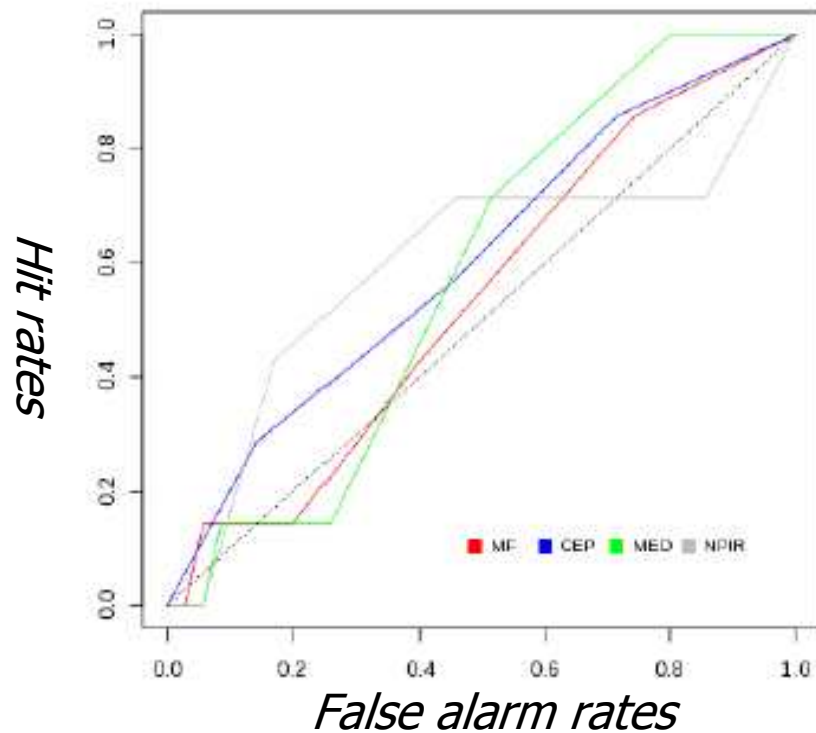
1. <u>Direct method:</u> Definition of HPE from daily simulated precipitations taken at one of the two grid points in southern France (distribution quantile providing a similar amount of HPE than the observed)
2. <u>Linear indirect Method:</u> Definition of HPE from a Linear Discriminant Analysis model from the simulated cluster (MOS technique) occurrence (Z500 firstly and $\chi\psi$200 secondly)

The predictability will be assessed using ROC curves and areas (confidence interval from a bootstrap) and economical value (cost/loss ratio framework) skill scores
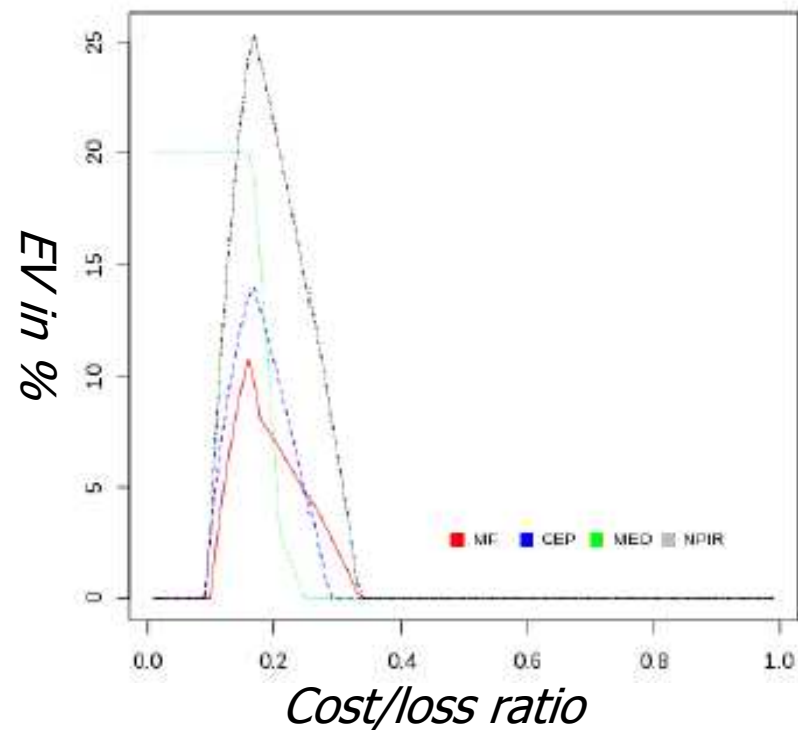
WMO OMM

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HPE predictability
1. Direct Method

ROC curves

Economical value

	MF	EC	MED	NPIR
ROC (area)	0.54	0.60	0.58	0.60

HPE predictability
2. Indirect Method Z500

ROC curves
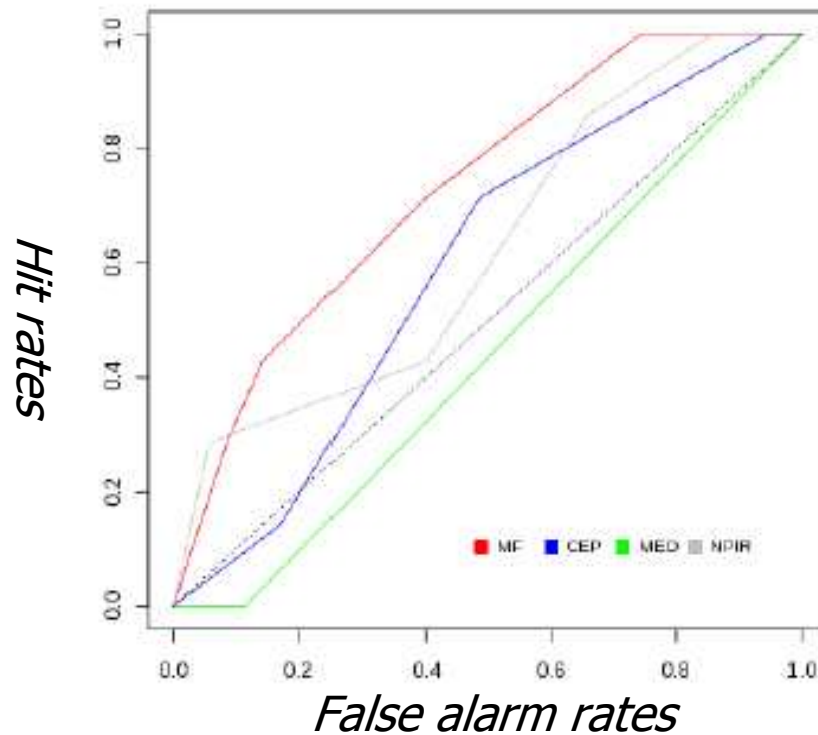
Economical value
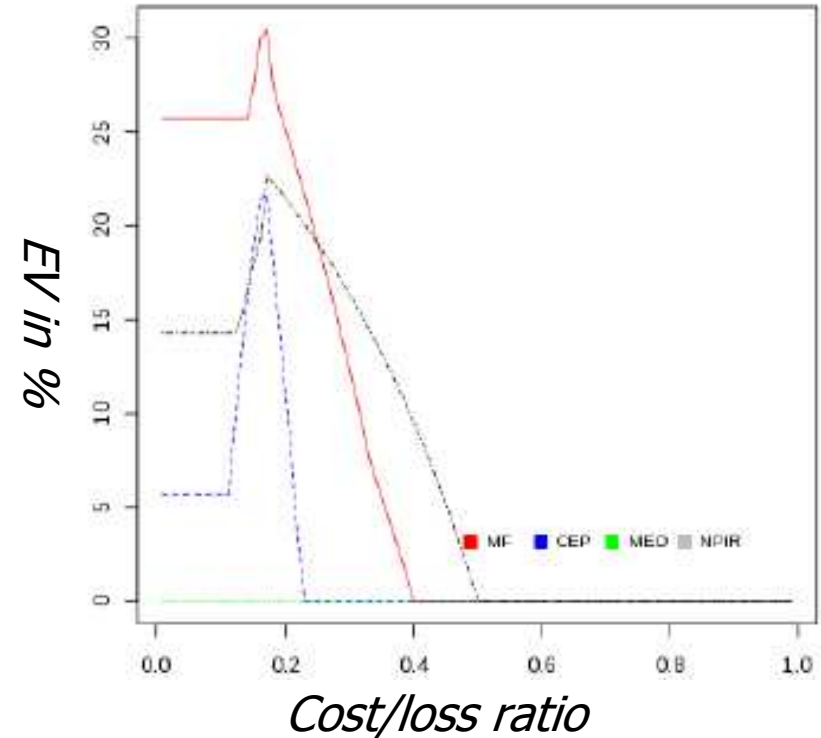
	MF	EC	MED	NPIR
ROC (area)	0.73	0.60	0.44	0.62

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HPE predictability
2. Indirect Method $\chi\psi200$

ROC curves
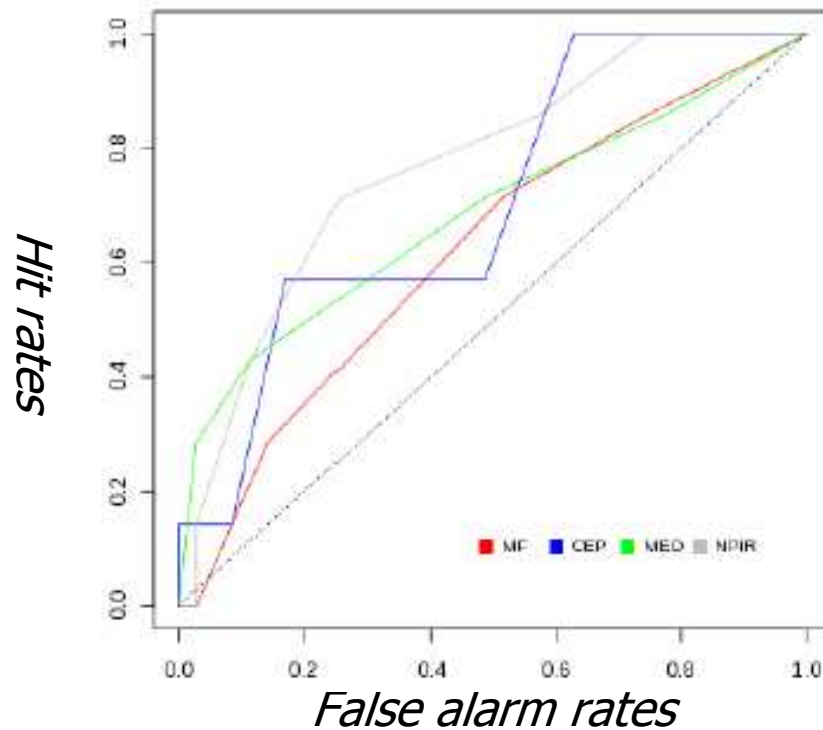
Economical value
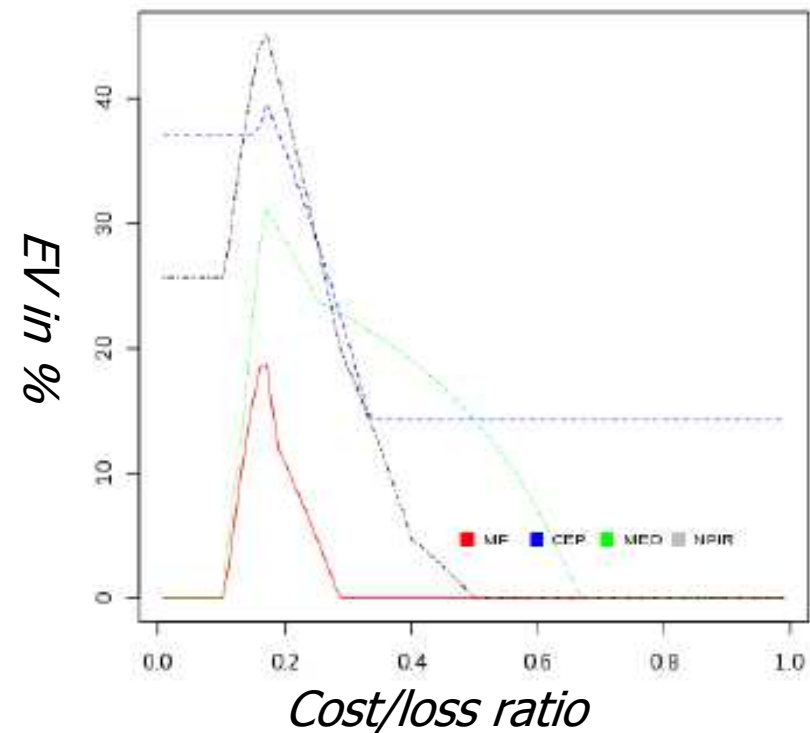
	MF	EC	MED	NPIR
ROC (area) 95% Boostrap	0.62 (0.37, 0.83)	0.71 (0.48, 0.90)	0.68 (0.41, 0.92)	0.77 (0.56, 0.94)

Predictability of the Hydrological system
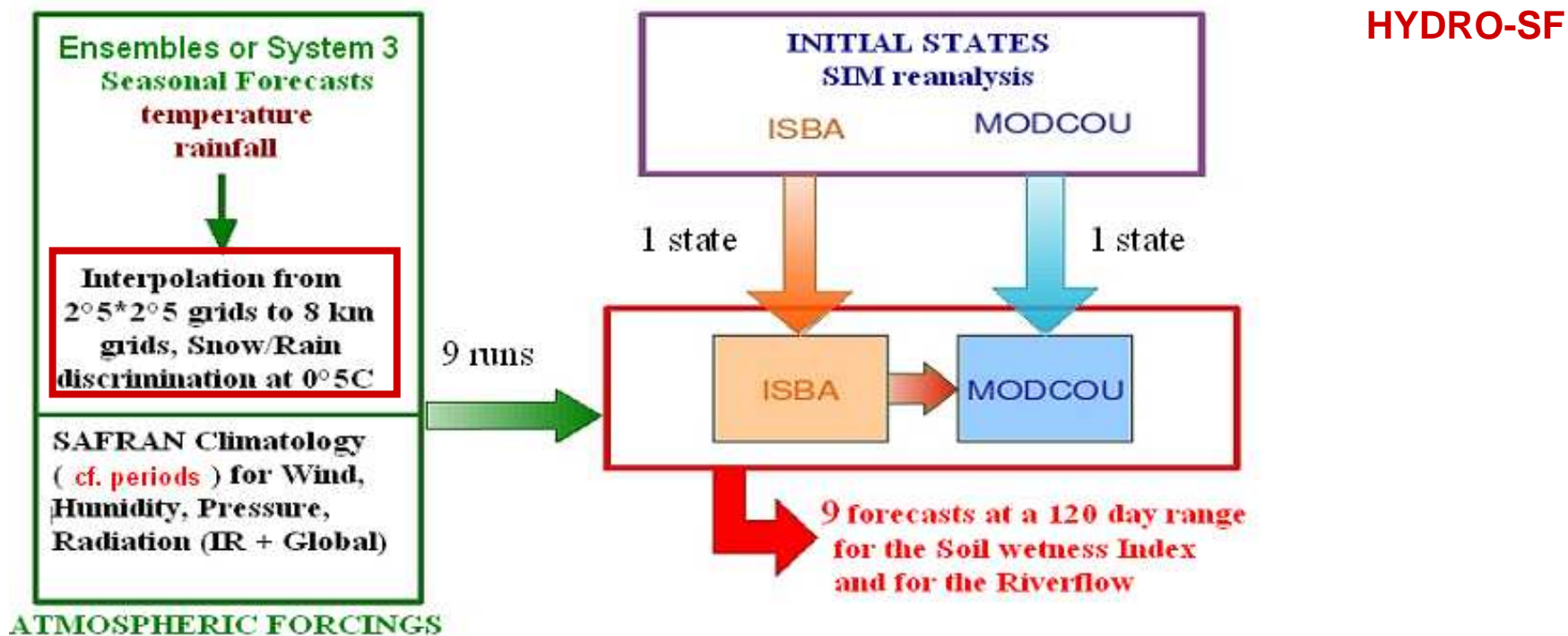
■ **National - Seasonal : SWI and River Flow**

September-October-November
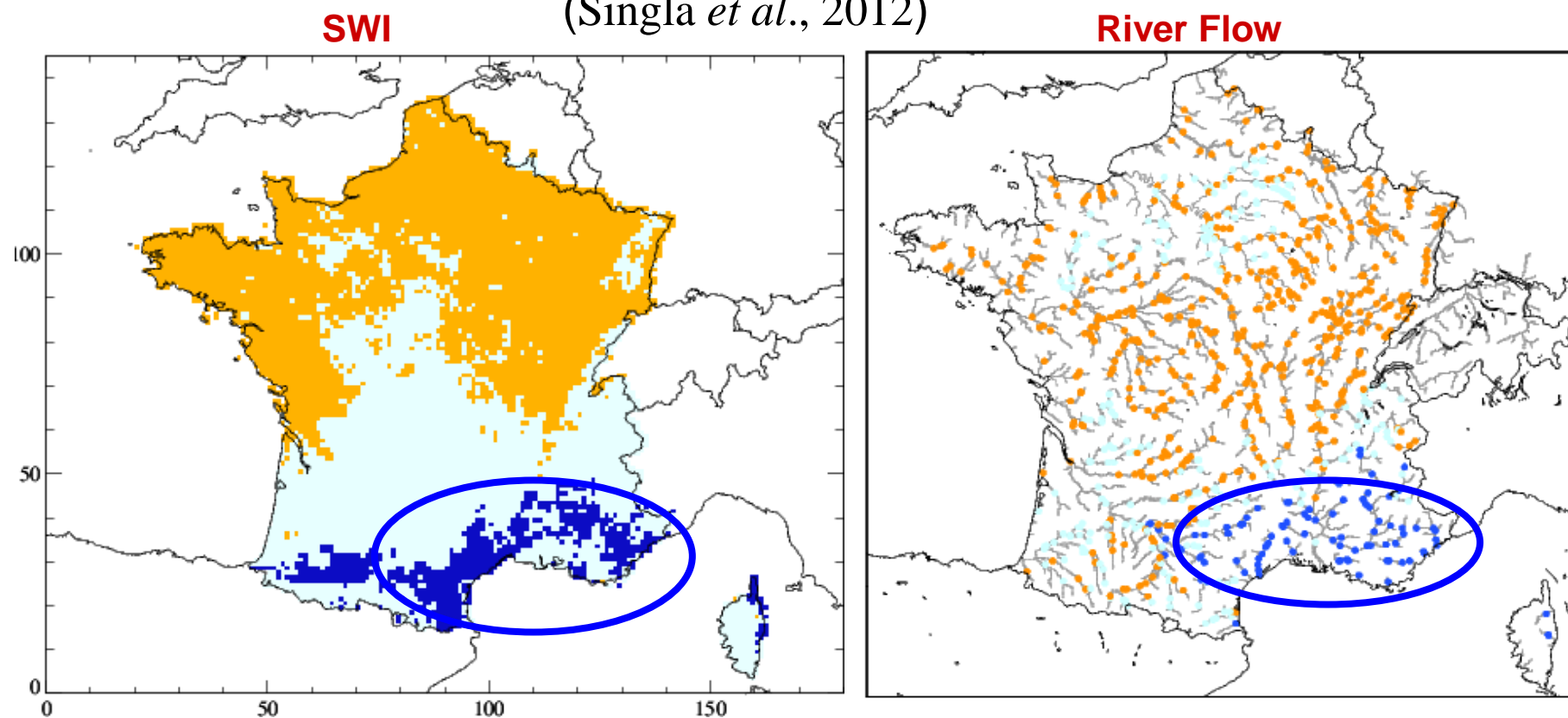
The hydrometeorological suite

- Method adapted from the medium range ensemble riverflow forecast (Tanguy - 2009, Céron *et al*. - 2010)

HYDRO-SF

- Period from 1958 to 2005 (ENSEMBLES) – 9 members
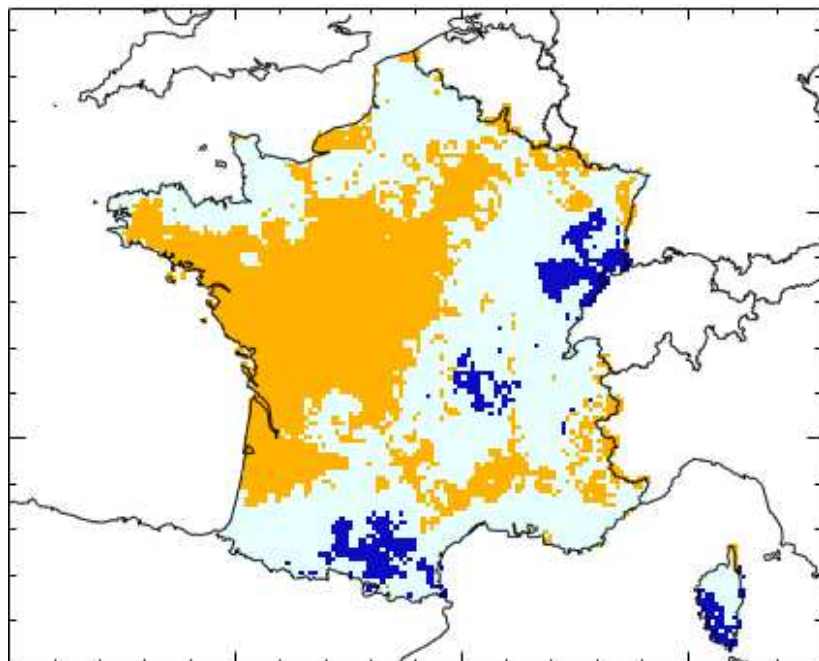- Period from 1979 to 2007 (System3) – 9 or 11 members

Results for Spring (MAM)

Comparison of correlations between Hydro-SF and RAF – IC 1st of February
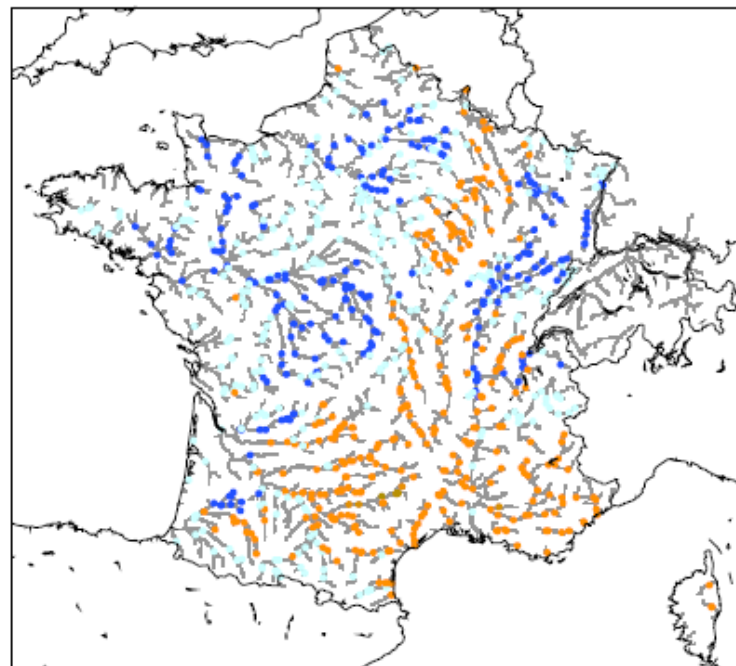
(Singla *et al.*, 2012)

SWI **River Flow**

Regions where Hydro-SF is significantly better than RAF

Regions where Hydro-SF is equivalent to RAF

Regions where RAF is significantly better than Hydro-SF

Results for Summer (JJA)

Comparison of correlations between Hydro-SF (April IC) and RAF

SWI

River Flow

■ (orange) *Regions where Hydro-SF is significantly better than RAF*

□ (light blue) *Regions where Hydro-SF is equivalent to RAF*

■ (blue) *Regions where RAF is significantly better than Hydro-SF*

Results for Summer (JJA)

ROC scores for Hydro-SF (1979-2007 – IC from 1st of April)
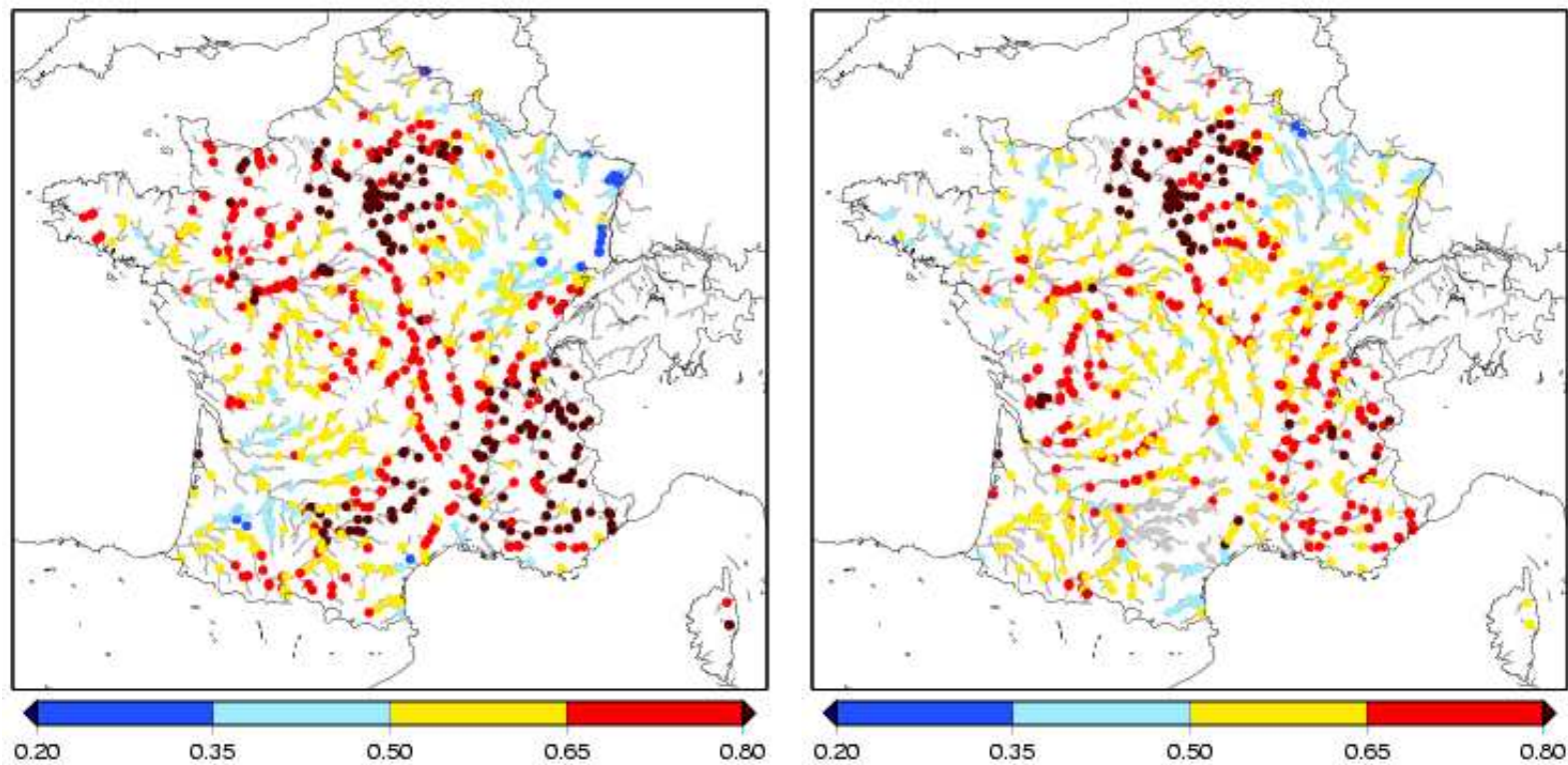
Upper Tercile

Lower Tercile

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