



# Use of Seasonal Forecast: Which Climate Services ?

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*SWIOCOF*

*On-line Forum*

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World  
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**GFCS**  
GLOBAL FRAMEWORK FOR  
CLIMATE SERVICES



COMMISSION DE  
L'Océan Indien

# The Seasonal Forecast

- Seasonal Forecast based on **Numerical Modeling of the Climate system** and the coupling between its different components,
- Forecast of the Climate (**mean state**) instead of the weather (**detailed chronology**),
- **Probabilistic nature** of the forecast,
- Potentially useful in a context **of Climate Risk Management**, of **Decision Making** and of Climate sensitive activities (especially economic but not only),
- **Added value depending of** the considered zone, season, year and parameter **but there is real value**,
- To be use in the best possible way, **need a strong and close collaboration** between providers and users and generally speaking **downscaled/tailored information**.
- Seasonal forecast represent the **first step of adaptation** (to present and futur climate variability)

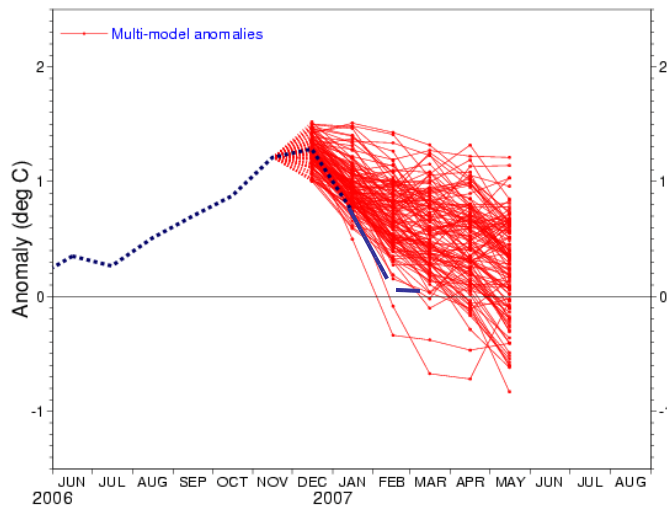
# The Seasonal Forecast

■ 2006/2007 :

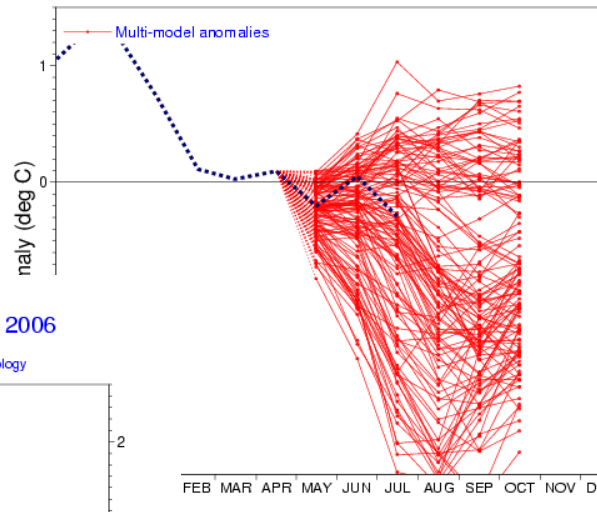
● SST forecasts

To sample uncertainties which are inherent to the forecasts

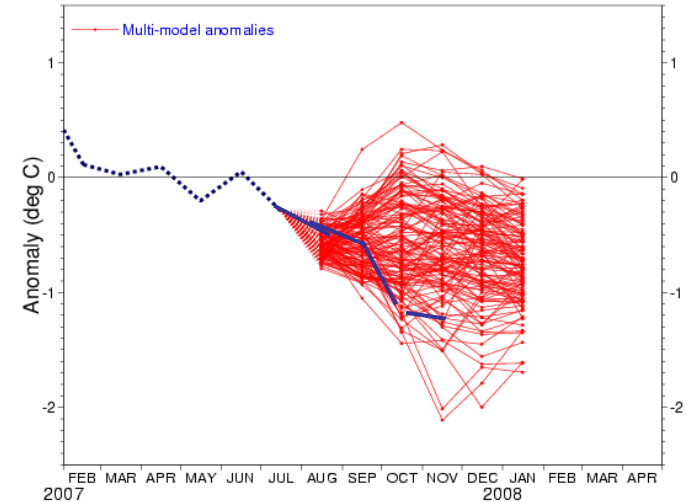
NINO3.4 SST anomaly plume  
EUROSIP multi-model forecast from 1 Dec 2006  
ECMWF, Met Office, Météo-France  
Monthly means plotted using NCEP adjusted OIv2 1971-2000 climatology



NINO3.4 SST anomaly plume  
EUROSIP multi-model forecast from 1 May 2007  
ECMWF, Met Office, Météo-France  
Monthly means plotted using NCEP adjusted OIv2 1971-2000 climatology



NINO3.4 SST anomaly plume  
EUROSIP multi-model forecast from 1 Aug 2007  
ECMWF, Met Office, Météo-France  
Monthly means plotted using NCEP adjusted OIv2 1971-2000 climatology



Forecast issue date: 15 Aug 2007

ECMWF

- Ensemble forecast
- Multi Model Ensemble forecasts

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ECMWF online session

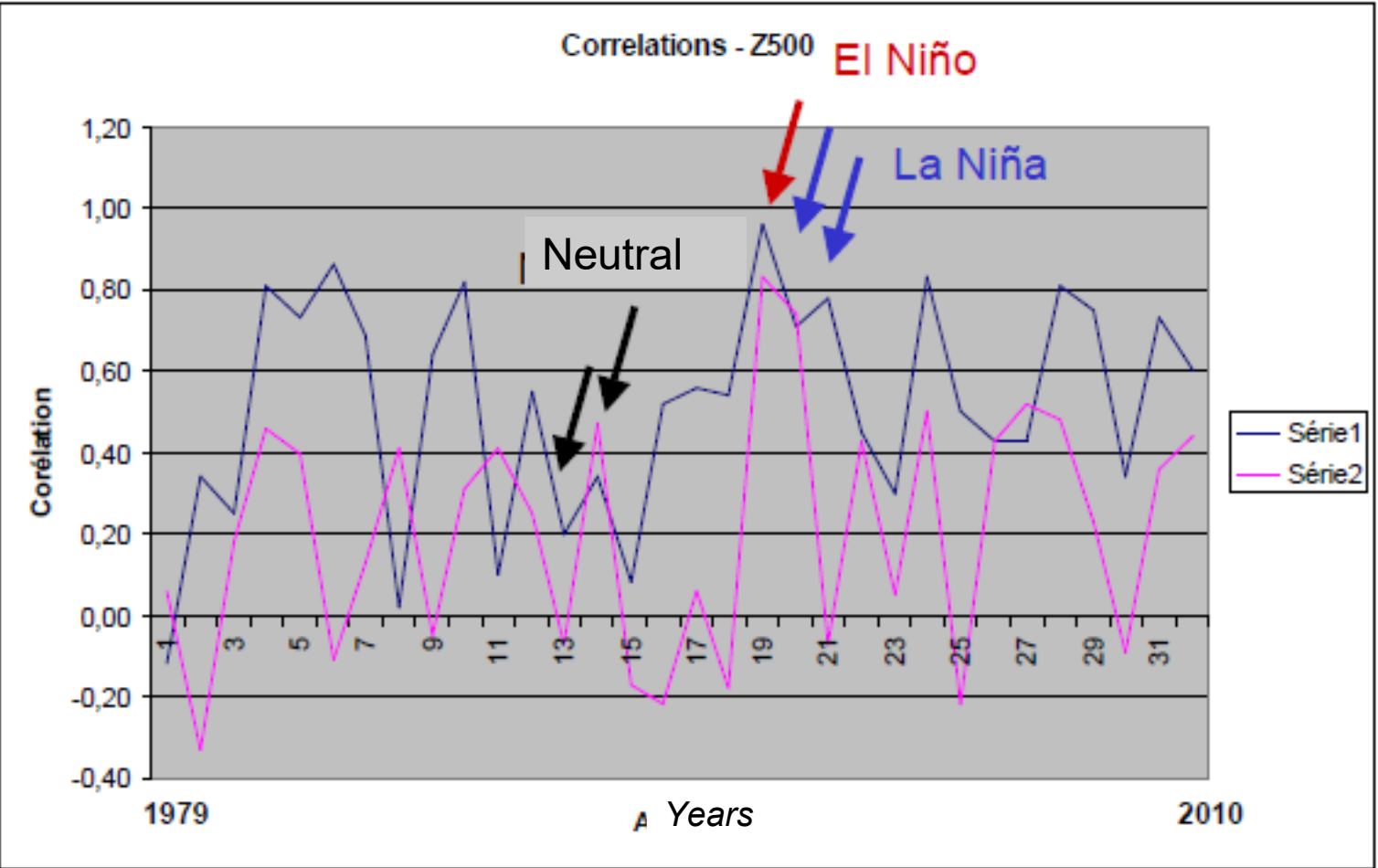


# The Seasonal Forecast

- Reliability depends on the year,
- Reliability depends on the region and the parameter,
- Quality (scientific view) different than Usefulness (user view - economical value, added value for Decision Making),

# Reliability and Skill

- Quality of the forecasts vs years (Geopotential Heigh)  
DJF season



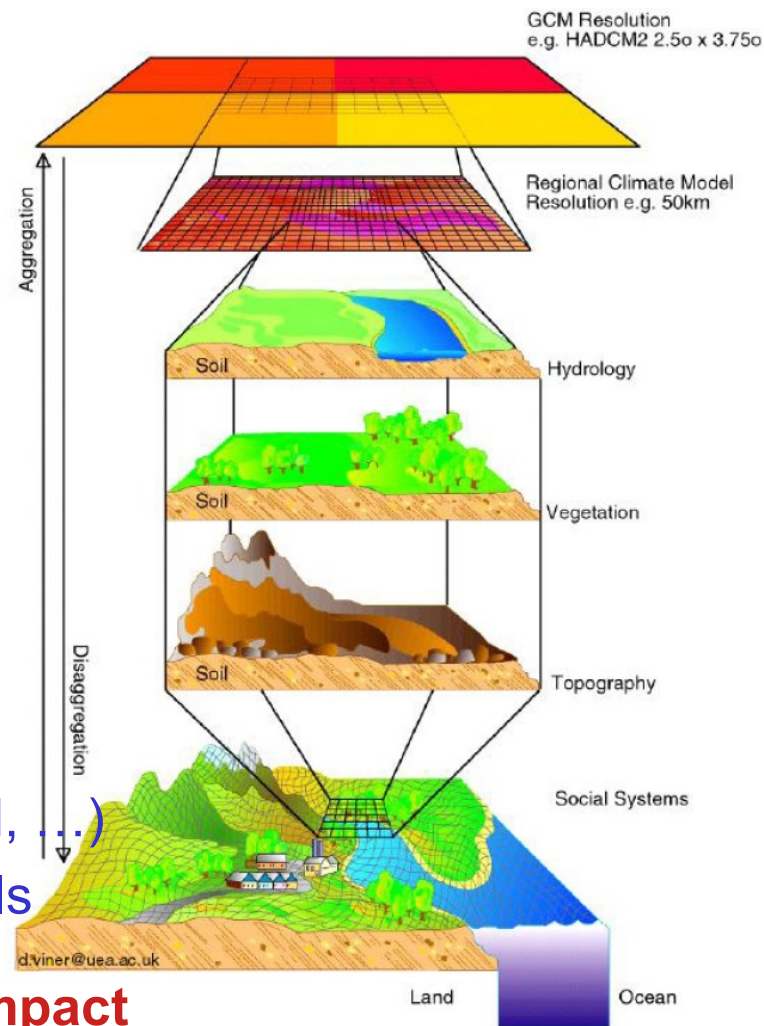
Tropics  
(20°N,20°S)

North  
Hemisphere

# The use of Seasonal Forecast

## Relevant Scales

- Mesh of the GCM ~ 100 km, 3 month averaged information (or month by month)
- Scales of applications ~ 1m to 10 km, Day, 10 days, month,
- Climate parameters (RR, Tn, Tx, Number of days ...),
- Parameters from the application domain (Agriculture, Water resources, Health, ... ),
- Climate parameters (RR, Tn, Tx, Wind, ... ) for downstream operation of Users' models



● **Need of knowledge of the climate impact**



# Use of Seasonal Forecasts

## ■ Sensitivity to the climate information

- Meteorological Parameters météorologiques (RR, Tn, Tx, Number of days ...),
- Parameters from the application domains (Agriculture, Hydrology, Health, Energy, DRR ... ),

## ■ Use of the seasonal forecasts (Decisions made and actions of the stakeholders)

- Climate Risk Management, Tactical vs Strategical decisions, contingency plans ....
- Not for detailed planifications, daily work, ...
- Delay between the dissemination of the information and the potential actions of the users (Lead Time)

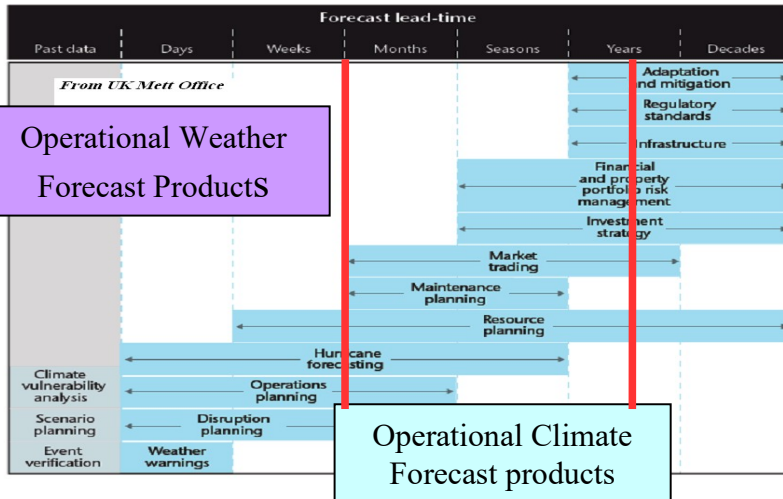


**Needs for downscaling and tailoring of the Climate Information and Knowledge of the Climate impact**

# Use of Seasonal Forecasts

## Seamless use of the available information

Seamless forecasting services



The Seasonal forecast is made for :

- ✓ Climate Risk Management
- ✓ Tactical decision
- ✓ Not for daily/detailed planning
- ✓ Crucial time window between the dissemination of the information and the potential users' actions (**Lead-Time**)
- ✓ Continuous information (in time) for decisions at different time scales (**seamless aspects**)

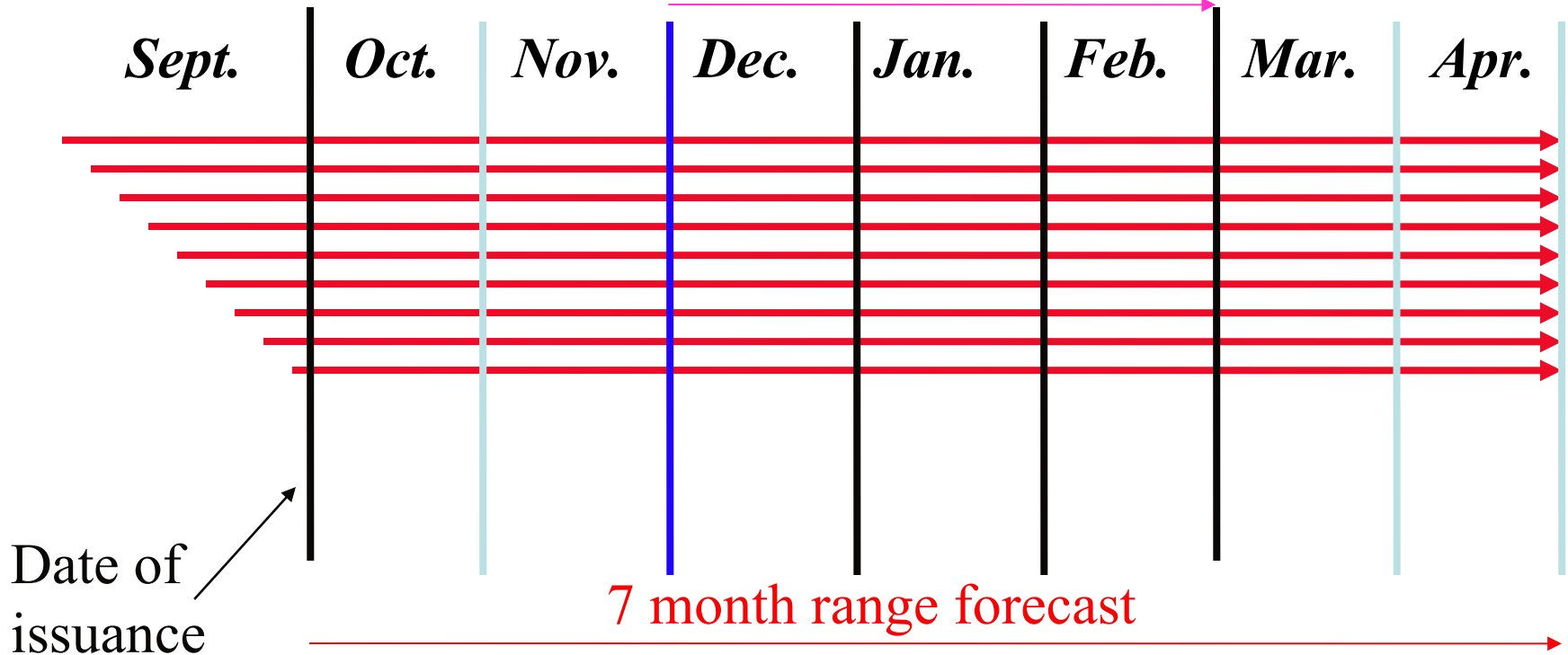
- ✓ Decisions are always taken in an **uncertain environment**
- ✓ The Forecasting information is **only one among several elements** which leads to the final decision
- ✓ The **different decisional options** are important to take on board, especially with respect of the forecast update process.
- ✓ A forecasting information which is **not use for action and/or decision** is **helpless** whatever the intrinsic quality of the forecast



# Use of Seasonal Forecasts

LT - 1 month    Seasonal Forecast 1

Seasonal Forecast 2



Beware of the predictability

# Which Climate Service ?

## ■ Definition of Climate Services (WMO)

- Generating and providing information on past, present and future climate, and on its impacts on natural and human systems
  - Climate monitoring
  - Climate watches
  - Monthly/Seasonal/Decadal climate predictions
  - Climate Change projections
  - Need for more information than climate
- Helping the user to choose the right product for decision making, and use it appropriately including aspects of uncertainty
  - Tailored information for Decision Making Processes (DMPs),
  - Impact of the use of the information onto the DMPs and associated evaluation,
  - Uncertainty and Decision Making,
  - Necessary shared knowledge,

# Use of Seasonal Forecasts

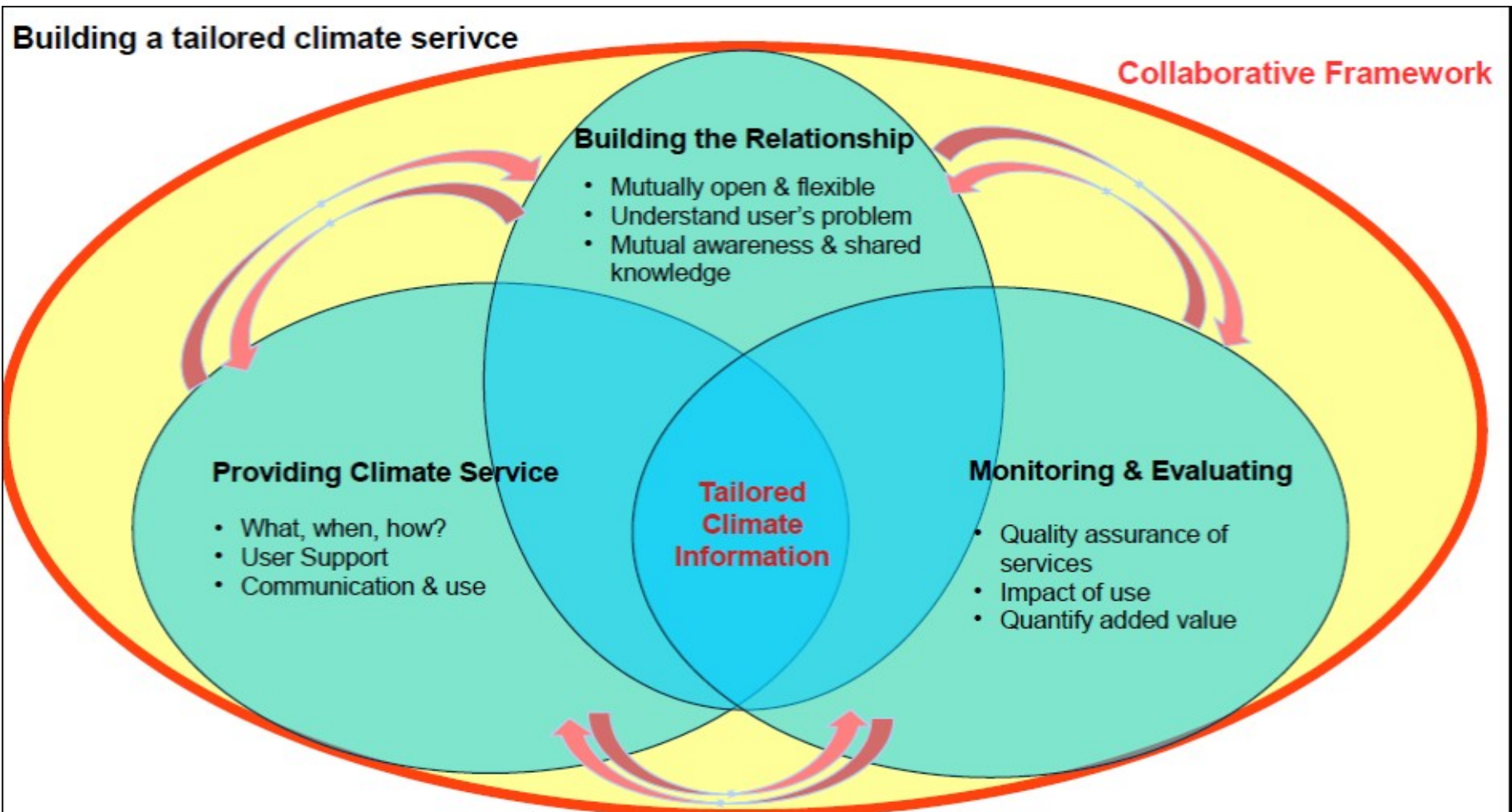
- Use of available information : Production of the information
  - ✓ Assessing the best compromise between users' needs and climate science (possible products, predictability of the climate system vs time and space scales, ... ),
  - ✓ Assessing the uncertainty inherent to the climate information and taking care of uncertainty tolerability on the user side,
  - ✓ Ensuring the consistency between the provided climate information and the use of the information,
  - ✓ Ensuring a dual liaison between providers and users : from the provider viewpoint needs of information on the use of the climate information (actions/decisions, available options, decisional calendar, critical scales and periods, ... )



The production and provision of Climate Information must be driven by possible users' actions

# Framework for Tailored Climate Information

## ■ A synthetic framework



# Framework for Tailored Climate Information

## ■ Some principles : Building relationship

- Overarching principles : credibility, salience, legitimacy, flexibility, transparency)
- Who is the target
- Being respectful, humble
- Respect their experience in their field
- What do they do?
- What are the stakes?
- What data is available to quantify the impacts?
- What are the externalities?
- What are the decisions you make?
- Which of these decisions may be informed by climate information?
- What information (including climate, traditional knowledge) are you currently using (if any) to inform your decisions?
- Building awareness on range of climate information available
- Which climate information could enhance the quality of decisions (additional or replacement)



# Framework for Tailored Climate Information

## ■ Some principles : Building relationship

- Building mutual understanding of how this climate information is relevant to the decisions and explain how it works
- Is further study required to establish the relationship between climate variable and the impact
- Are there many other non-climatic factors that will also affect impacts that complicate the problem?
- Can we solve this problem?
- Do you have options to respond to climate information
- When are the key decision-making times, and what are the planning time horizons?
- Given a significant event or updated information do you have options to modify your decision?
- Building mutual understanding of the tools that will need to be accommodated
- What are the costs of incorporating this additional climate information into the decision making process? What are the benefits?
- Building mutual awareness of any standards and regulations

# Framework for Tailored Climate Information

## ■ Some principles : Building a Climate Service

- Details of what climate information is required
- **Be open about what is possible to produce**, scientifically credible, concept that the information may come tied with metadata and related data such as verification statistics, uncertainties to ensure credibility
- **What, how, when?**
- **What variables? What resolution (space and time)?**
- Nature of the product e.g. PDF, index, forecast, average...)
- **Timing of the climate input** provided to be relevant, frequency, point in time...
- Design the form that the climate information will be delivered in graphical, narrative or digital forms
- What format e.g. ascii, netCDF, GIS layers How must the information should be delivered (Web, Hard copy, USB, FTP, OpenDAP, ...)
- **Establish a Help desk or some form of user support**
- Design a process to deliver on the tailored climate service. Timelines, milestones, governance, etc

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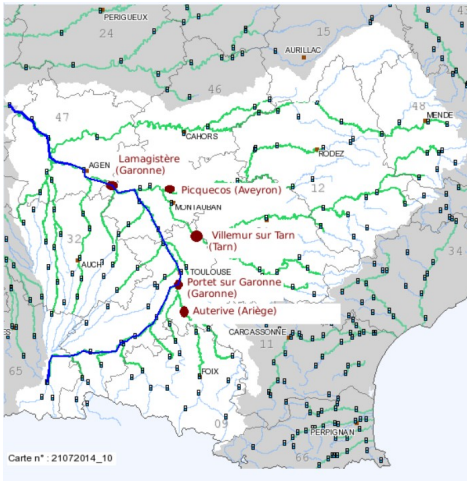
On-line session

# Framework for Tailored Climate Information

- Some principles : Monitoring and evaluating
  - Quality Assurance – two-way communication to ensure quality of service
  - Is Helpdesk and support working?
  - Did the tailored climate service deliver the outcomes as expected (timely, quality, verification)?
  - Did the climate service add value to the decision making?
  - Did the climate information change the decision making? If not, why not?
  - Analysis of benefits using operational data to determine value of the intervention

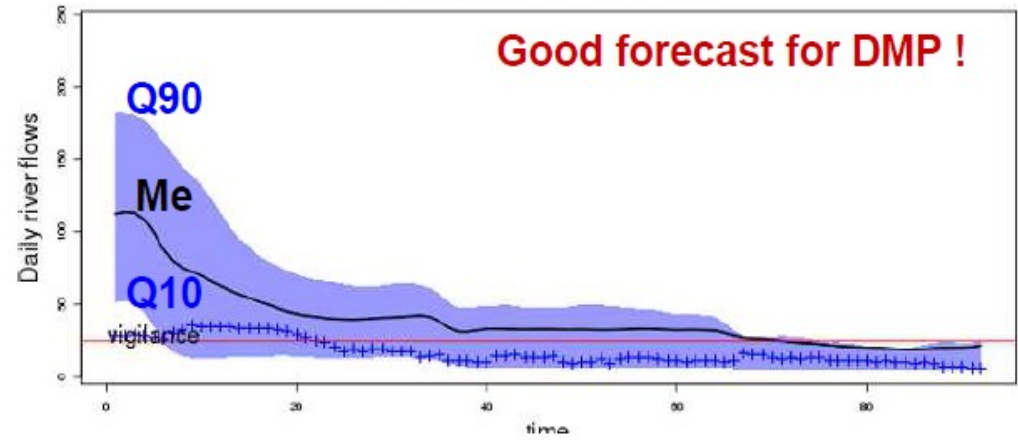
# Tailored information to DPMs

## Some examples

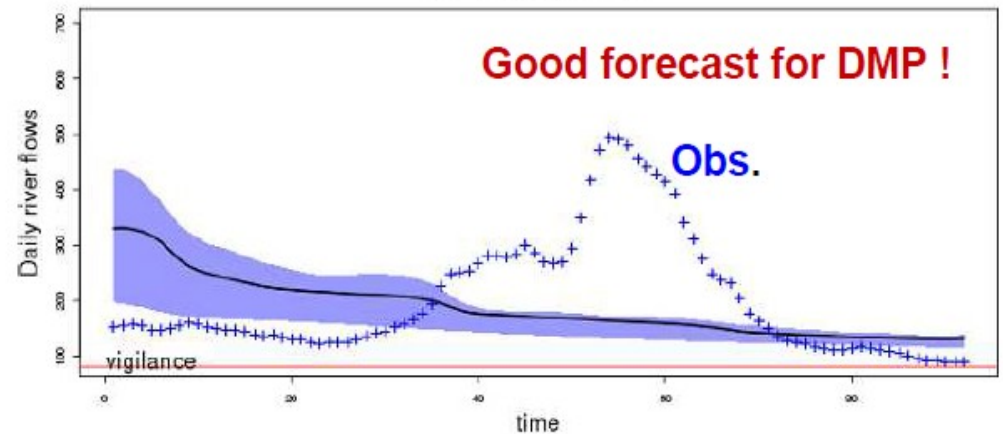


## Key Stations used by the SMEAG

Seine @ Pont-sur-Seine 1992



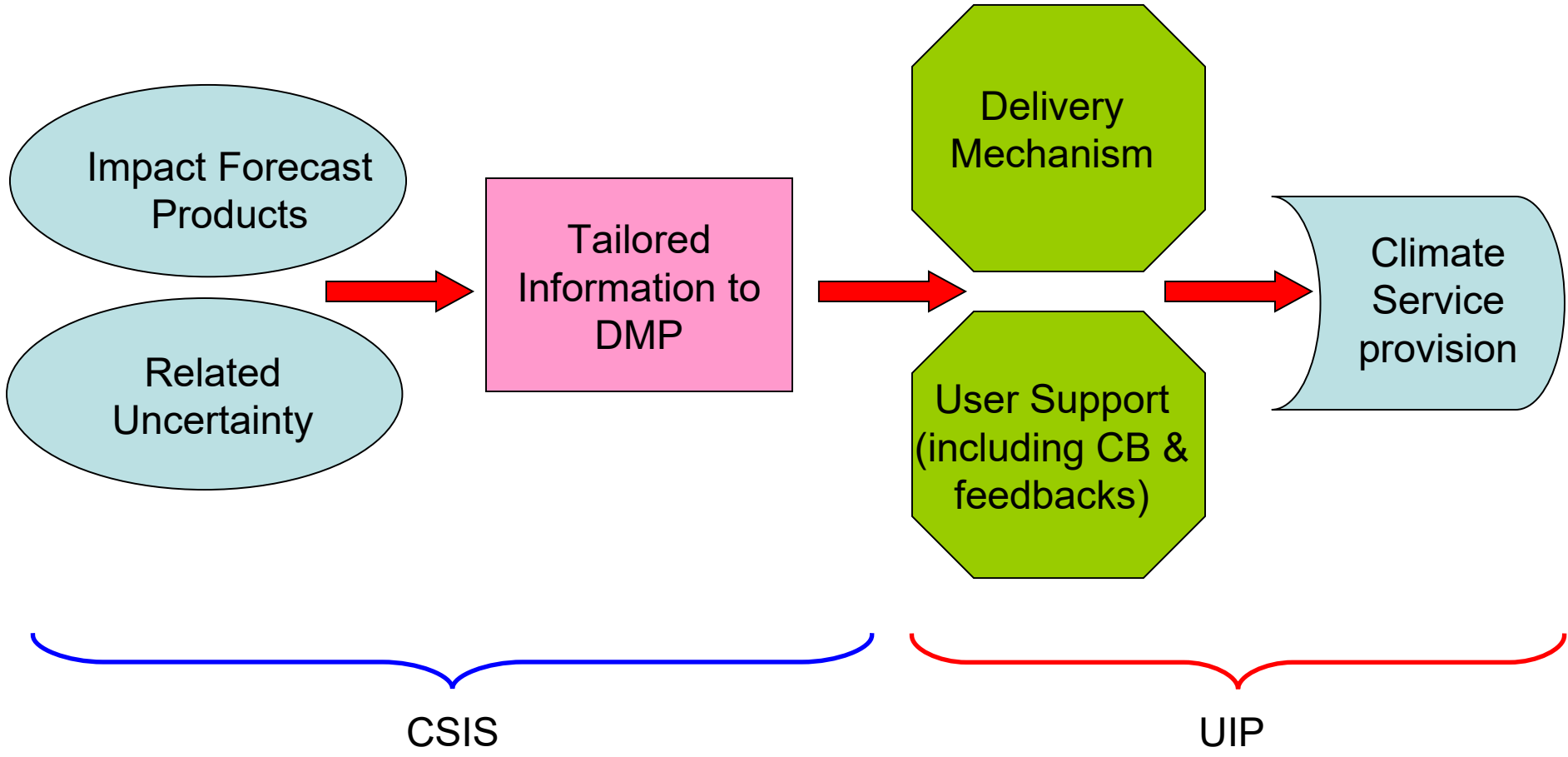
Seine @ Paris 1980



Forecast - Daily Time Series of ensemble Median, Q10 and Q90

# Which Climate Service ?

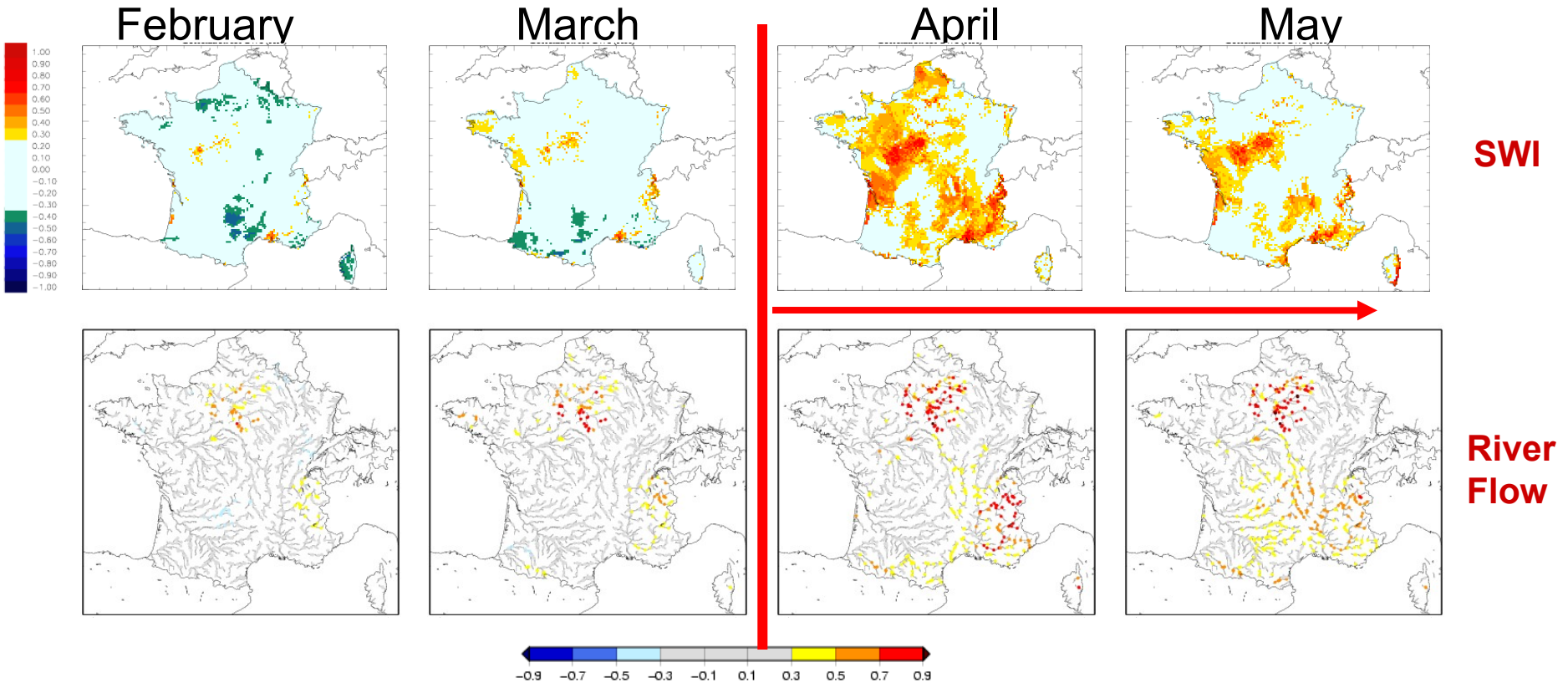
## ■ Schematic vision for a Climate Service





# Use of Seasonal Forecasts

- Correlation for SWI and River Flows over the 1979-2007 period (HYDRO-SF / ARPEGE-S3) for different IC for the summer forecast (JJA)



Correlations > 0.3 significant.  
Clear improvement between March and April

*No useable information before the beginning of April*

# Applications of Seasonal Forecasting

- Numerous domains of application : food security and food trading, tourism and leisure, Buildings and infrastructures, agriculture, hydrology, insurance, energy, civil security, ...
- Numerous applications in regions under the ENSO influence (especially Tropical regions),
- Health : Early Warning Systems for Malaria in Africa (Zimbabwe, Angola, ... ), Vector born diseases (Dengue, ...), ...
- Agriculture : Varietal choice, Farming method, Yield forecasts, ...
- Energy : winter and summer consumptions, energy trading, maintenance planning, ...
- Hydrology : Risks of severe Low flow and Floods, Water resource management, Dam management, ...
- NGO : anticipation/preparation of potential crisis, ...

# Use of Seasonal Forecasts

## ■ Which applications for the SWIO region?

- Water Resources
- Agriculture
- Food security
- Fire Risk
- Health (vector borne diseases)
- Importations (and associated markets)
- Tropical Cyclone Activities
- Ecosystems
- ...



**Seasonal Forecast is the first step for adaptation to  
Climate Variability and Climate Change**

# What to remember

- Downscaling/tailoring necessary for the use of the information
- Best compromise between needs and real possibilities
- Uncertainty part of the information ; must be integrated within the decision making processes and the use of the information
- Dialogue users / providers crucial all along the chain related to the climate information (development of products, dissemination, use, ...)
- Knowledge about the use of the information is essential for an efficient liaison and dialogue
- Data from the user domain crucial to tailor relevant products and information to the benefit of the users (sampling size, homogeneity, data quality, ...)
- Available actions and decisions should drive the co-design, co-production and the use of the climate information





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