EUPORIAS

European Provision Of Regional Impacts
Assessments on Seasonal and Decadal Timescales

GOBIERNO DE ESPAÑA
MINISTERIO DE AGRICULTURA, ALIMENTACIÓN Y MEDIO AMBIENTE
AEMet Agencia Estatal de Meteorología

Use of seasonal forecasts for water resources management in Spain

Laurent Pouget, Tamara Roldán, Manuel Gómez, Àngels Cabello (CETaqua),
Ernesto Rodríguez Camino, Beatriz Navascués, Jose Voces, Eida Sánchez, Federico Franco (AEMET),
Pau Comas (AQUALOGY),
Fernando Pastor, Mª Concepción García Gómez (MAGRAMA),
Juan José Gil, Delfina Gil, Rogelio Galván (River Basin Authorities of Douro, Tagus and Ebro rivers)

Motivation

- Climate services (CS) may be defined as scientifically based information and products that enhance users' knowledge and understanding about the impacts of climate on their decisions and actions. These services are made most effective through collaboration between providers and users [AMS stament, Aug 2012]

- Water dams are so far managed in Spain using climatological (historical) information and short/medium range weather forecasts.

- Use of SCF in Spain is rather limited due to:
  - Lack of precipitation skill over Spain
  - Accessibility, usability of information by end-users
  - Format of information (probabilistic versus deterministic)
  - Lack of tools to exploit information
  - Complexity of products
  - Lack/limitated support

EUPORIAS Project study case

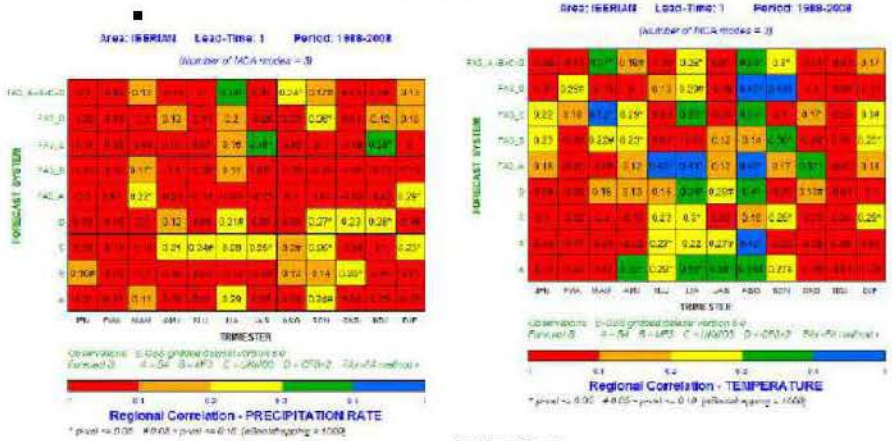
- WG encompassing AEMET, CETaqua, DG Water (Spanish Ministry for Agric/Envir), Douro, Tagus, Ebro Basin Water Authorities, AQUALOGY
- Start from a very single algorithm for seasonal prediction of user's relevant variables → Add complexity in further steps
- Co-design and co-production with users (Basin Water Authorities) → hand by hand going forward
- Emphasis on decision making based on probabilistic information
- Proto-type for a few representative dams
- Final product for all water dams over Spain

Skill of seasonal models

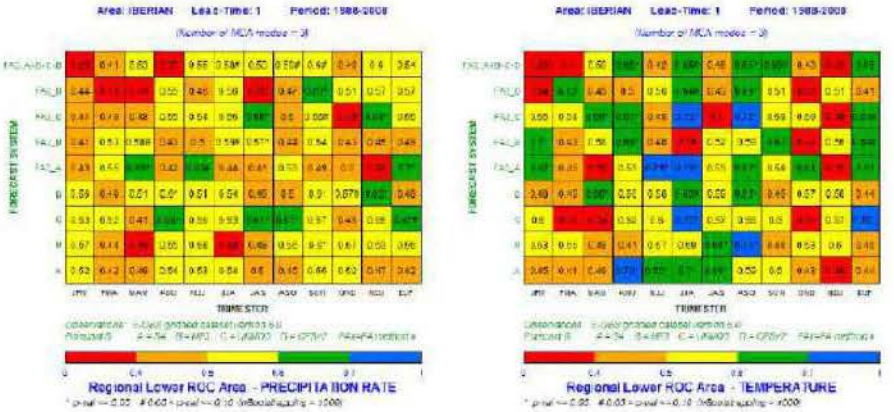
Precip.

Temp.

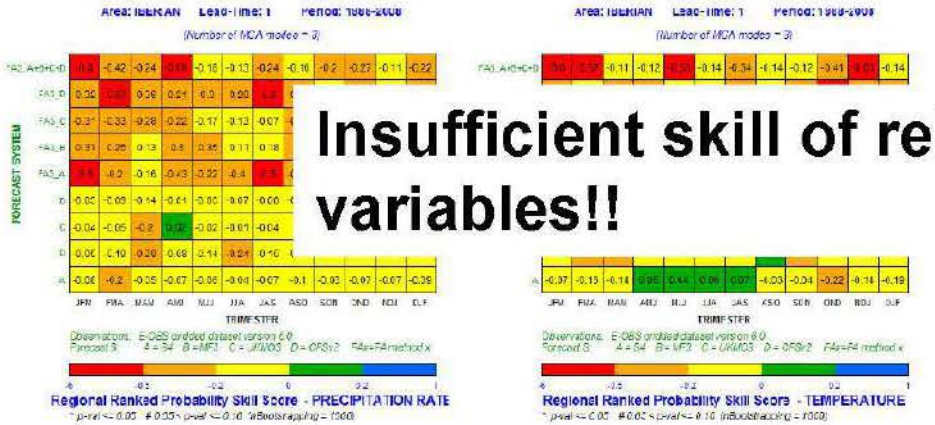
Pearson corr.



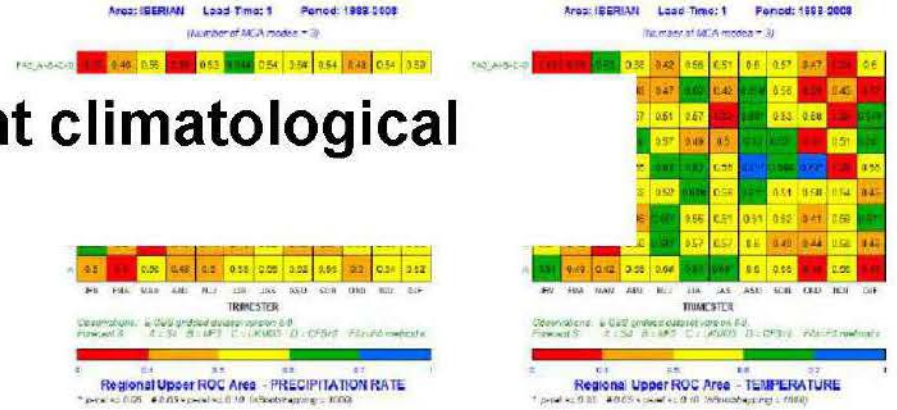
Lower ROC Area



RPSS

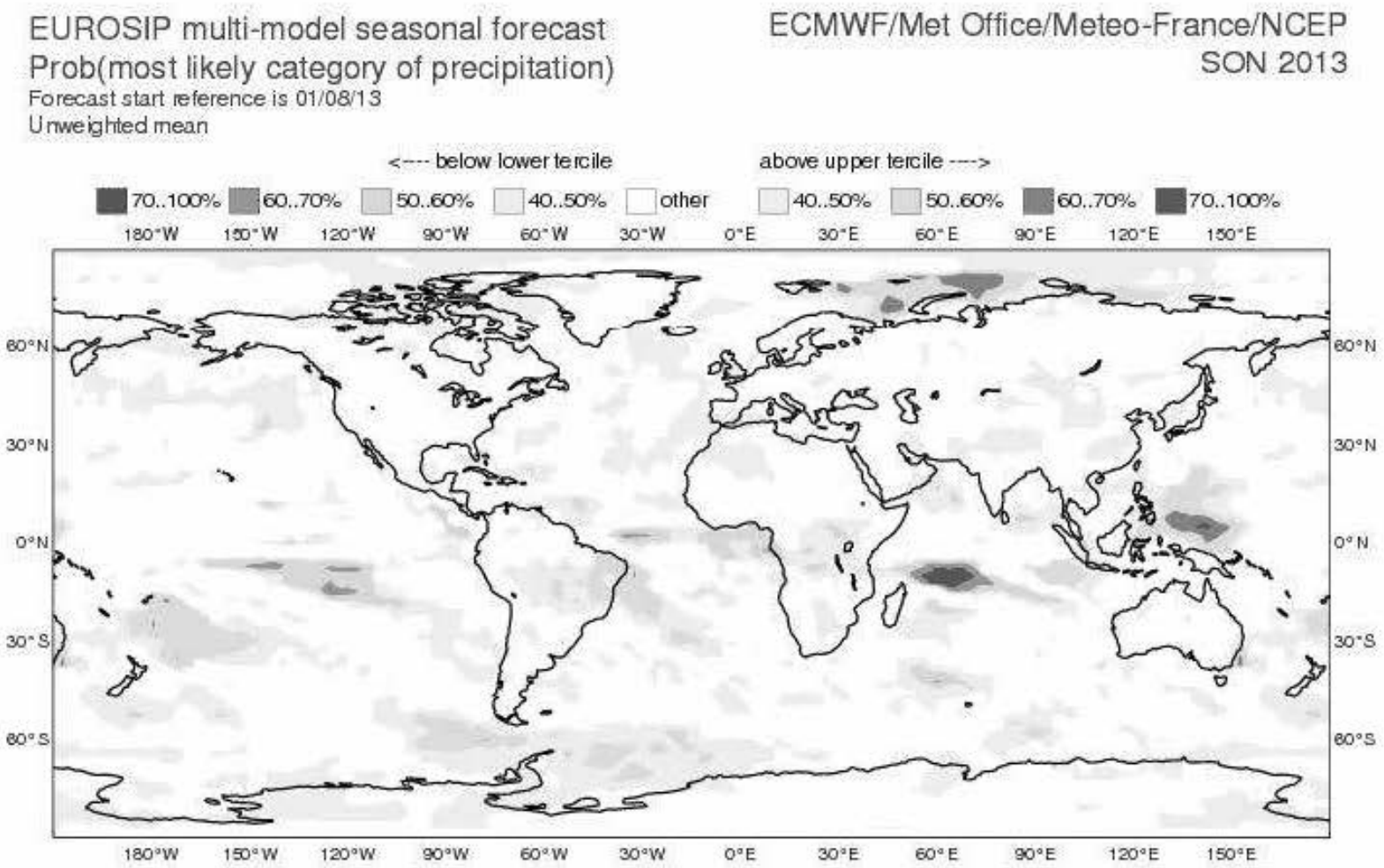


Upper ROC Area

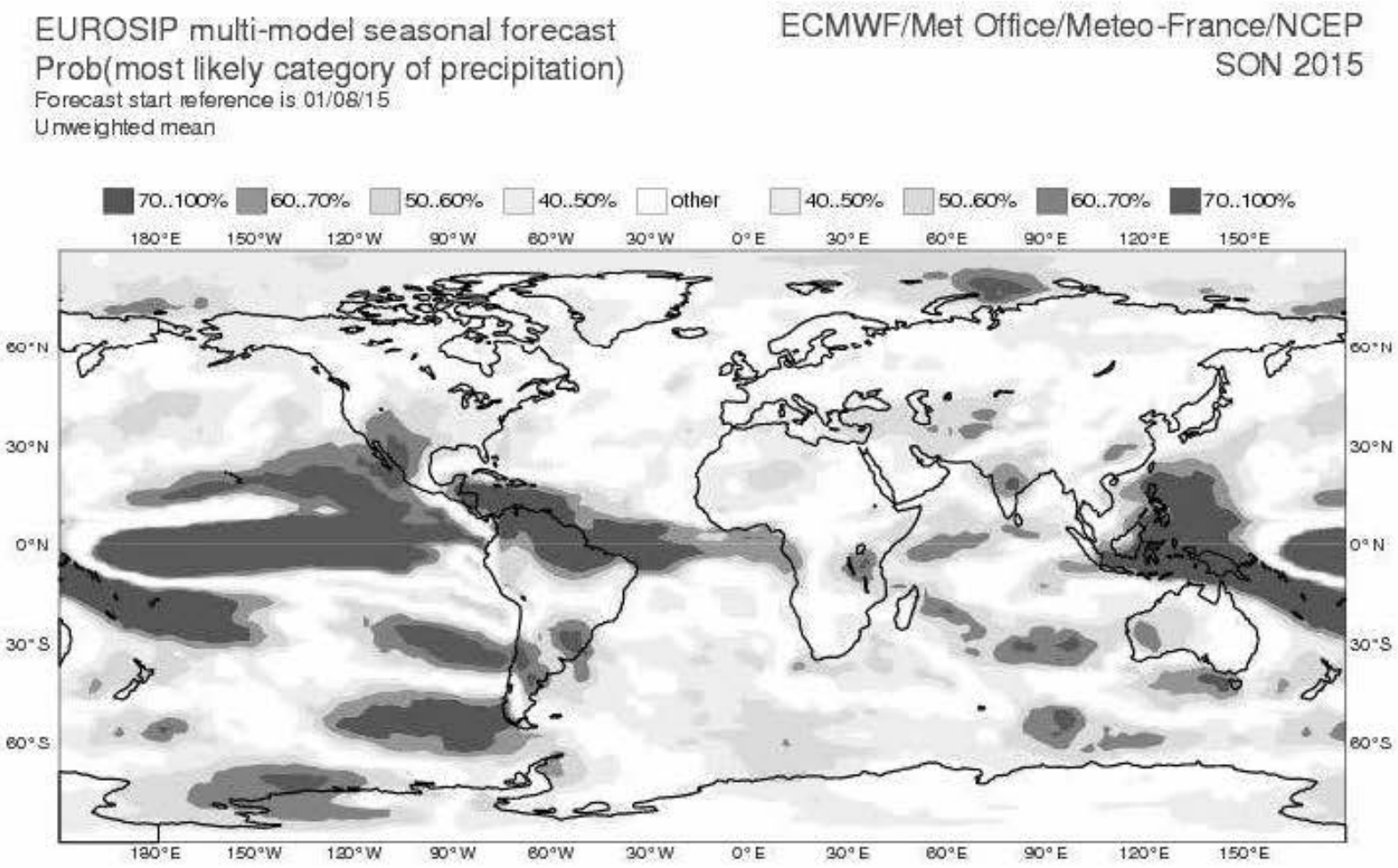


Insufficient skill of relevant climatological variables!!

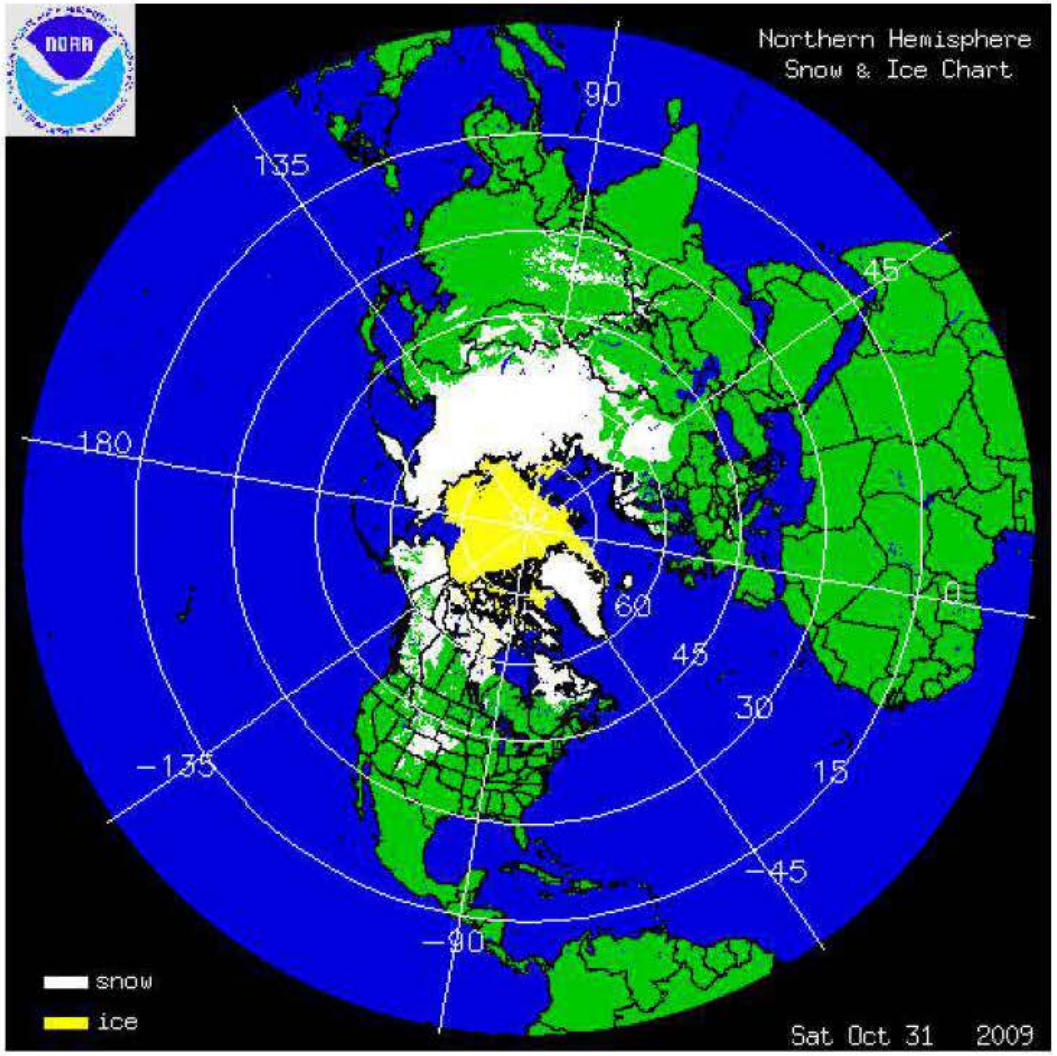
Frequently one cannot say much more than climatology!

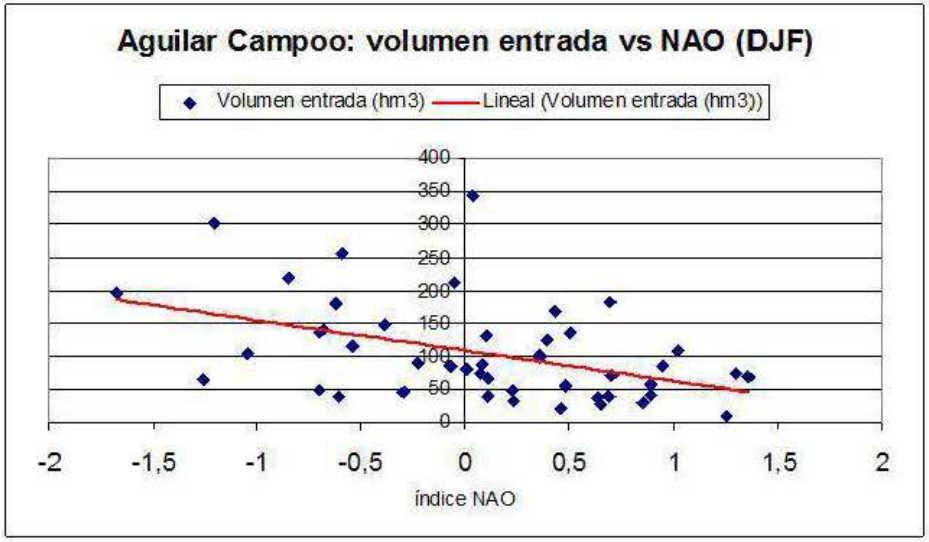


Current ENSO signal!



SAI (October) → NAO (DJF)





Pearson correlation coefficients btw October daily SAI and following winter precipitation (DJF)

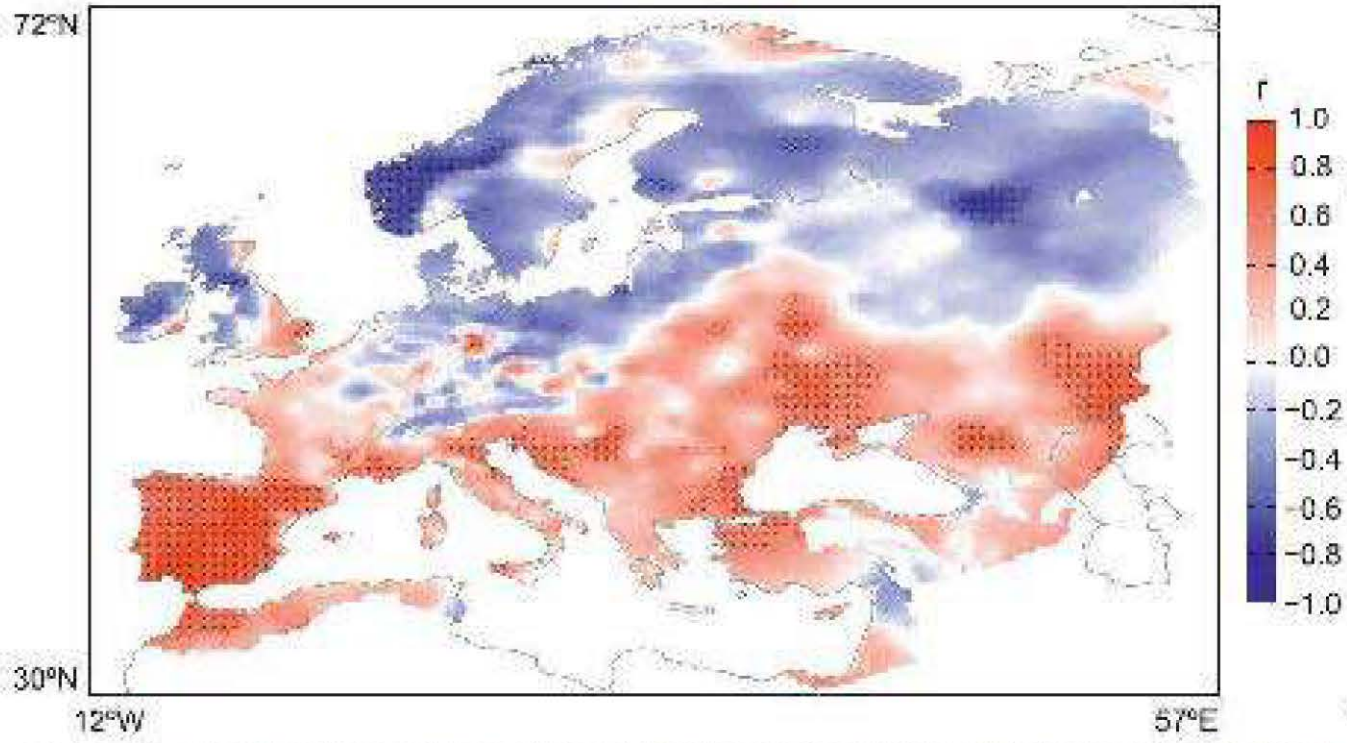


FIG. 1. Pearson correlation coefficients between the October daily SAI and the precipitation sums of the following DJF ($n = 14$, critical value $= \pm 0.53$). Locally significant correlations ($\alpha_{local} = 0.05$) are shaded in black. Global significance was obtained ($\alpha_{global} = 0.05$); all calculations are based on E-OBS.

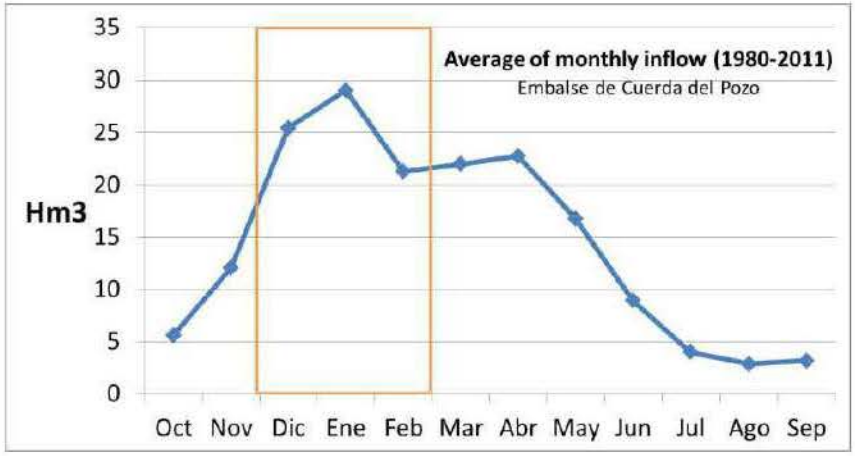
General recommendations

- Windows of opportunity linked to certain seasons, regions, variables, state, patterns, …
- Do not disregard empirical/statistical methods
- Incorporate users to the process of design and production of SCP
- Users are interested in certain specific variables (not always T and/or Prec)
- Explore the skill of such variables
- Effect on decision making process

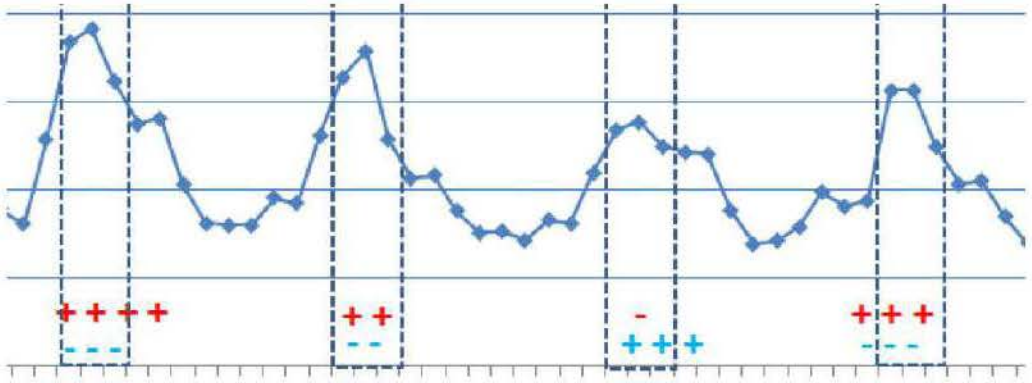
(Brands et al., JC, 2012)

Potential uses from the supply and demand sides

Inflows into dam (DJF)



Monthly water consumption



Many different strategies are being tested both for the supply and demand sides!!

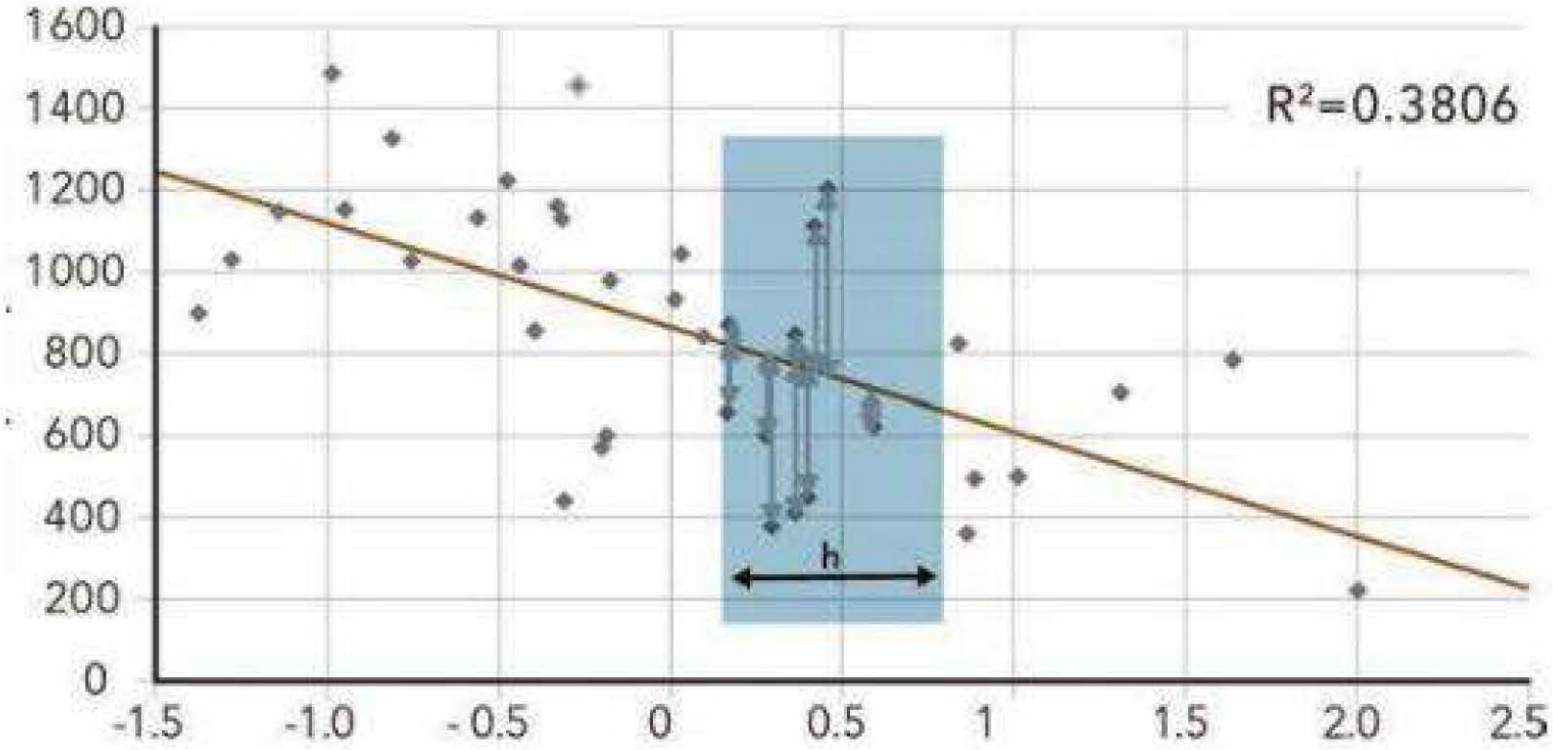
SUPPLY SIDE

Predictor (SAI) → NAO → Precipitation → Inflow

Predictor (SAI October) → Inflow (DJF)
Predictor (SAI October) → Inflow (NDJFM); N, M clim
Predictor (daily SAI October) → Inflow (DJF)
Predictor (weekly SAI October) → Inflow (DJF)

Multiple regression
Combination empirical + model outputs

From empirical relationship to ensembles



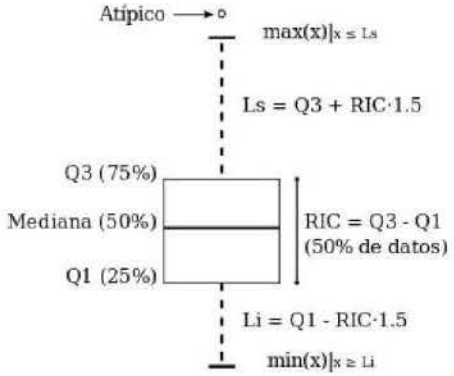
Several alternatives:

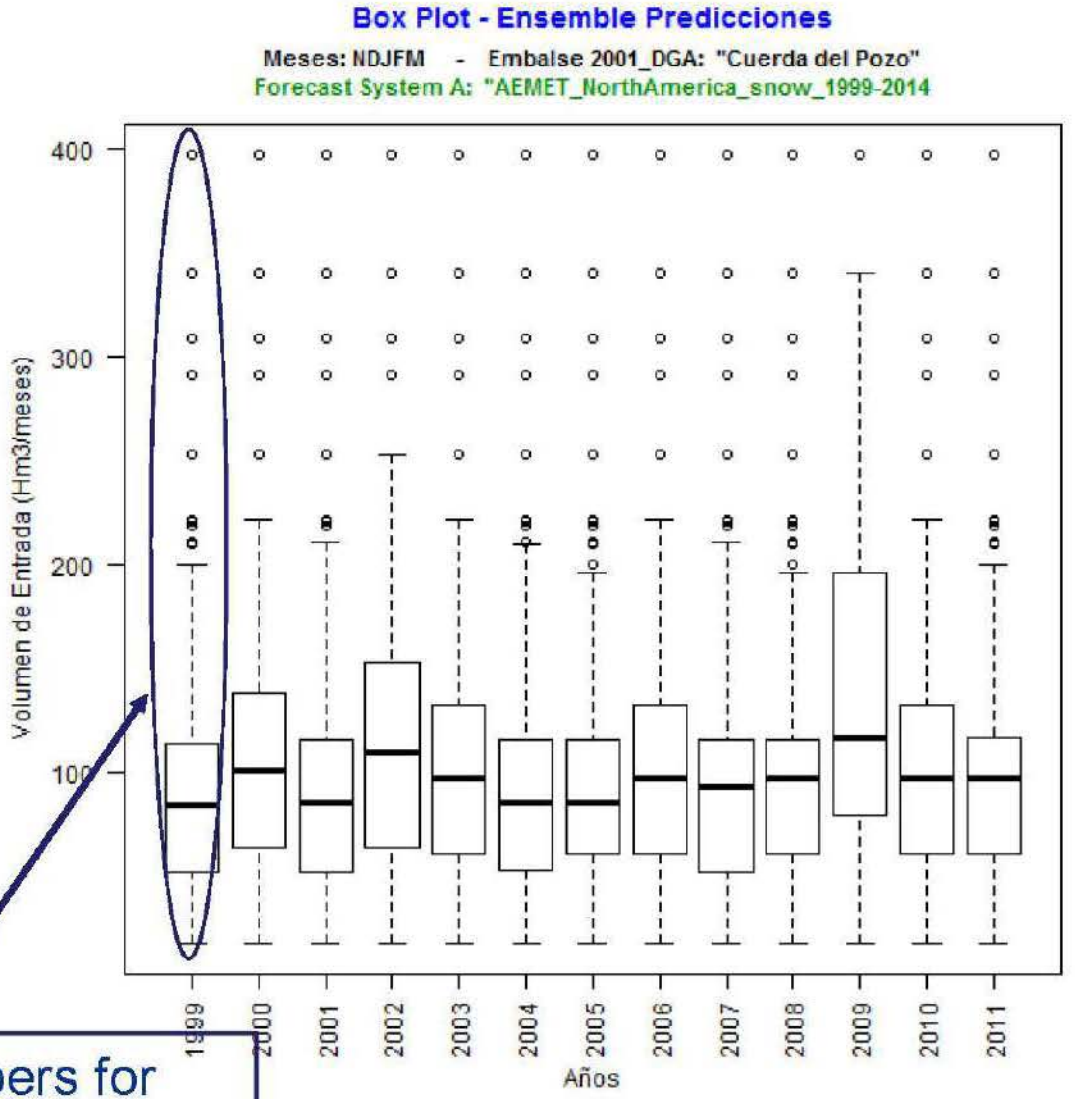
- Given a neighborhood of width h that contains the k nearest neighbors to the observed predictor variable, the residuals are sampled to develop k forecast scenarios (as in (Brown et al 2009))
- A probability distribution could be fit to the sampled residuals,
- 1500 members used

4 different predictors based on SAI

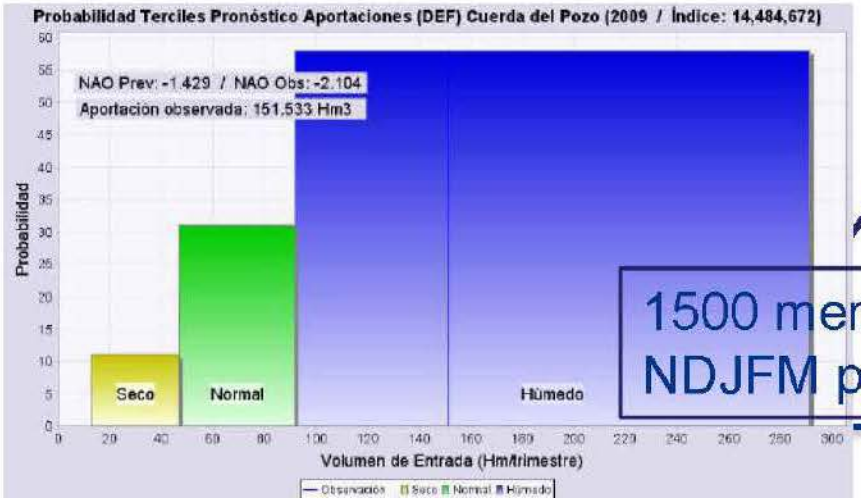
	Name	Description
A	AEMET_NorthAmerica_snow_1999-2014	Daily SAI for North America and Western Europe PERIOD 1999-2014
B1	AEMET_snow_advance_index_1973-2013	Weekly SAI for Eurasia PERIOD 1973-2013
B2	AEMET_snow_advance_index_1999-2013	Weekly SAI for Eurasia PERIOD 1999-2013
C	AEMET_Eurasia_snow_1999-2014	Daily SAI for Eurasia PERIOD 1999-2014

Ensemble forecast



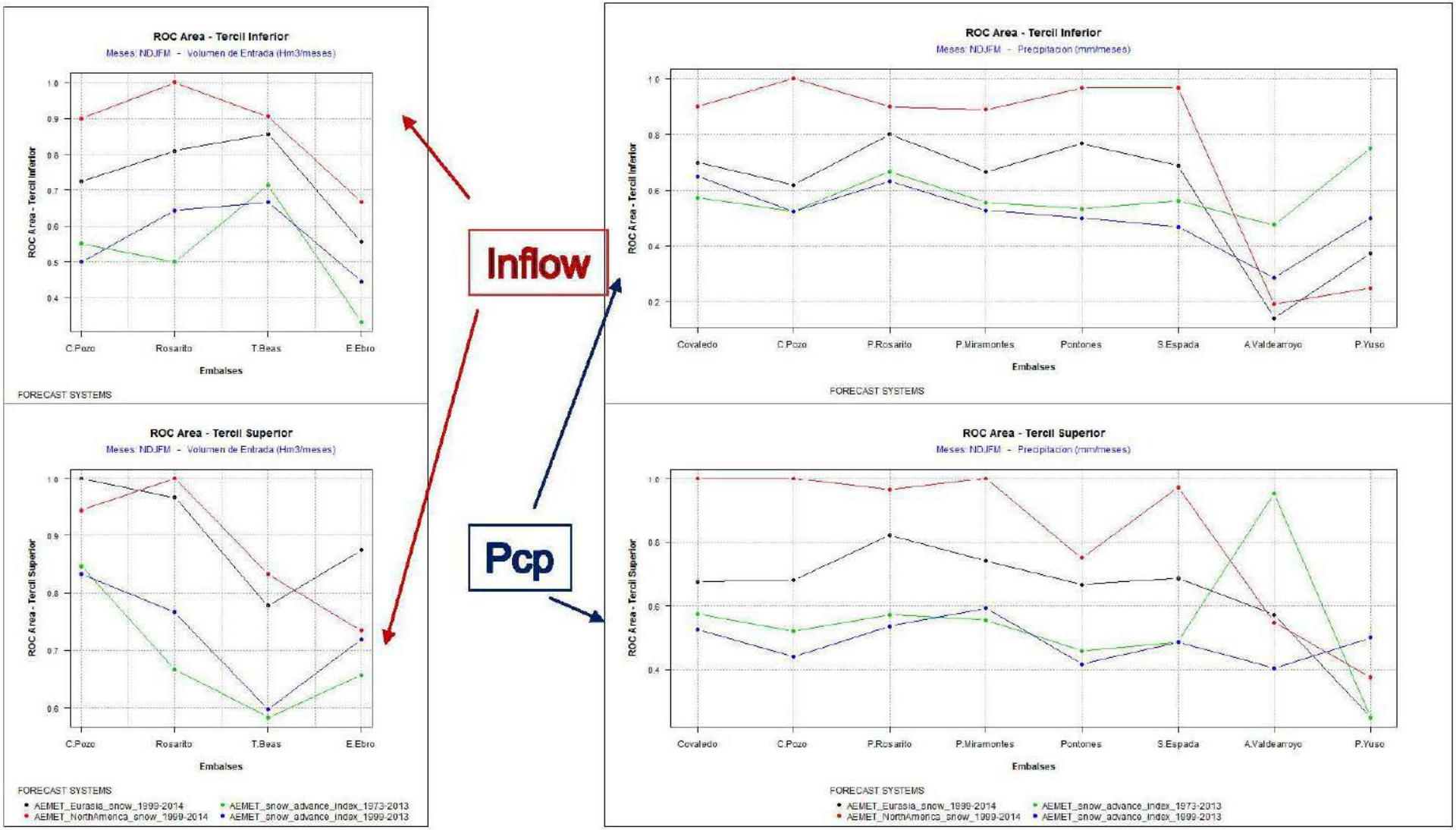


2009

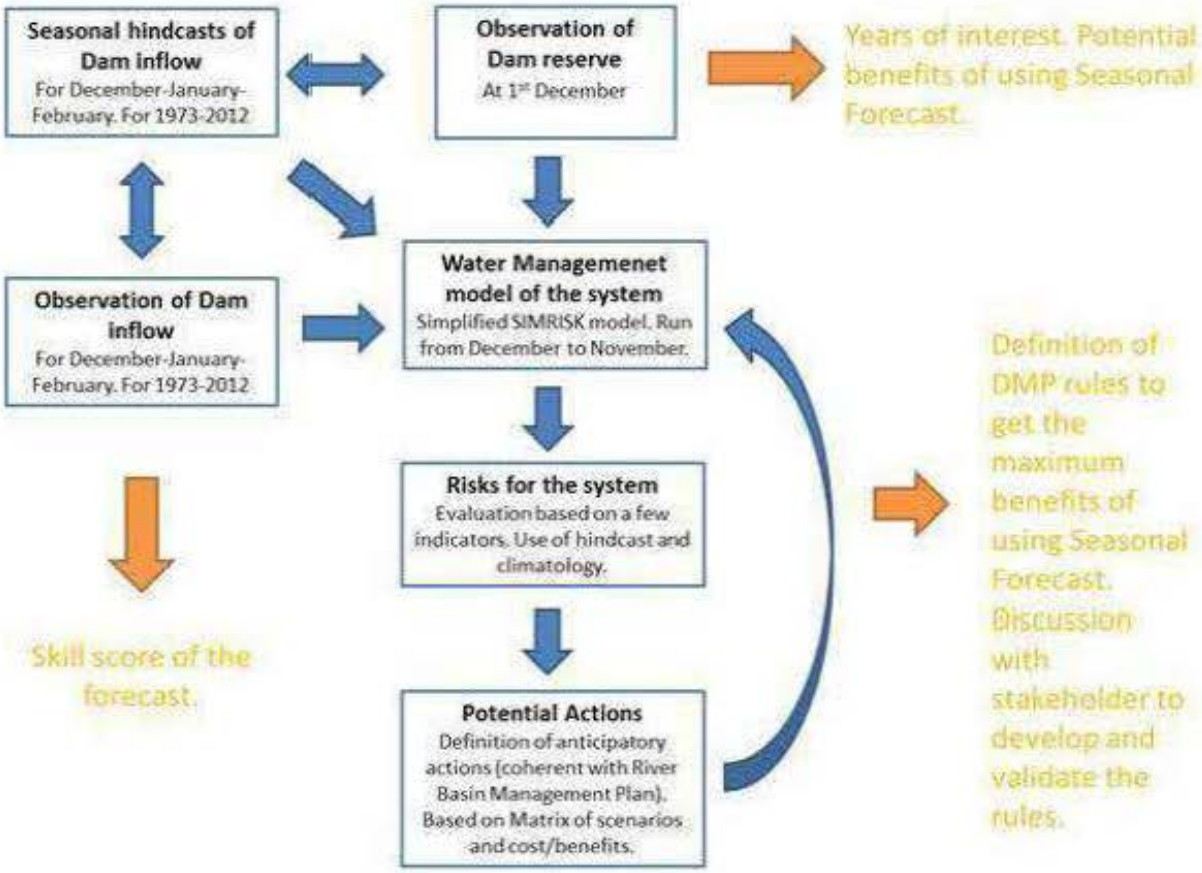


1500 members for NDJFM per year

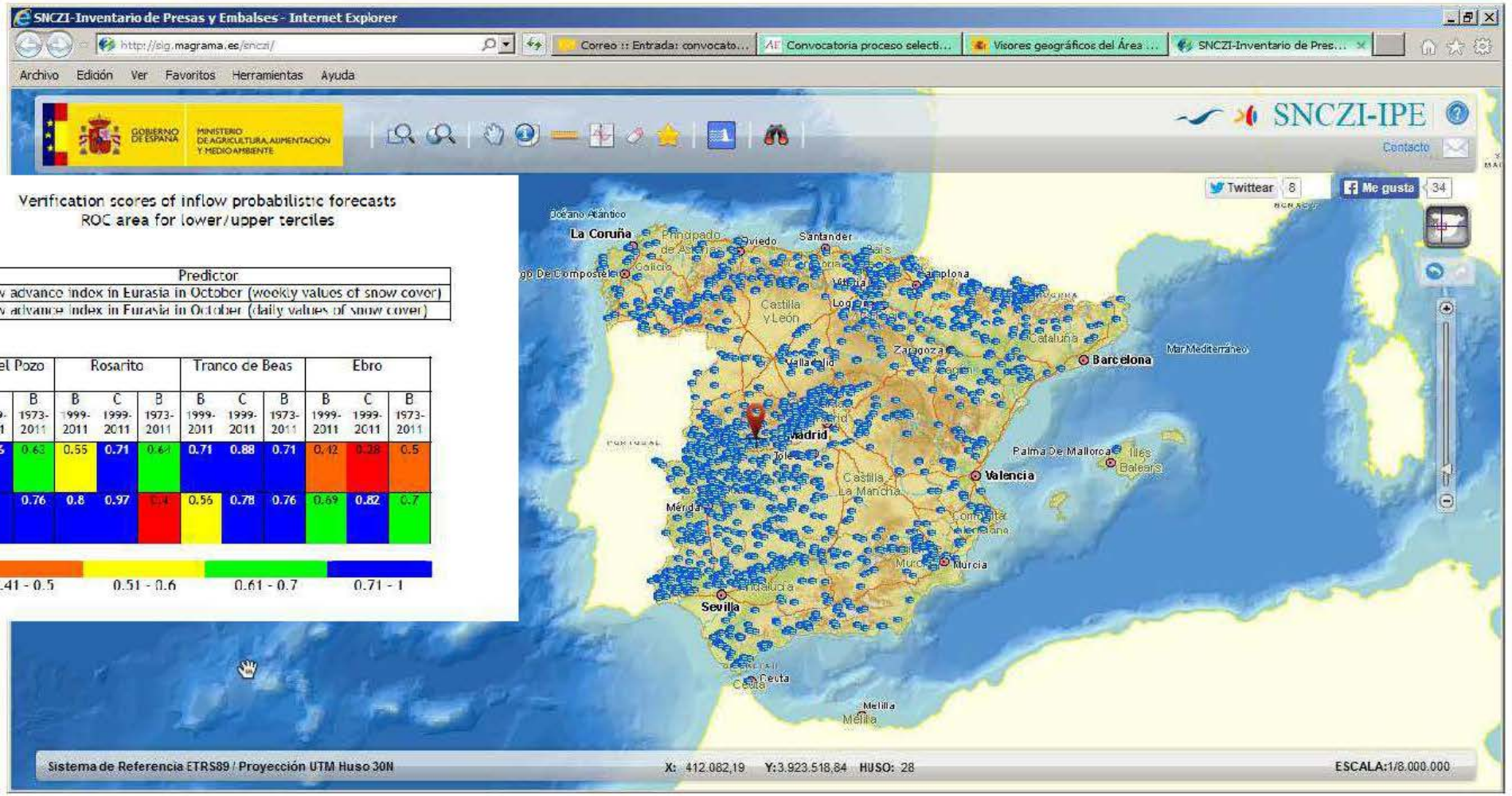
Upper/Lower ROC area (NDJFM)



SIMRISK model



Big difference in skill among river basins!!



Conclusions

- In Spain, there are opportunities for using seasonal prediction in periods, area and variables with significant **skill either coming from models or empirical algorithms**
- Accordingly, opportunities exist for **dam management** (peak inflow in winter; peak water demand in summer).
- **Hand by hand** going forward in design and production
- To take the full benefits of these opportunities, forecasts should efficiently be integrated into the existing tools and management structure, so **decision making and management rules could be upgraded** based on performance assessment.