

# C3S\_441\_Lot1\_SMHI



Climate Change

**SMHI**



## The pan-European seasonal hydrological forecasting service developed by SMHI for C3S

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Climate Change

# Sectorial Information System: P o C W A T E R

**WHAT WILL THE INFORMATION BE USED FOR?**

The wealth of climate information will be the basis for generating a wide variety of climate indicators aimed at supporting adaptation and mitigation policies in Europe in a number of sectors. These include, but are not limited to, the following:

**C3S WILL DELIVER SUBSTANTIAL ECONOMIC VALUE TO EUROPE BY:**

- 1 INFORMING**  
POLICY DEVELOPMENT TO PROTECT CITIZENS FROM CLIMATE-RELATED HAZARDS SUCH AS HIGH-IMPACT WEATHER EVENTS
- 2 IMPROVING**  
PLANNING OF MITIGATION AND ADAPTATION PRACTICES FOR KEY HUMAN AND SOCIETAL ACTIVITIES
- 3 PROMOTING**  
THE DEVELOPMENT OF NEW SERVICES FOR THE BENEFIT OF SOCIETY

- ‘Proof-of-Concept’ in C3S for Sectorial Information System
- Nov. 2015 – Feb. 2018:
  - Co-design a web service with users (Knowledge Purveyors)
  - Define & Provide Climate Change Indicators and Seasonal Indicators (CII and SI)
  - Evaluate user uptake
- <http://swicca.climate.copernicus.eu/>

**SWICCA**  
Service for Water Indicators in Climate Change Adaptation

SWICCA offers readily available climate-impact data to speed up the workflow in climate-change adaptation of water management across Europe.

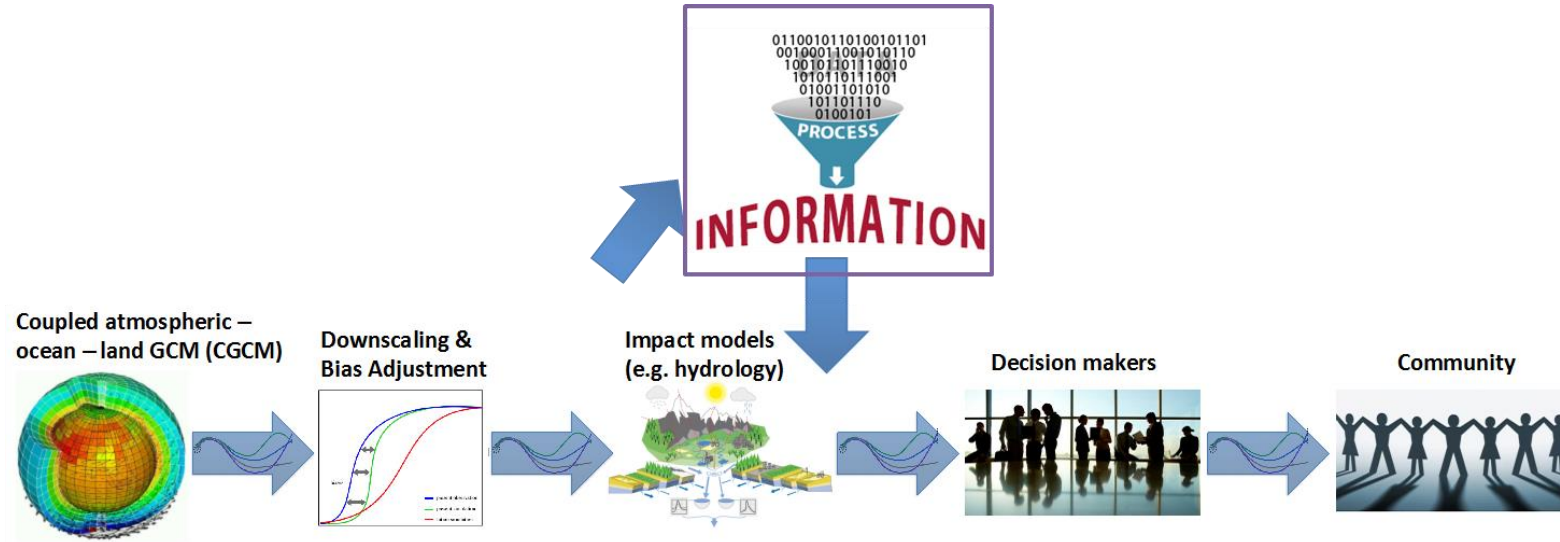
Getting started | Maps, graphs and downloads | About SWICCA data | Showcases

Consulting engineers: Make your own climate impact assessments!



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# Sectorial Information System: P o C W A T E R

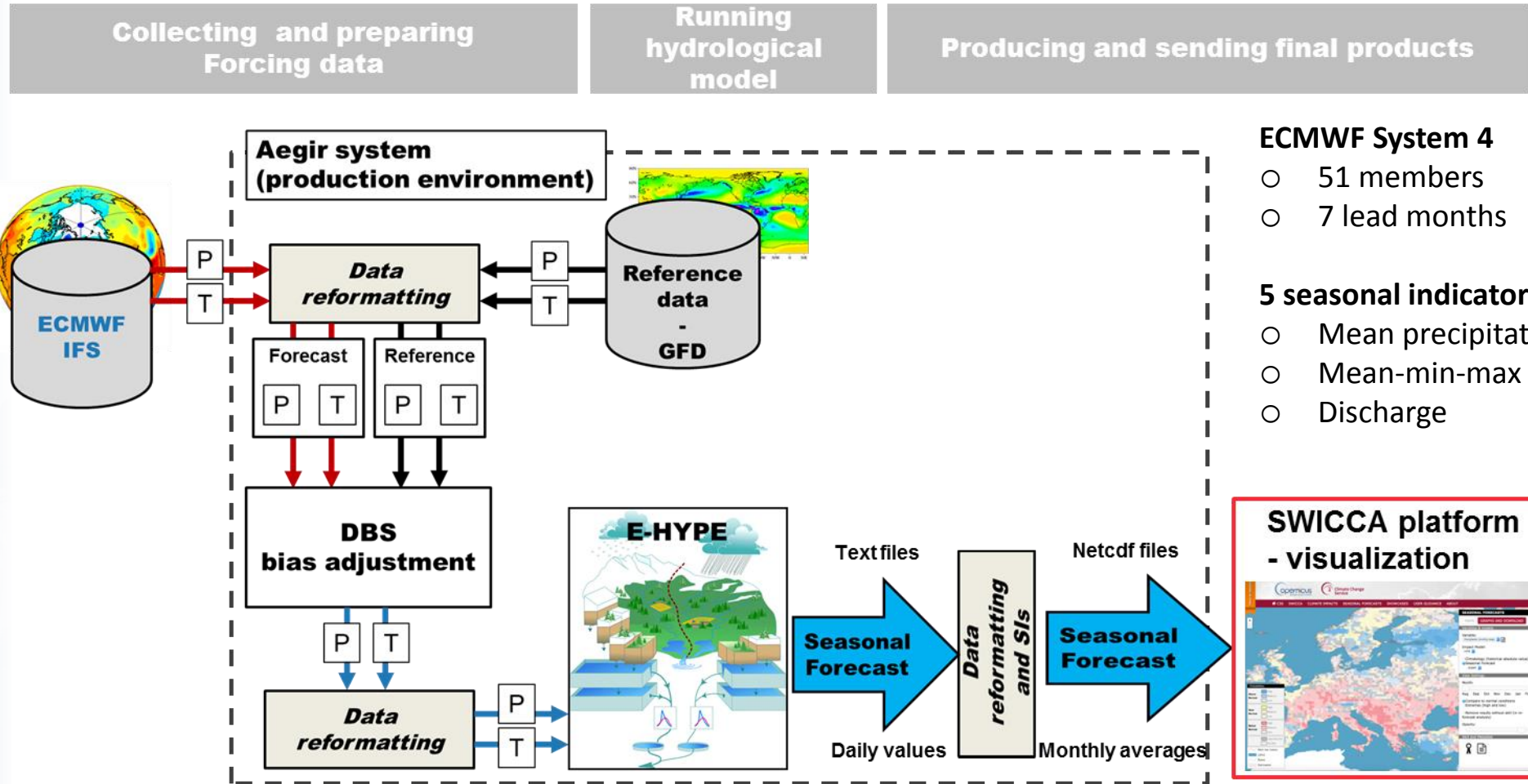


The screenshot shows the SWICCA website interface. The header includes the Copernicus logo and 'Climate Change Service'. The main content area features a banner for 'SWICCA Service for Water Indicators in Climate Change Adaptation' and a navigation menu with buttons for 'Getting started', 'Maps, graphs and downloads', 'About SWICCA data', and 'Showcases'. A footer banner reads 'Consulting engineers: Make your own climate impact assessments!'.



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# Seasonal forecasting service



## ECMWF System 4

- 51 members
- 7 lead months

## 5 seasonal indicators (SIs)

- Mean precipitation
- Mean-min-max temperature
- Discharge

## SWICCA platform - visualization

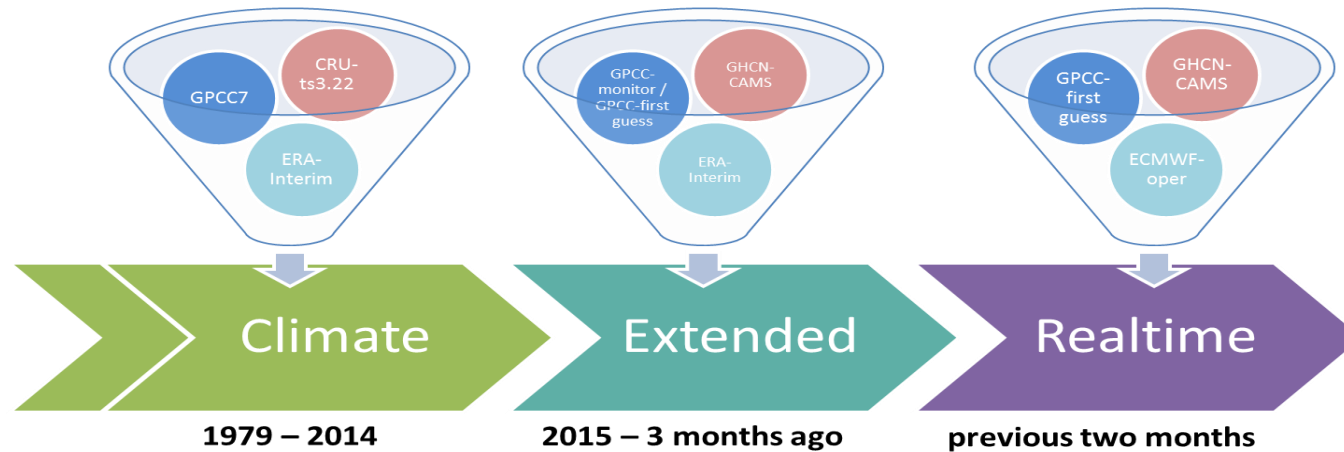




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# Initialisation - Global Forcing Data (GFD)

- 0.5 degrees resolution
- 3-hrs frequency for 'Climate' and 'Extended'
- 6-hrs frequency for 'Realtime'



Hydrology and Earth System Sciences  
An interactive open-access journal of the European Geosciences Union

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<https://doi.org/10.5194/hess-2017-326>  
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Research article

## Near real-time adjusted reanalysis forcing data for hydrology

Peter Berg, Chantal Donnelly, and David Gustafsson

Hydrology Research Unit, Swedish Meteorological and Hydrological Institute, Folkborgsvägen 17, 601 76 Norrköping, Sweden

Discussion papers

Abstract

Discussion

Metrics

17 Aug 2017

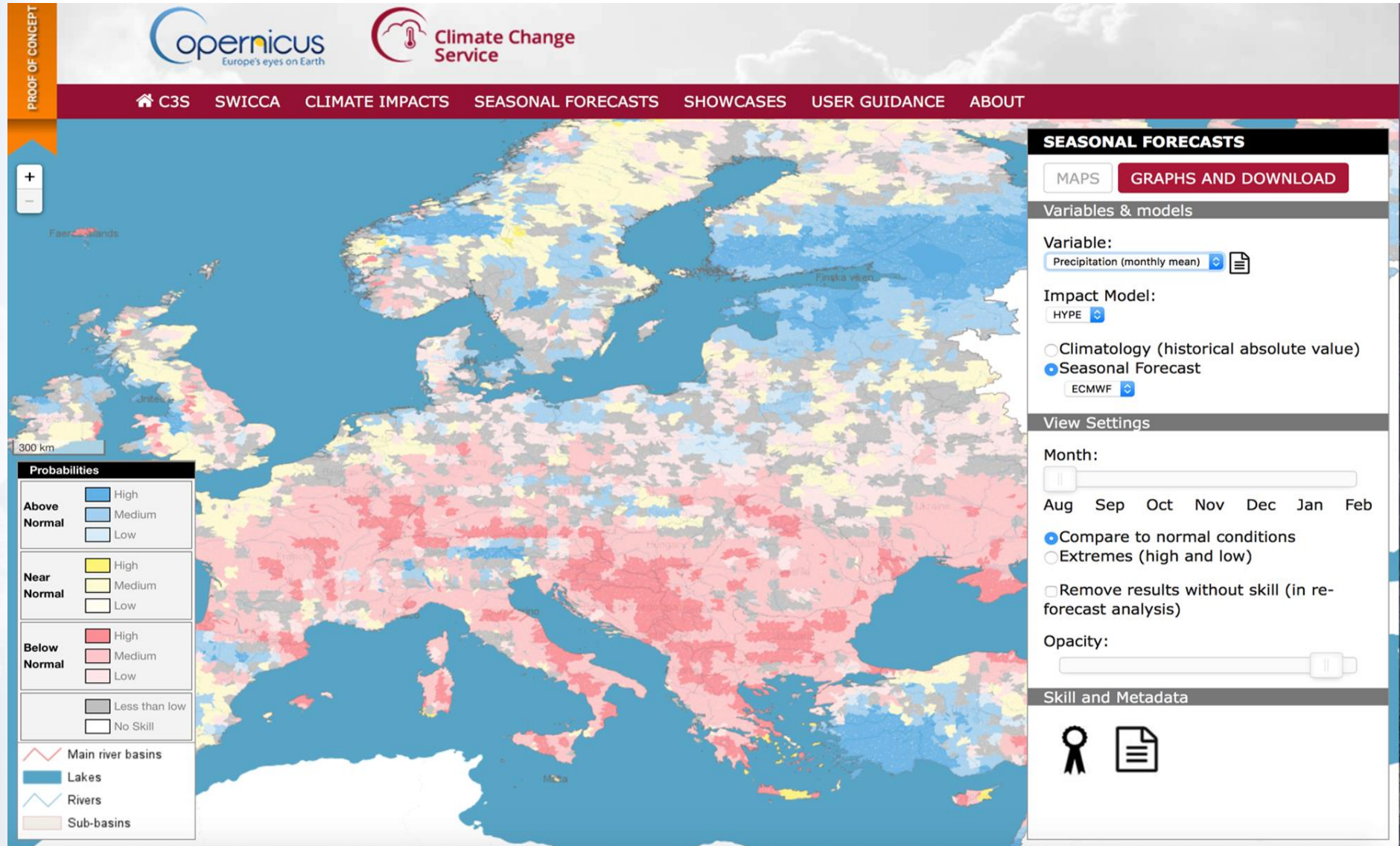
### Review status

This discussion paper is a preprint. It is a manuscript under review for the journal Hydrology and Earth System Sciences (HESS).



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# C3S for Water content: Maps





Climate Change

# C3S for Water content: Maps

For percipitation and riverflow

→ blue is above normal and red is below normal (same for extremes)

For temperature

→red is above normal and blue is below normal (same for extremes)

## Probability

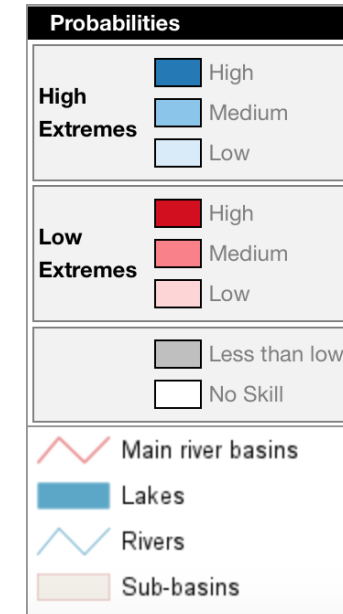
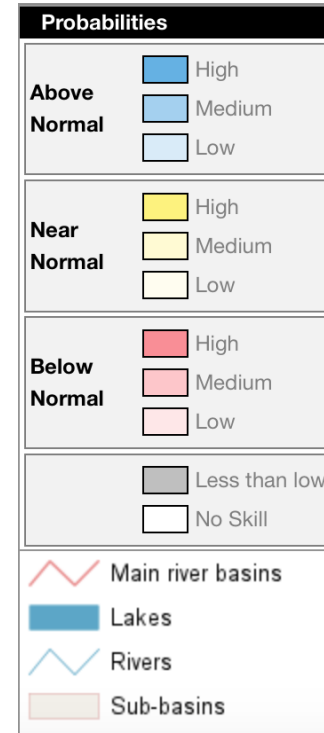
Low	35-50%
Medium	50-75%
High	75-100%
Otherwise unreliable	

## Monthly (month compared to normal month)

Above Normal	>66%
Near Normal	>33% and < 66%
Below Normal	< 33%

## Extremes (month compared to extreme month)

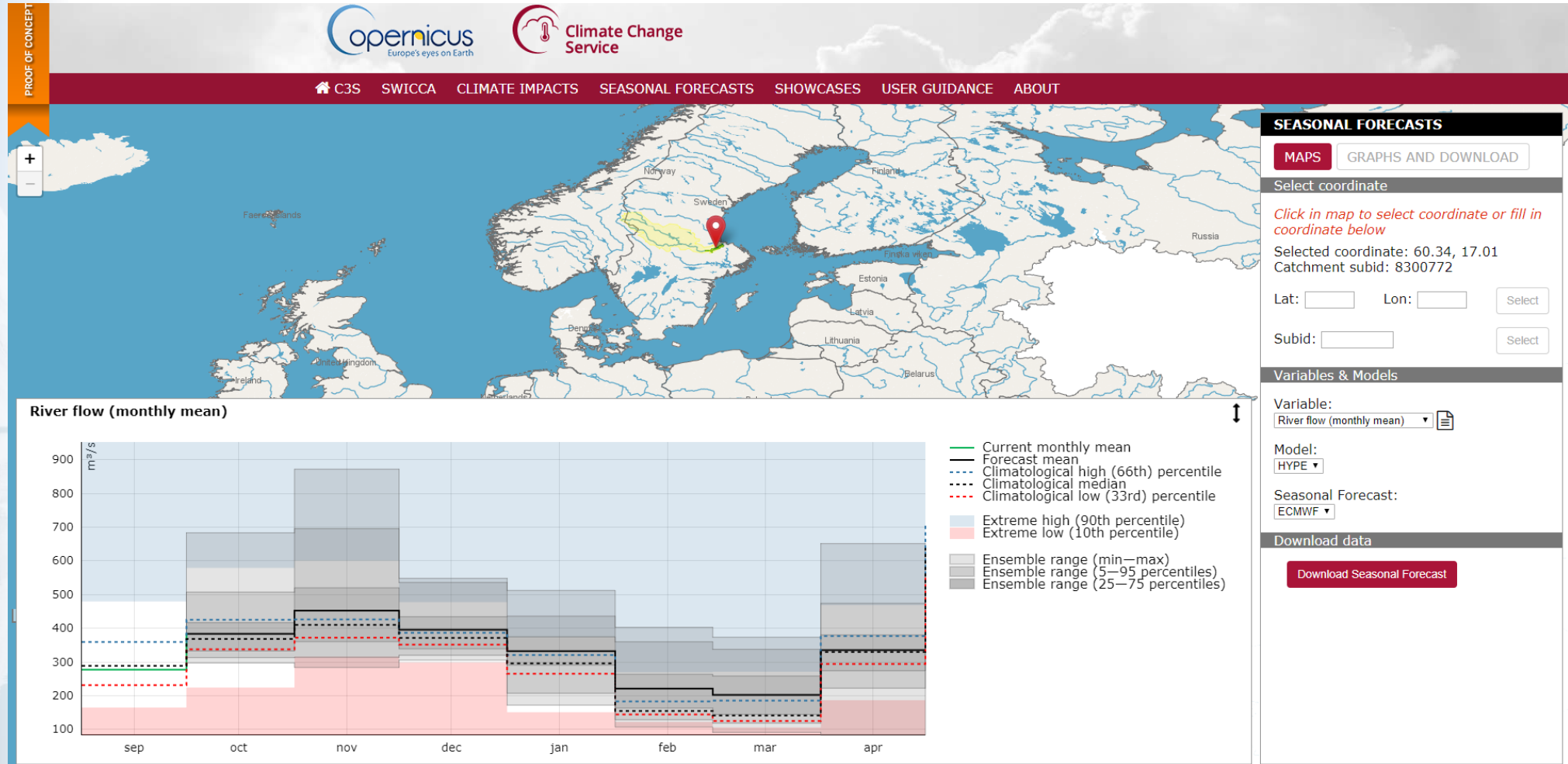
High Extreme	> 90%
Low Extreme	< 10 %





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# C3S for Water content: Graphs & Downloads



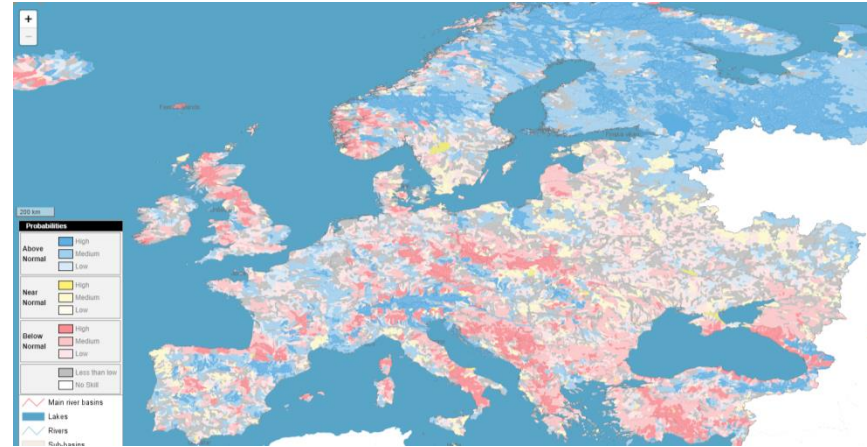




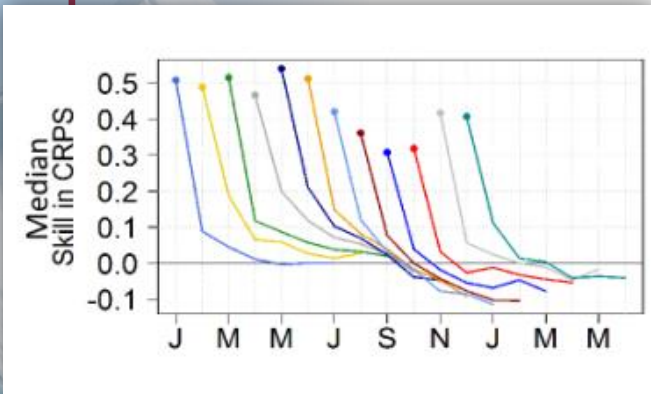
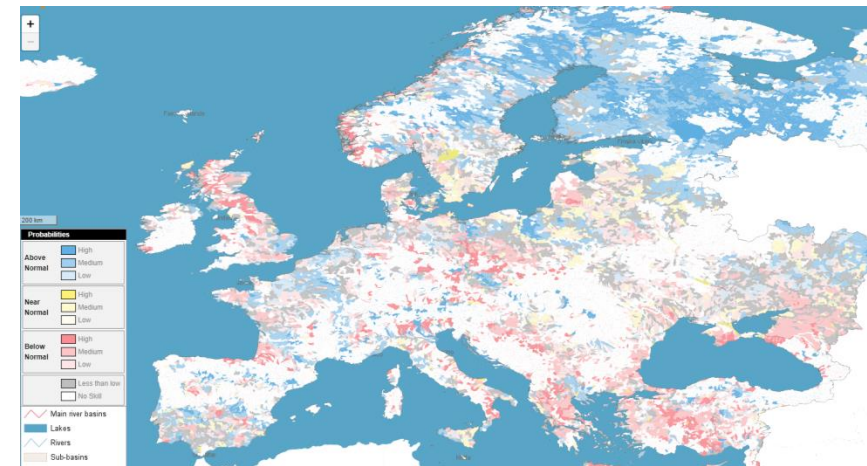
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# C3S for Water content: Communication

## All catchments



## ONLY catchments with skill



Forecasting performance: season, lead time, location, regime...

SEASONAL FORECASTS

MAPS | **GRAPHS AND DOWNLOAD**

Variables & models

Variable: Precipitation (monthly mean)

Impact Model: HYPE

Climatology (historical absolute value)

Seasonal Forecast

ECMWF

View Settings

Month: Aug Sep Oct Nov Dec Jan Feb

Compare conditions

Extremes (high and low)

Remove results without skill (in re-forecast analysis)

Opacity:

Skill and Metadata



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# Lessons learnt from user engagement

1. The users want Guidance rather than technical tools for local use.
  - *Climate science is difficult and the climate signal is not clear....*

The screenshot shows the Copernicus Climate Change Service website. The 'FAQ' link in the left-hand navigation menu is circled in red. The main content area displays the 'River flow (catchment): monthly mean' page, which includes sections for '1. General', '1.1. Description', and '1.2. Maps'. The right-hand side of the page shows a navigation menu with 'CLIMATE IMPACTS', 'SEASONAL FORECASTS', 'SHOWCASES', 'USER GUIDANCE', and 'ABOUT'. Below the navigation menu, there is a section for 'Climate Impact Indicators' with a table of indicators.

**FAQ**

- [How to use this](#)
- [How to estimate](#)
- [What is a climat](#)
- [What is a season](#)
- [Why and how to](#)
- [Why the spread](#)
- [How to use differ](#)
- [How to explore](#)
- [How does SWIC](#)
- [How does SWIC](#)
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**River flow (catchment): monthly mean**

**1. General**  
Forecast monthly averages are calculated for each catchment. The service is updated on a monthly basis when the new seasonal forecasts become available (usually on the 9<sup>th</sup> of the month).

The seasonal impact indicators are based on hydrological impact modelling using the hydrological model E-HYPEv3.1.2. The hydrological modelling was done for SWICCA with an ensemble of bias-corrected seasonal climate forecasts (51 members) provided by the ECMWF System 4.

**1.1. Description**  
River flow is the volume of water flow that is transported through a given cross-sectorial area. It is synonym to river discharge or streamflow.

For each monthly period, the available indicator for river flow based on daily data is:  
**Monthly mean:** full monthly period mean of all daily values

**1.2. Maps**  
For the reference period (1982-2010) the absolute values are given (see the option "Climatology (historical absolute value)"), while for the seasonal forecast periods (see the option "Seasonal Forecast") the probabilities of reaching above/near/below normal conditions are provided.

The map shows the anomaly for each catchment and lead month using as reference either the normal values for the month of interest ("Compare to normal conditions") or the extreme values for the catchment conditions ("Extremes (high and low)"). The colours show the indicator's anomalies for each catchment over the forecast period (up to 7 months of lead time).

For "Compare to normal conditions", blue (yellow) [red] colours indicate the probability of forecasts being above (near) [below] normal conditions for the forecast month. The thresholds to define the normal conditions are the 66<sup>th</sup> and 33<sup>rd</sup> percentiles for the monthly averages and for each month as these are derived from the water balance simulation for the period 1982-2010. The water balance simulation is a continuous evaluation of the E-HYPE model forced with the Global Forcing Dataset (GFD; an SMHI operational system for generating corrected re-analysis fields of precipitation and temperature. GFD combines re-analysis and forecast products from ECMWF, corrected to observations from GPCC and GHCN-CAMS). The analysis is month specific.

For "Extremes (high and low)", blue [red] colours indicate the probability of forecasts being above [below] the extreme conditions for the forecast month. The thresholds to define the extreme conditions are the 90<sup>th</sup> and 10<sup>th</sup> percentiles for the monthly averages and for each month as these are derived from the water balance simulation for the period 1982-2010. The analysis is month specific.

The intensity of the colour represents the forecast probability (percentage of ensemble members) of exceeding (falling in between) [falling below] the selected thresholds (either for the normal conditions or the extremes) within the forecast month (see Figure 1). The probability categories are defined as high = 75 - 100%, medium = 50 - 75%, and low = 35 - 50%. If the probability is less than 35% for crossing either threshold, the region is shown as grey on the map ("Less than low").

The "Compare results without skill for a forecast period" option allows the user to mark the catchments

**CLIMATE IMPACTS** **SEASONAL FORECASTS** **SHOWCASES** **USER GUIDANCE** **ABOUT**

**CLIMATE IMPACTS**

Indicator is an aggregate quantitative measure used to show the impact of climate change on complex environmental phenomena in d variability. Estimates of essential climate variables (ECVs) and associated climate impact indicators may be derived from reanalysis, and climate projections as well as observations. The indicators are of different complexity. They can be based on time-series of from projections, a combination of variables, or be composed using information from other disciplines such as socio-economics. des indicators and ECV's that have been requested by Knowledge Purveyors in the [case studies](#) for climate adaptation in the water

and relevance describes the future trends of climate change across Europe, and lists the showcases of climate impact adaptation that h future trend. The metadata of climate impact indicators describes the SWICCA impact indicators and how they have been produced. are available for inspection and download at 'Maps, Graphs and Downloads'.

[of Climate Impact Indicators](#)  
[of Seasonal Forecasts](#)  
[Patterns and Relevance](#)  
[icator should I use?](#)  
[odels](#)

**Climate Impact Indicators**

or datasets of different resolution (below). The catchments are on average, 215 km<sup>2</sup> across Europe. Click on the links to read

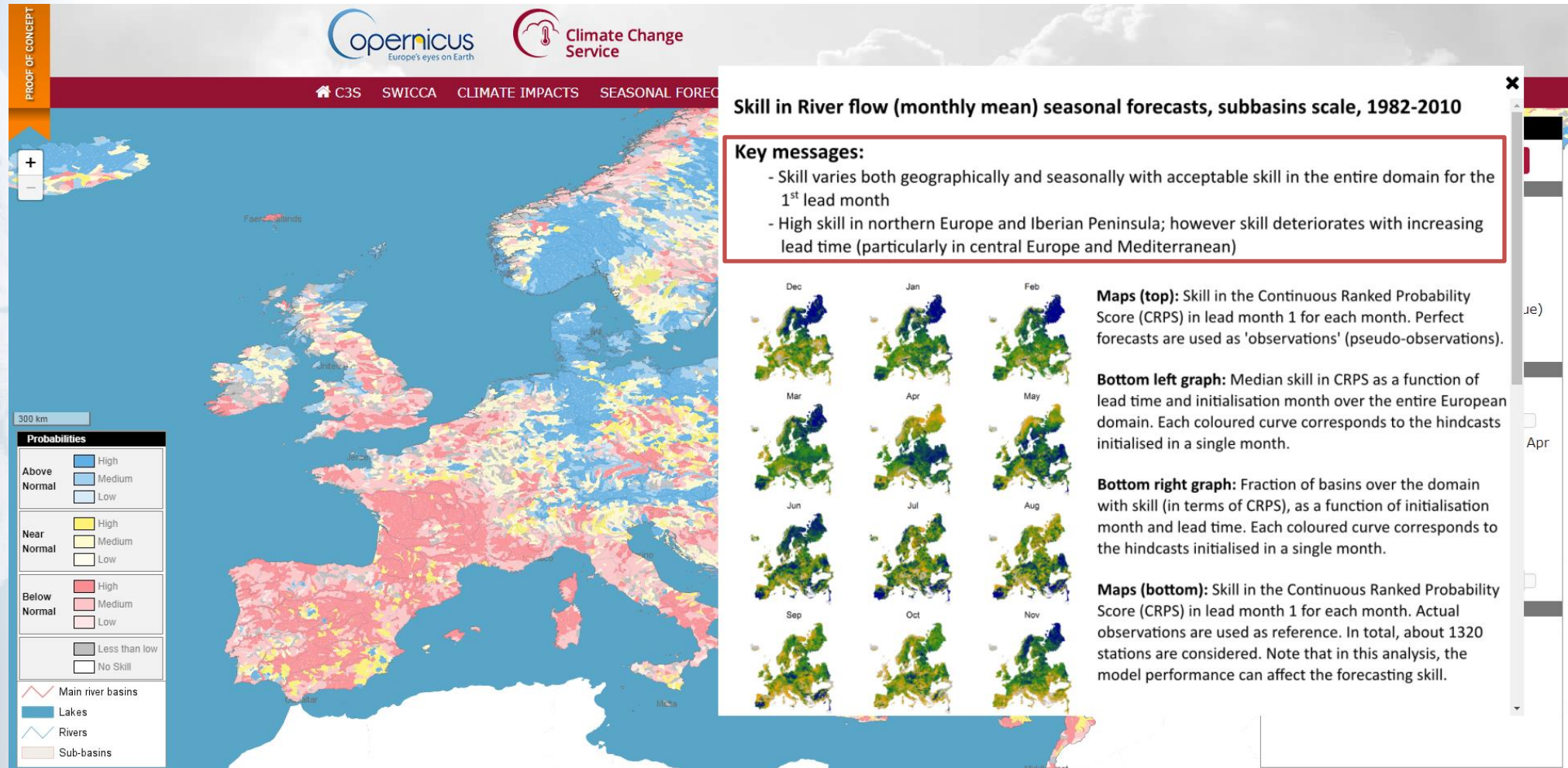
*with a \* should be used with caution at this stage, as the spatial representation is uncertain.*

Water Quality	Temperature	Precipitation	Air	Socio-economic
0.5 Phosphorous concentrations (catchment)	Freezing degree days (0.5 deg grid)	Dry spell (0.5 deg grid)	Cloud cover (0.1 deg grid)	GDP-SSP Scenarios
Phosphorous loads (catchment)	Freezing degree days (catchment)	Dry spell (catchment)	Relative humidity (0.1 deg grid)	Land Use Projections

Europe's eyes on Earth



- 2. Key messages must follow with the data for user uptake.
  - *Climate science is difficult and the climate signal is not clear....*



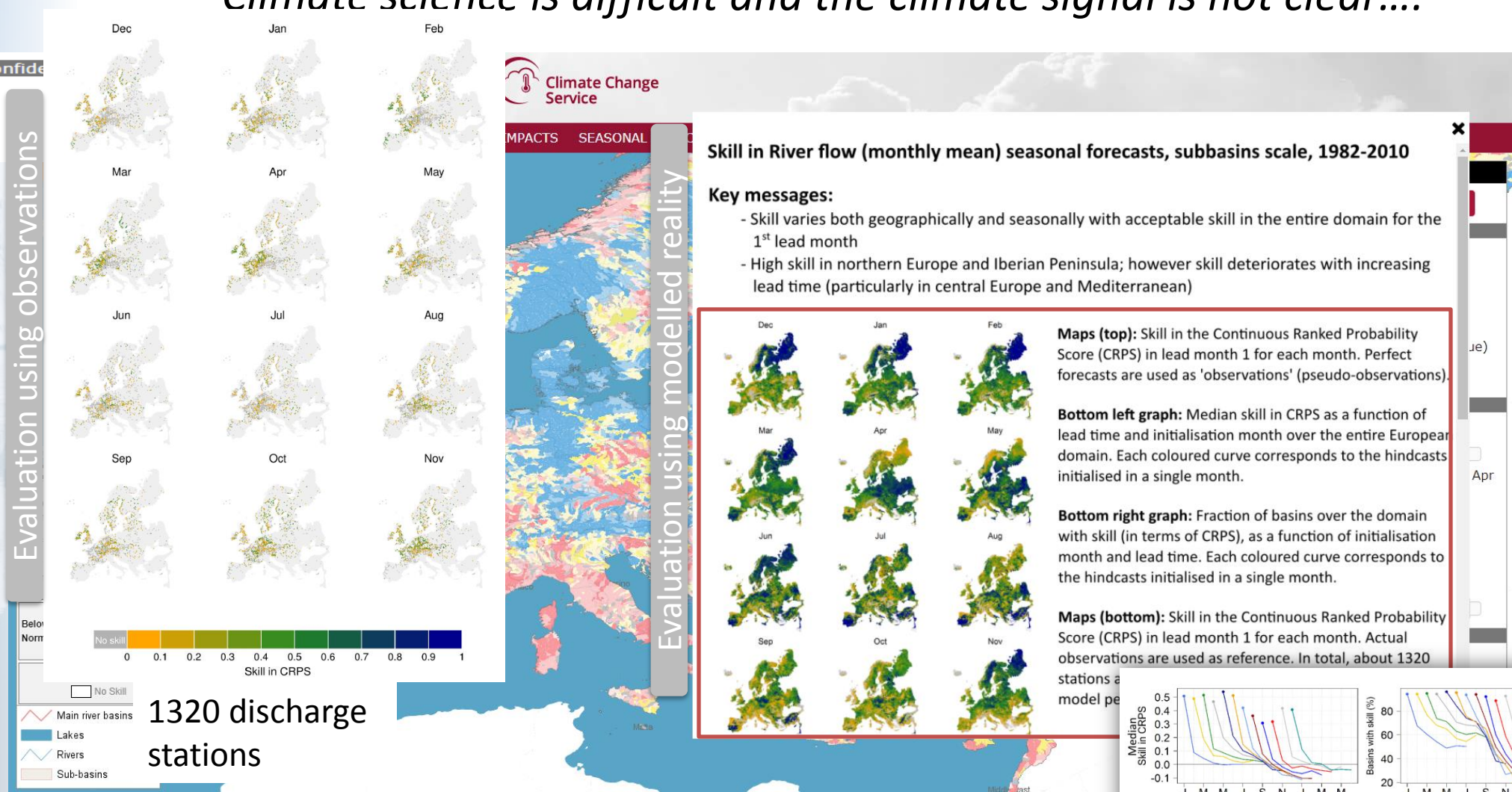


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# Lessons learnt from user engagement

## 3. Skill and reliability of forecasts are important to communicate.

– *Climate science is difficult and the climate signal is not clear....*





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# Lessons learnt from user engagement

## 4. 'Teach the teachers'

– *Purveyors need to understand to be able to communicate results with clients*



**Opernicus** Europe's eyes on Earth **Climate Change Service**

Search

C3S SWICCA CLIMATE IMPACTS SEASONAL FORECASTS SHOWCASES USER GUIDANCE ABOUT

**Tutorials**

**SWICCA Tutorial**

2017, 21st August

**Webinar #1: Seasonal climate forecasts**

Tuesday, August 22nd, 14:00-15:00 CEST

Experiences regarding the skill and opportunities of using seasonal forecasts, EUPORIAS project (European provision of regional impact assessment on a seasonal-to-decadal timescale)

Christiana Photiadou, the Royal Netherlands Meteorological Institute and the Swedish Meteorological and Hydrological Institute

Copernicus seasonal forecast products

Anca Brookshaw, European Centre for Medium-Range Weather Forecasts

To participate at the webinar, please register at: <https://goo.gl/forms/UuQFISUnflirUUr12>

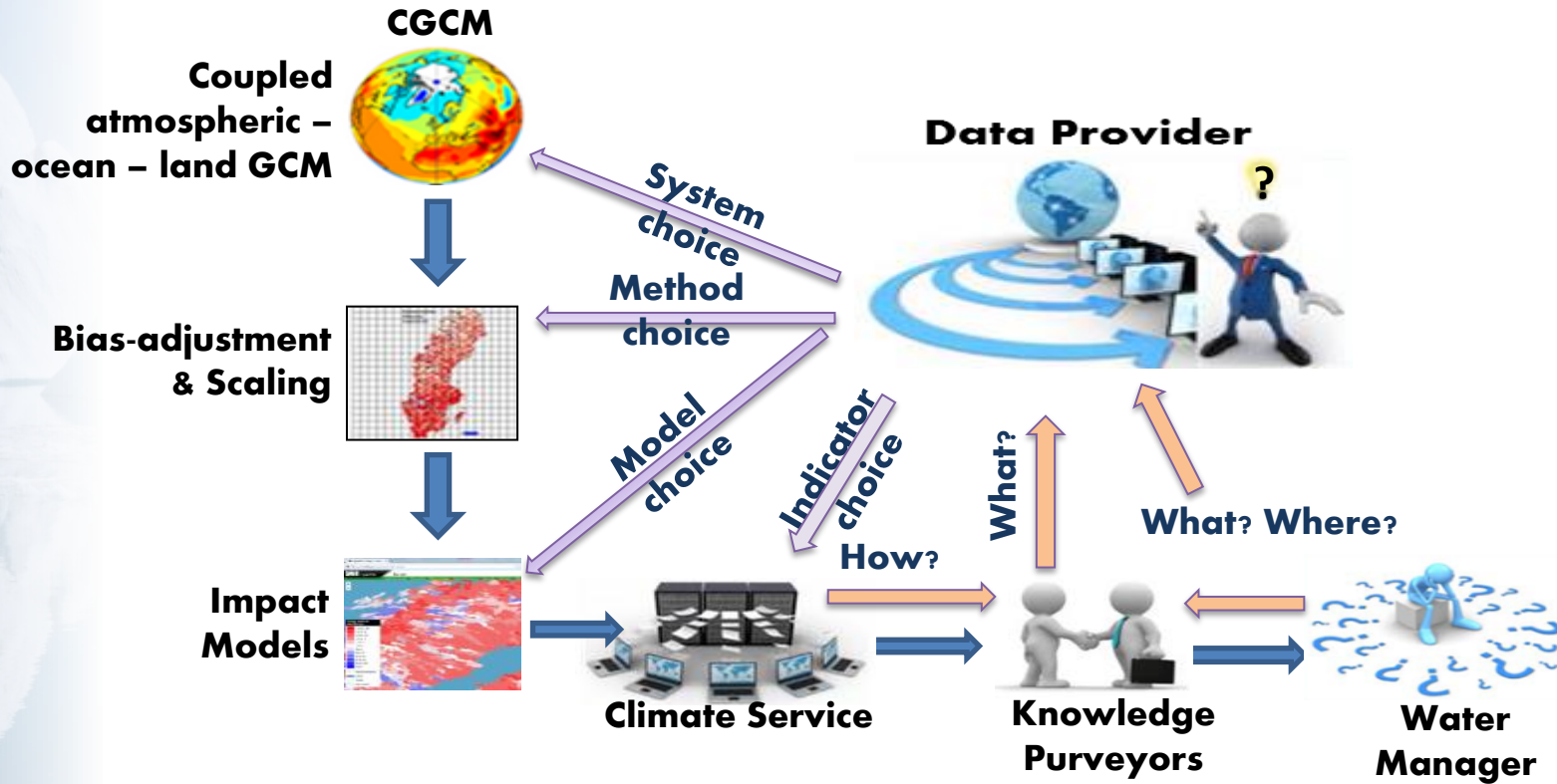
SWICCA Climate Impact Ind...





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# Production behind C3S Water Forecasts





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You can give your FEEDBACK!!!

## What do you prioritise most in a seasonal forecasting service:

- Guidance?
- Data quality?
- User friendliness of web interface?
- Technical tools?
- Key messages?
- Maps and graphs?
- Data downloads?
- Predictability at the local scale?
- Support service?
- Showcases?
- Hands-on training?
- *Anything else? (suggestions are Welcome!)*



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Thank you from the team!



Let's try a real demo!!

<http://swicca.climate.copernicus.eu/indicator-interface/seasonal-forecasts-maps/>