Climate Change

# Climate Change Service

## Climate Information for regional and sectoral applications

Jean-Noël Thépaut
ECMWF

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# Climate Change Service: Vision

- Be an authoritative source of climate information for Europe
- Build upon massive European investments in science and technology
- Enable the market for climate services

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# Climate Change Service: Solutions

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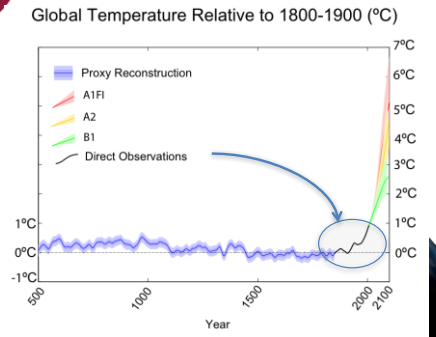


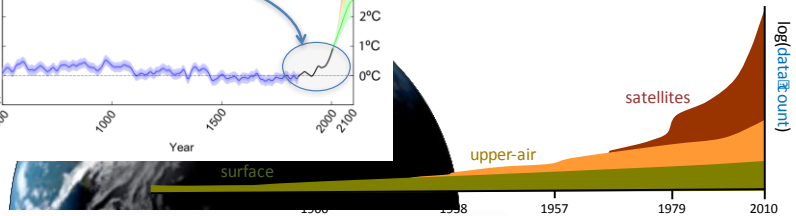


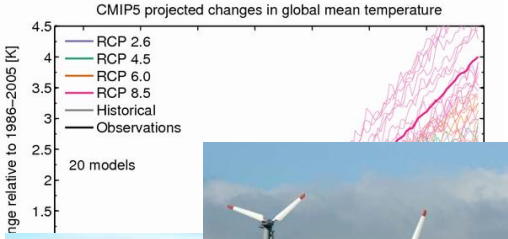




- How is the climate changing?
- How will it change in future?
- How will it impact society?

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# Climate Change Service (C3S) in a nutshell

## Climate Data Store

- ECVs past, present and future
- Observed, reanalysed and simulated
- Derived climate indicators
- Tools to support adaptation and mitigation at global and European level
- Open and free access

## Sectoral Information System

## Evaluation and Quality Control

- Monitors quality of C3S products and services
- Ensures C3S delivers state-of-the-art climate information to users
- Identifies gaps in service provision
- Bridges Copernicus with the research agenda in Europe (e.g. H2020, national research projects)

## Outreach and Dissemination

- Web content
- Public outreach
- Coordination with national outreach
- Liaison with public authorities
- Conferences, seminars
- Training and education

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# Climate Data Store Content

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# Climate Data Store content

Scientific basis:

- Essential Climate Variables as defined by GCOS
- GCOS Status Report and Implementation Plan
- IPCC, CMIP

Action engaged

In preparation (PIN or ITT out)

Not started

| | | | | |
|---|---|---|---|---|
| Observations | Global estimates of ECVs from satellite and in-situ observations | Reprocessed CDRs, reference observations | Support for data rescue, climate data collections | Climate Indicators |
| Climate reanalysis | Global atmosphere, ocean, land | Regional reanalysis for Europe | Coupled climate reanalysis for 100 years | |
| Model output | Multi-model seasonal forecast products | Access to CMIP data and products (global and regional) | Reference set of climate projections for Europe | |

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# Monthly State of Climate: global/european

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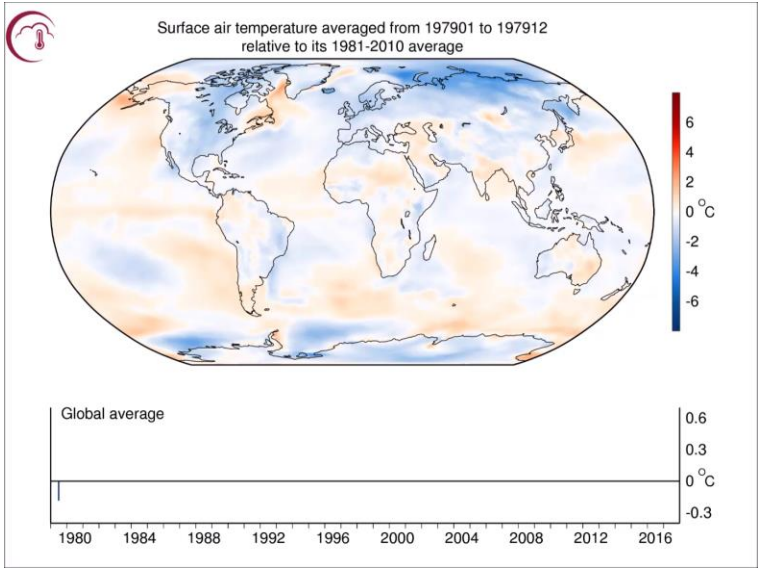
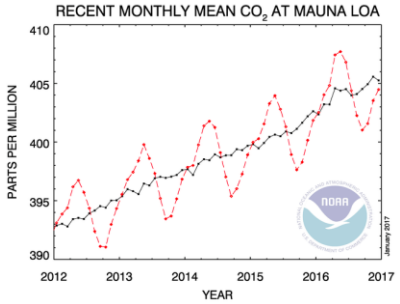


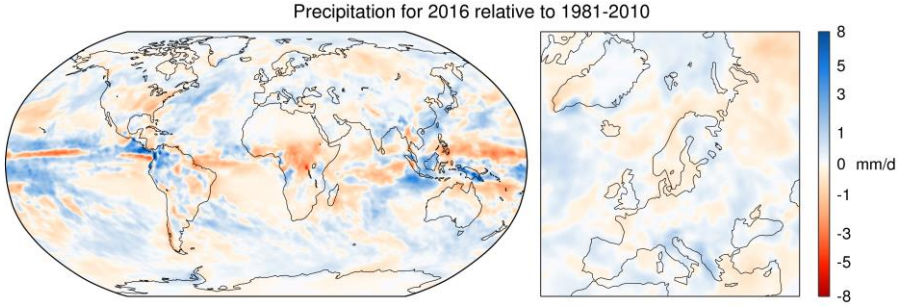

## Climate drivers:

- Greenhouse gases, aerosols, …

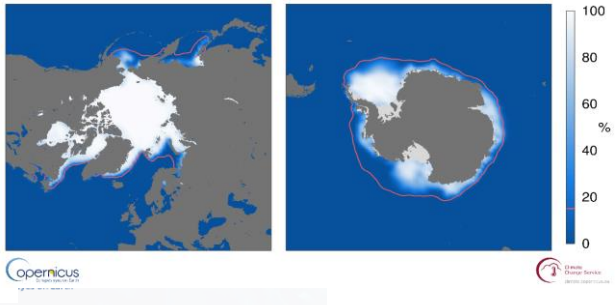



## Climate impacts:

- Temperature, precipitation, sea-ice, sea level, etc.




Sea-ice cover for April 2017. The pink line denotes the climatological ice edge for April for the period 1981-2010. Source: ERA-Interim



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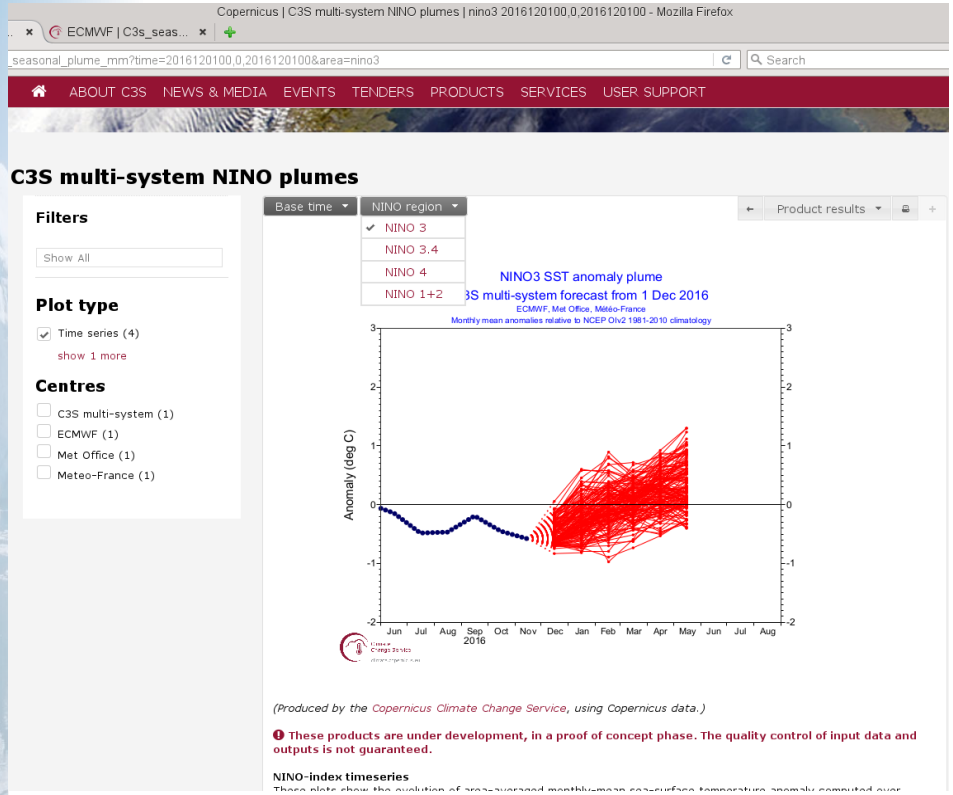
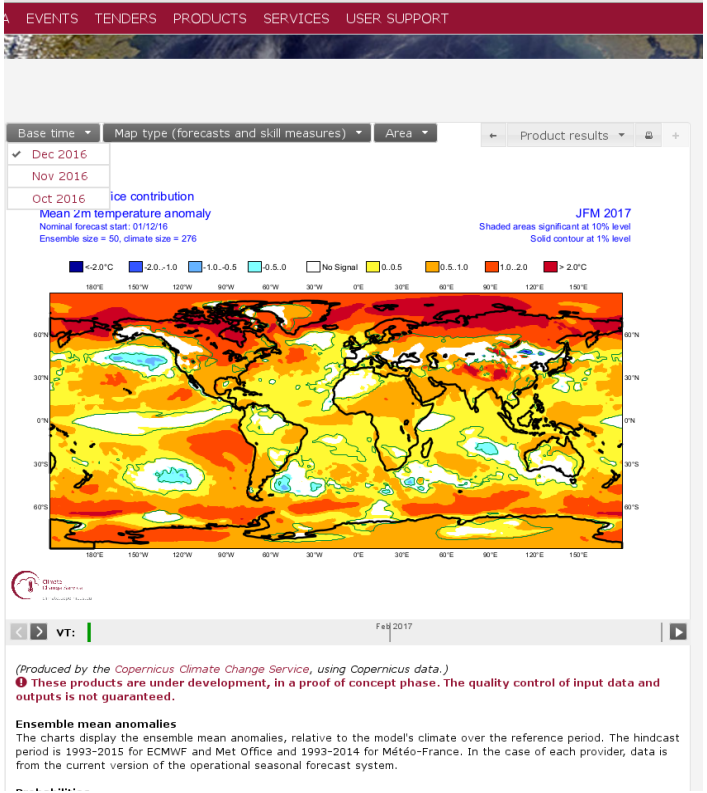
# Multi-model seasonal forecasts



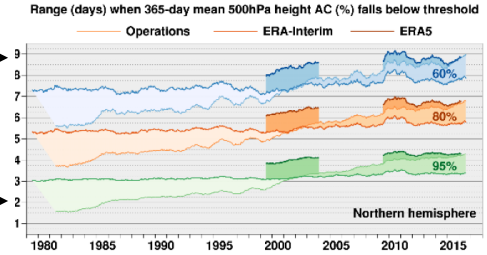



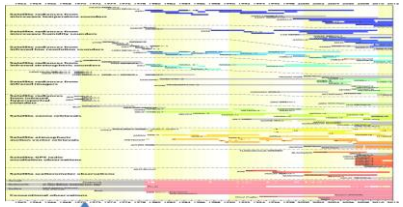

## Full, free, open data

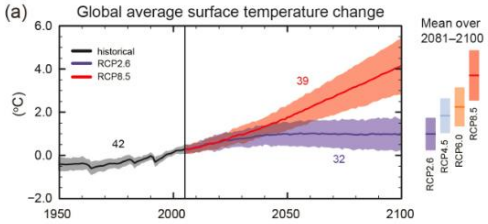
- 1 deg x 1 deg global forecast products produced every 15th of each month, with a 6 month outlook

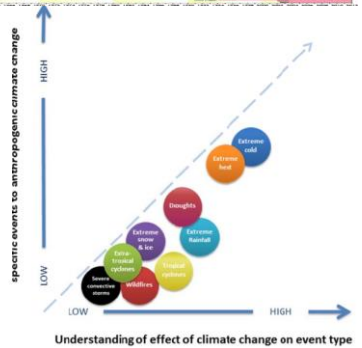
# Building Upon National and European Investments

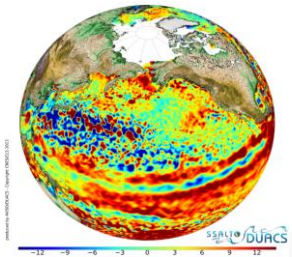
National investments: Modeling capabilities, in-situ observations, seasonal forecasts, …

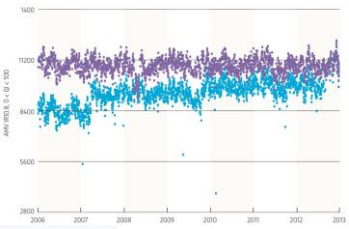




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# Climate Data Store

# Infrastructure and toolbox

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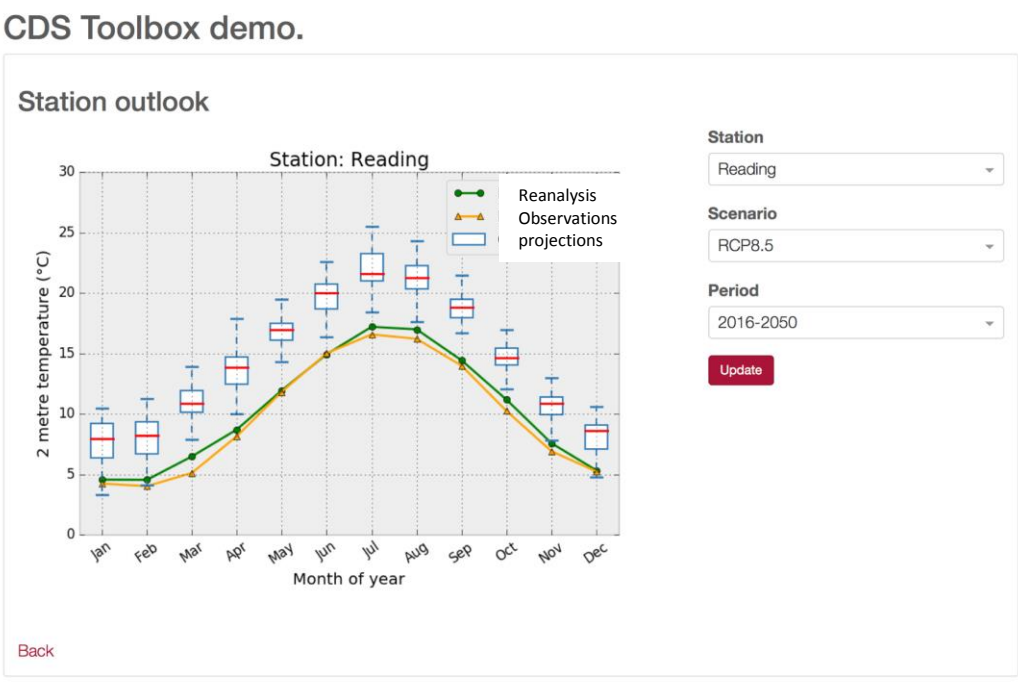
# CDS infrastructure and tool box



## Technical challenges:

- Diversity of users
- Diversity of data sets
- Very large data volumes
- Data residing at different locations
- Interoperability, efficiency
- User-defined workflows
- Variety of presentation methods
- Need for interactivity
- Access via API
- User management
- Performance monitoring



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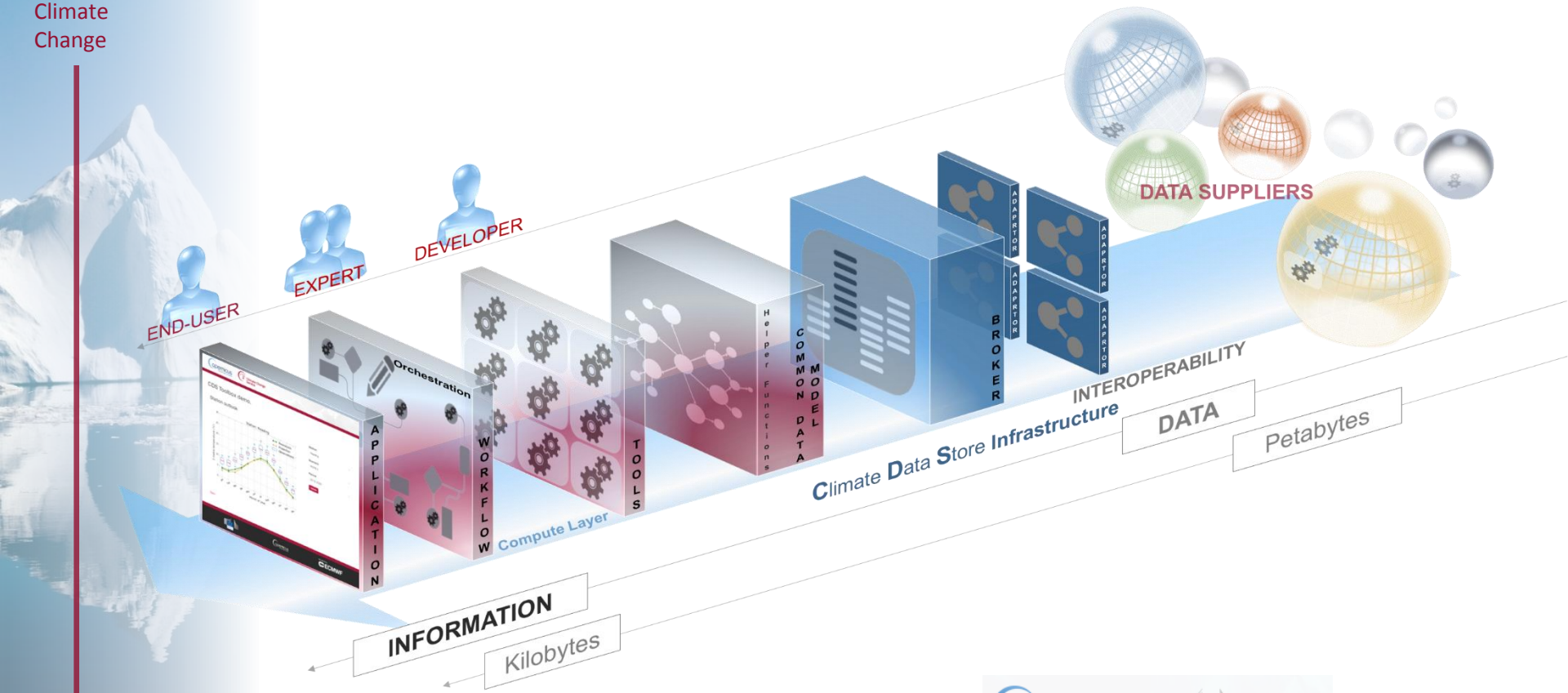
# CDS infrastructure and toolbox

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# Proof-of-concepts with end-to-end demonstrators

## 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 adapt nd mitigation s in Europe in a number of sector e include, but are no ed 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

# SIS: Use Cases – monthly mean river flow

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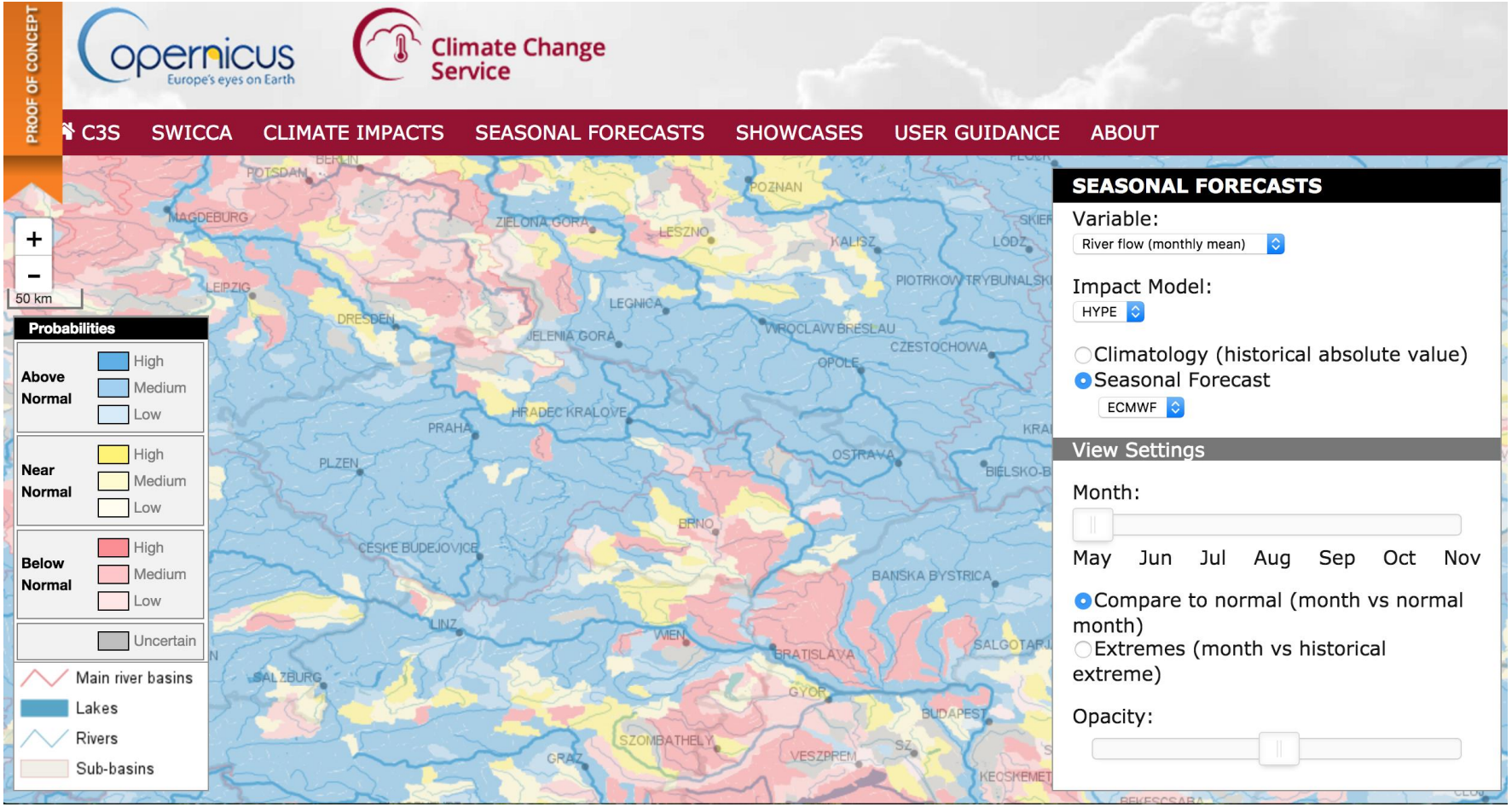

# SIS: Use Cases – monthly mean river flow

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PROOF OF CONCEPT

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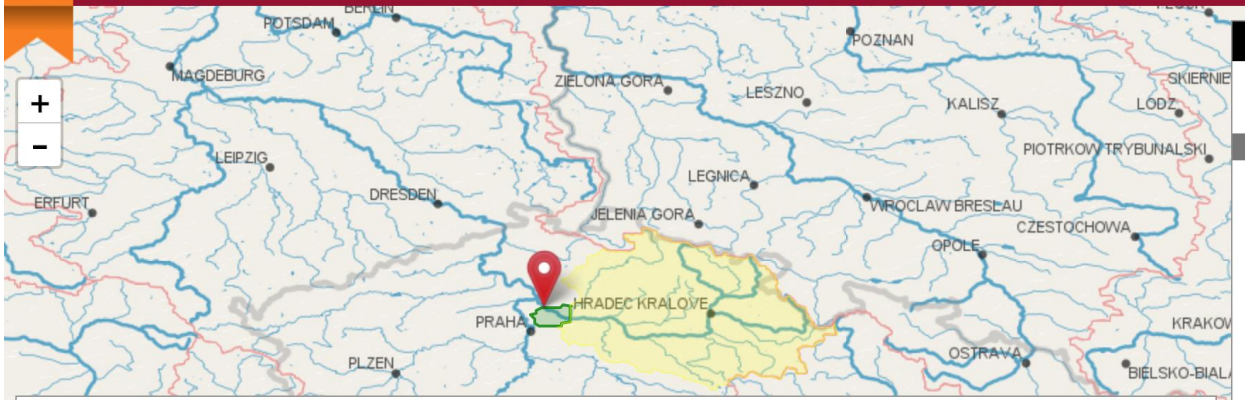
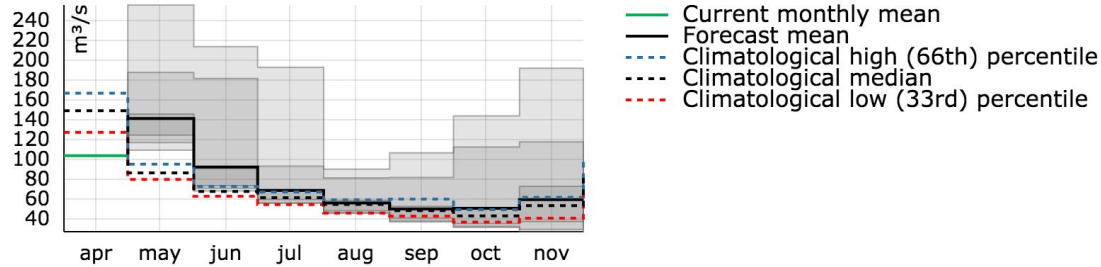
C3S | SWICCA | CLIMATE IMPACTS | SEASONAL FORECASTS | SHOWCASES | USER GUIDANCE | ABOUT




**River flow (monthly mean)**




## SEASONAL FORECASTS

MAPS | GRAPHS AND DOWNLOAD

### Select coordinate

*Click in map to select coordinate or fill in coordinate below*

Selected coordinate: 50.26, 14.52
Catchment subid: 9569987

Lat: Lon: Select

Subid: Select

### Variables & Models

Variable: River flow (monthly mean)

Model: HYPE

Seasonal Forecast: ECMWF

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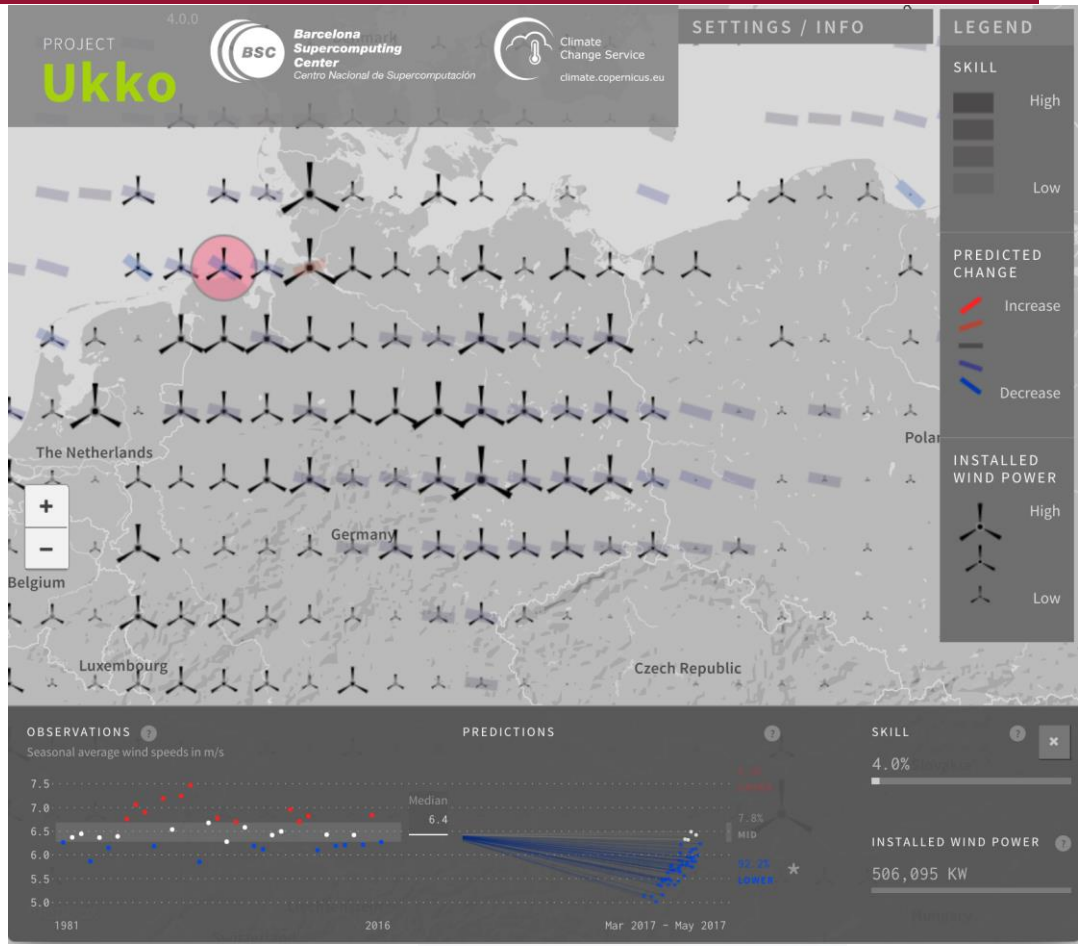
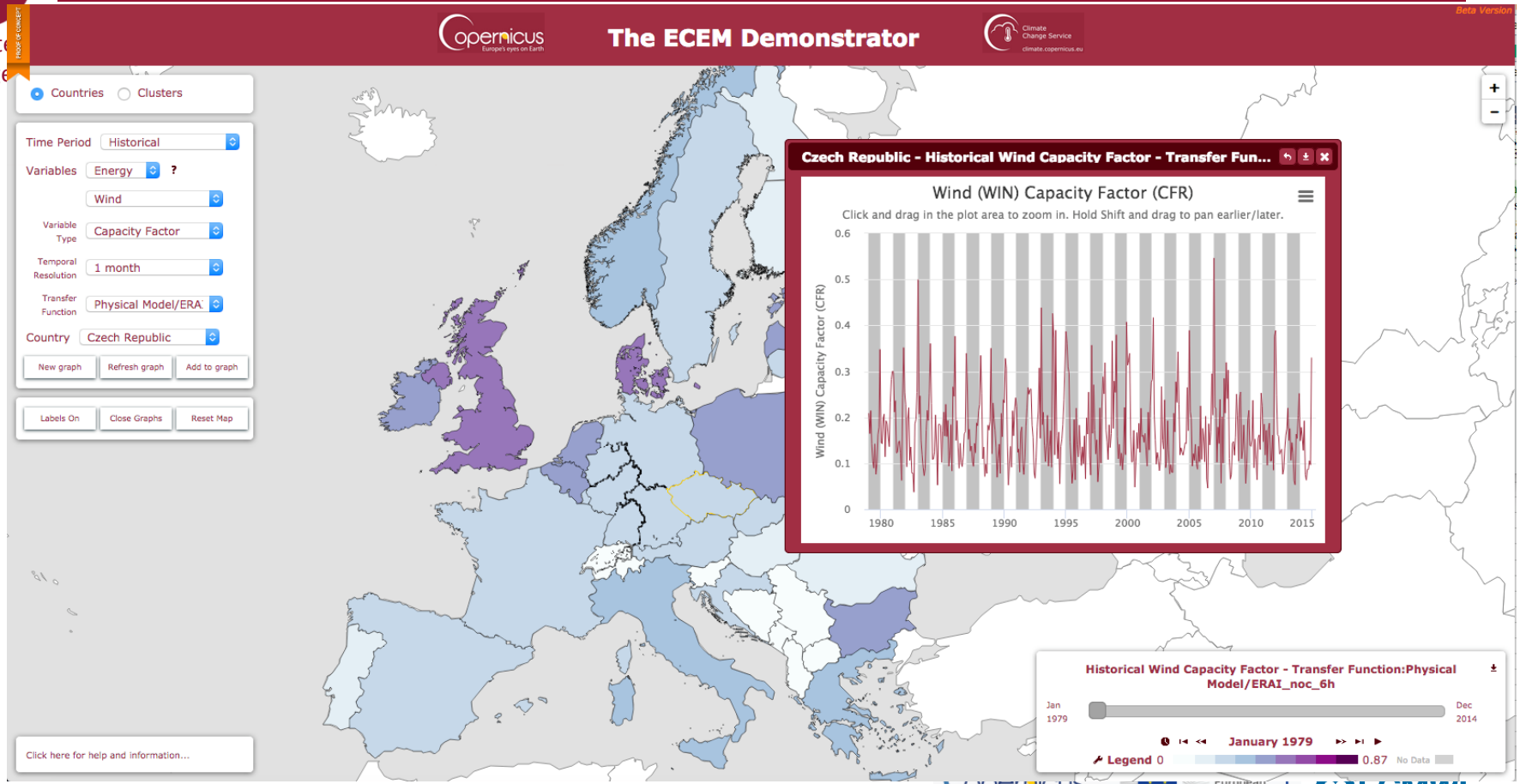
# SIS: Use Cases – wind power capacity

Seasonal forecasts of wind power capacity



# SIS: Use Cases – wind power capacity



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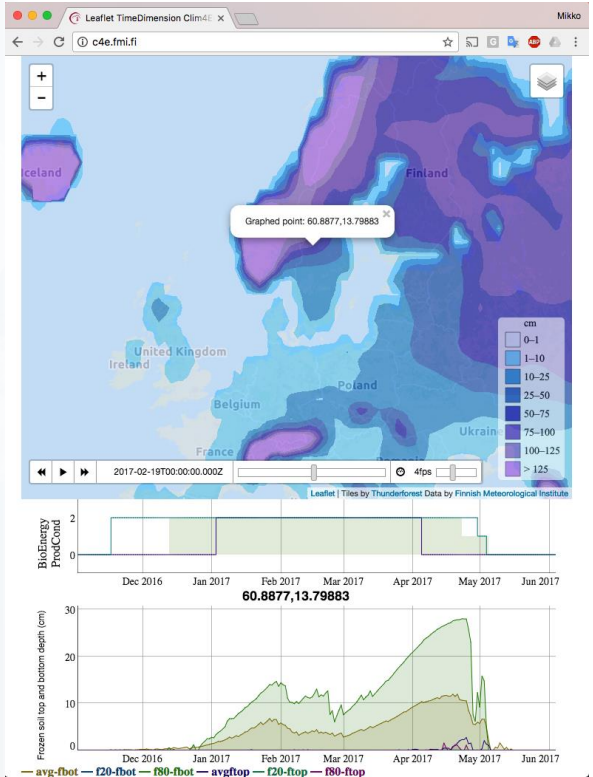
# SIS – USE CASES - BIOENERGY

**(Finnish Meteorological Institute, co-designer Metsäteho)**

## How will next winters harvesting conditions be for European peatlands?




Seasonal forecast service demonstration for the winter season:

- Frozen soil depth (and thawed top depth)
- Snow depth
- Bioenergy production conditions indicator

Forecast ensemble average and fractiles 20% and 80% can be visualized and animated on a map or as a 7 month time series of any point with data on the map.

Wet peatland is growing a substantial amount of forest of lesser quality, which can be used for bioenergy if harvesting is affordable. This usually requires either ~40 cm snow depth or ~20cm frozen soil.

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# What are the SIS for?

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1) to provide practical examples of how C3S in general and CDS in particular could deliver information of relevance to specific sectors.

2) To provide examples of best practice. This means that the SISs should be built to the highest possible standards so that services developers could be inspired by them and look at them as quality benchmarks.

3) To provide information on users needs, and whenever possible address those. In particular SIS develops and makes available **sector-relevant indicators** and **tools** that were either unavailable or inaccessible before.

**C3S does not ambition to cover the whole end-to-end chain for all sectors regions: It ambitions to become an enabler of downstream services, by providing high quality data and tools.**

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# Evaluation and Quality Control

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# EQC: Engaged and future activities

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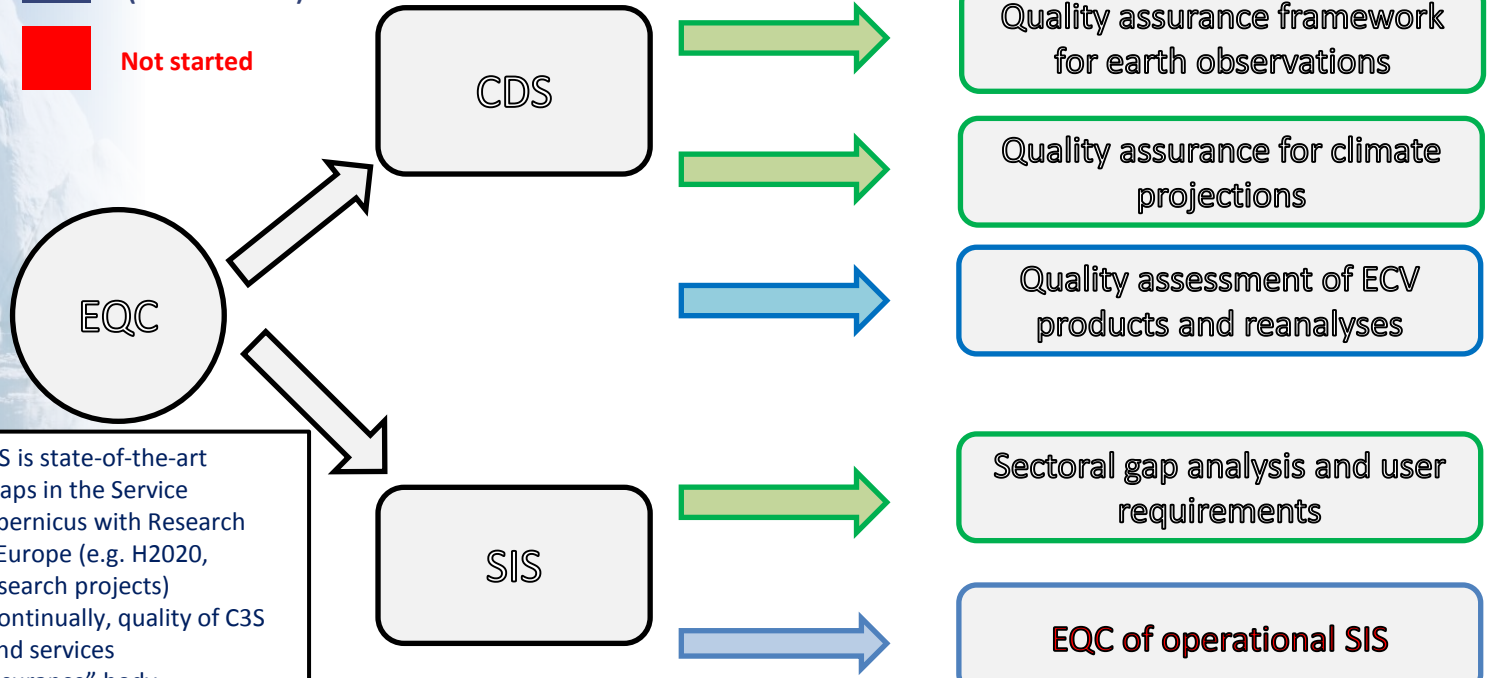
Action engaged

In preparation (PIN or ITT out)

Not started




Ensures C3S is state-of-the-art
Identifies gaps in the Service
Bridges Copernicus with Research Agenda in Europe (e.g. H2020, national research projects)
Monitors continually, quality of C3S products and services
"Quality Assurance" body
Contributes and develops URDB/SES/etc documents

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# Thank You

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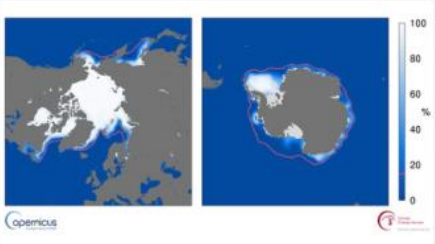
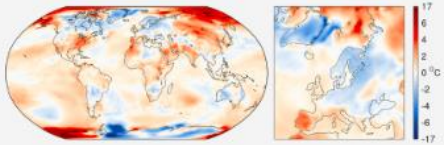
## IN FOCUS



Monthly sea-ice maps

04 May 2017

## MONTHLY MAPS



Average surface air temperatures for April 2017

April 2017

## NEWS

03 Mar 2017
#OpenDataHack @ECMWF - explore creative uses of open data

03 Mar 2017
C3S holds its inaugural General Assembly

26 Jan 2017
Copernicus at the 4th International Conference on Energy & Meteorology (ICEM)