Copernicus Climate Change Service

Climate Change

Climate Change

The C3S mission

To support European adaptation and mitigation policies by:

- Providing consistent and authoritative information about climate (past, present, future)
- Building on existing capabilities and infrastructures (nationally, in Europe and worldwide)
- Stimulating the market for climate services in Europe

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Achievements since the signature of the Delegation Agreement

Celebrating C3S transitioning from a concept to an operational Service*

Video 1

*: C3S second General Assembly, Berlin, 24-28 September 2018

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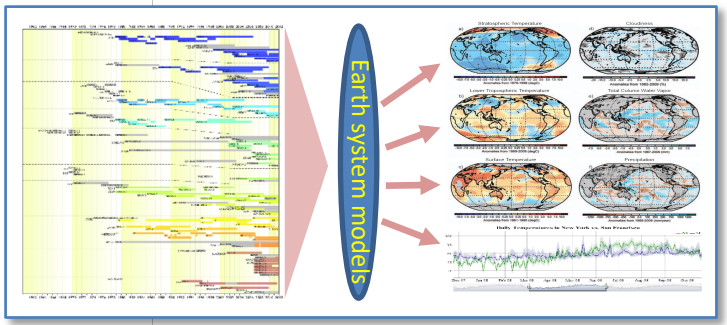
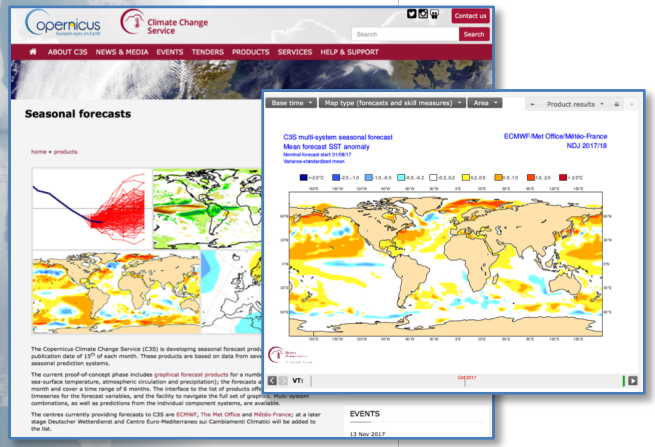
Access to past, present and future climate information



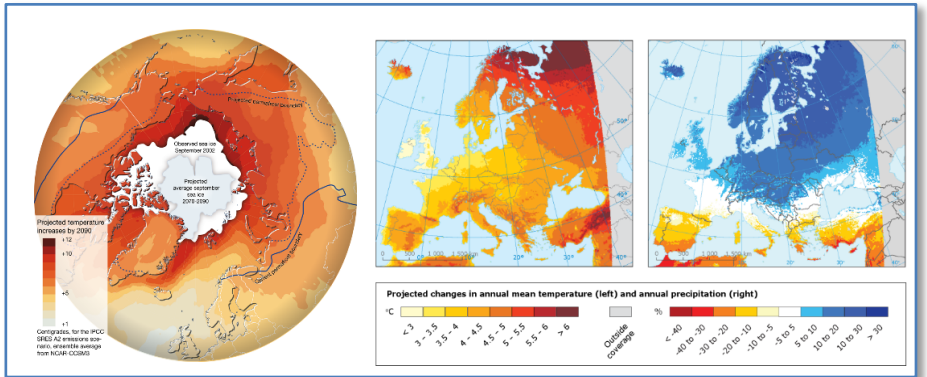
Observations and climate reanalyses

Seasonal forecast data and products

Climate model simulations



Sectoral climate impact indicators



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Climate Data Store content (November 2018)

Scientific basis:

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

Action engaged

In progress

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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(*): To be produced 2021-2022 based on FP7 ERA-CLIM2 outcomes (CERA-20C)

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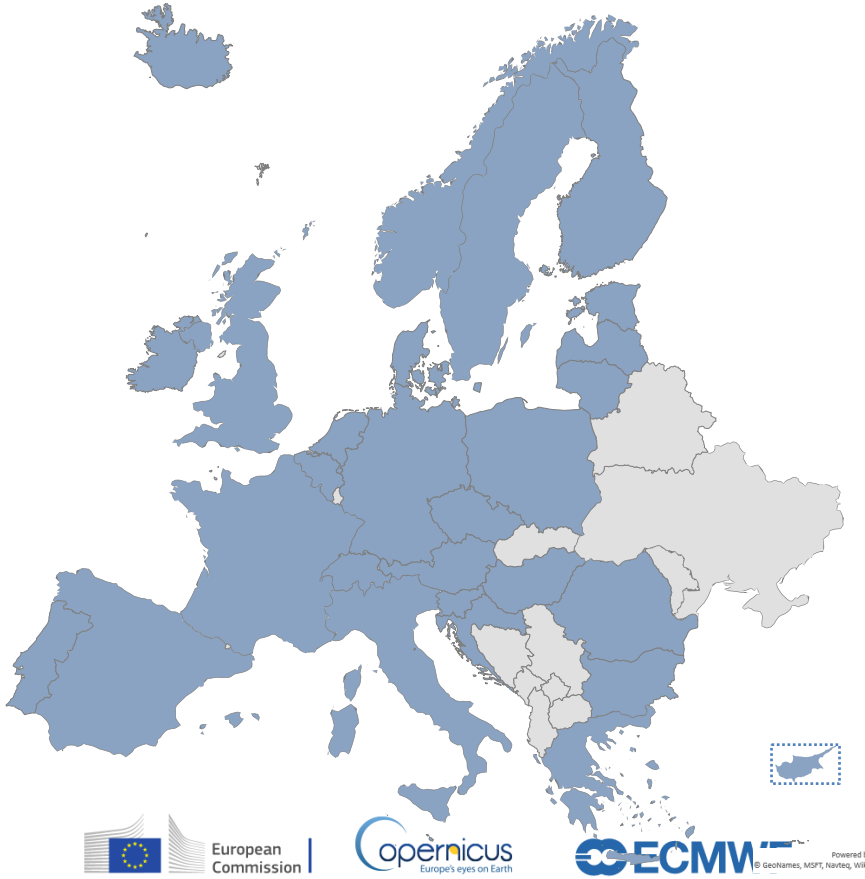
Entities contributing to C3S

dd.29/10/2018

C3S:
a truly European effort

249 different entities from
29 EU and ECMWF Member States,
International Organisations and third countries



C3S and the ecosystem

Climate Change

Climate Change

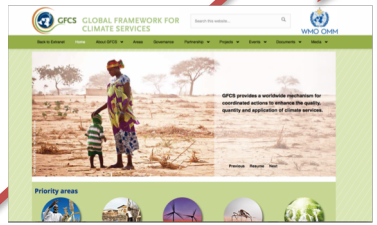
etc...

Drias les futurs du climat

National Climate Services
- Value chain at local level, governments, etc.
- Provision of pan-European dimension for national businesses

EEA (Climate Adapt):
- State of Climate for Europe
- Climate Indicators
- CDS toolbox
- CC IV report

DG-Clima



GFCS:
- Global products (ECVs, reanalyses, seasonal forecasts and projections)
- WIS compliance
- Training and outreach
- Global SIS
- Liaison with RCCs

H2020/ERA4CS/JPI/KIC/etc.:
- CDS as a data resource
- Liaison with RD projects
- Underpinning science

Coordination with DG-DEvCO

GEO & UNFCCC:
- C3S discoverable through GEOSS portal
- Contribution to many SDGs

GCOS

WMO & GCOS:
- C3S ECVs and global indicators
- WMO State of the Climate

NOAA

NOAA:
- Coordination on observations and CDR issues with NCEI
- In-kind contribution of NCEP seasonal forecasts

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Climate Data Store Content

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What C3S offers to its users

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- Access to climate data
- Tools needed to use the data
- Information on sectoral impacts
- Quality assurance
- User support and training
- Climate change assessments
- Outreach and communication

A one-stop Climate Data Store

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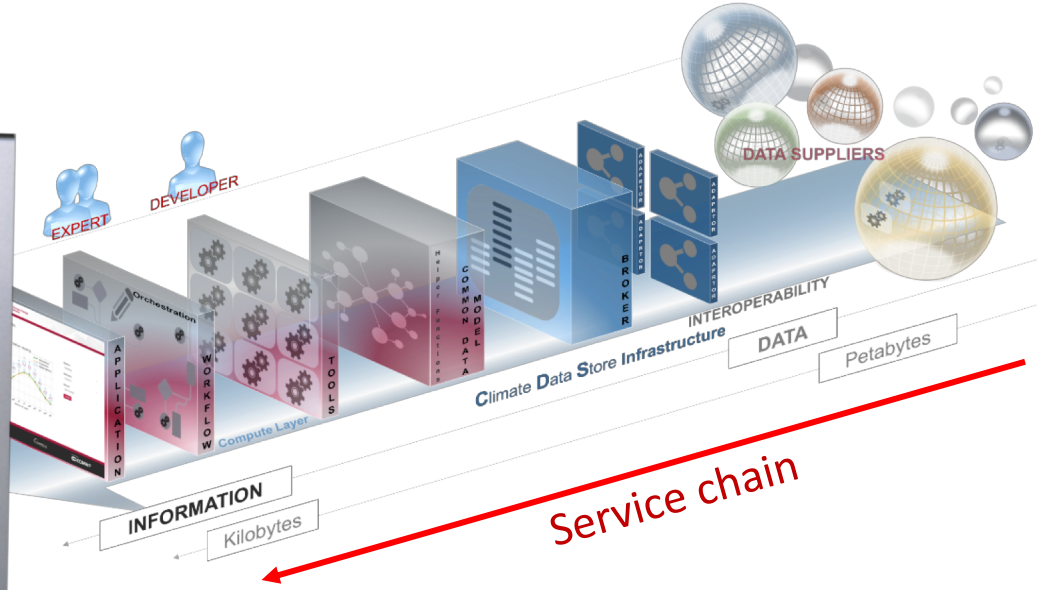
CDS toolbox, workflows and applications



Quality assured information and tools for users: scientists, consultants, decision makers.

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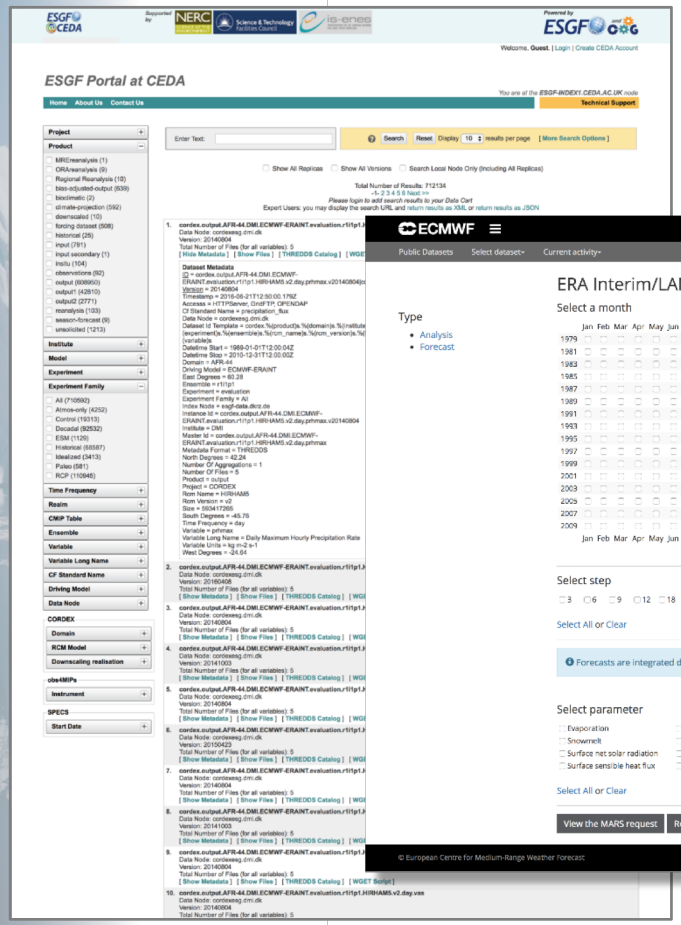
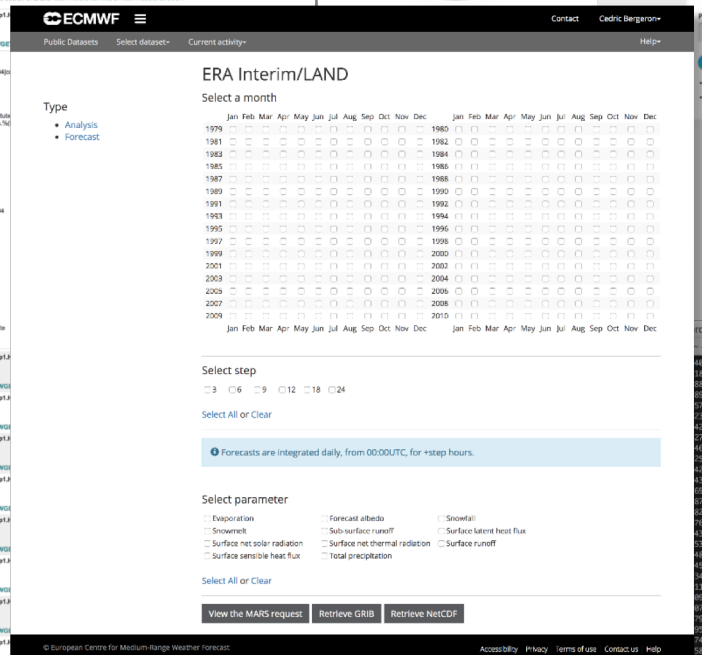
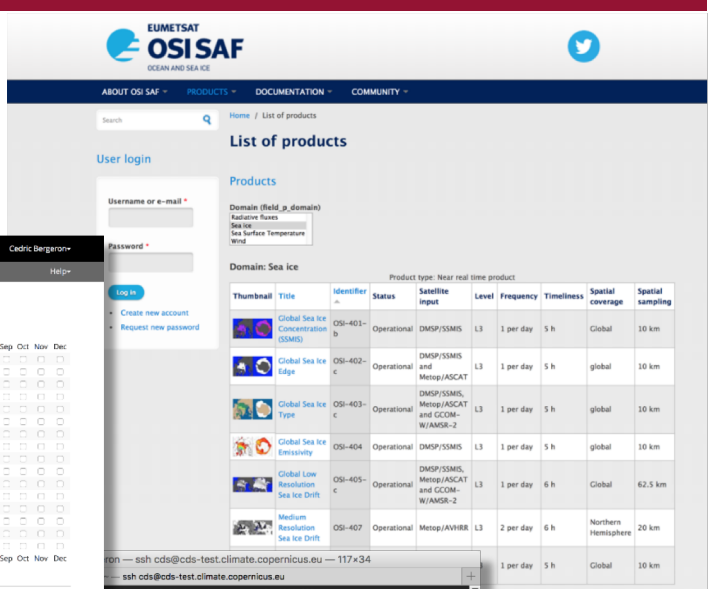
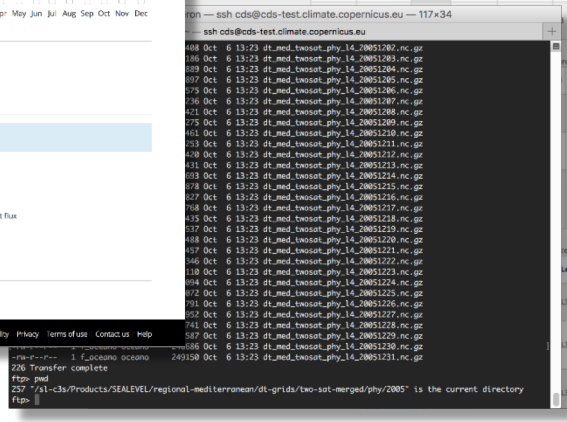
Access to climate datasets before the CDS…









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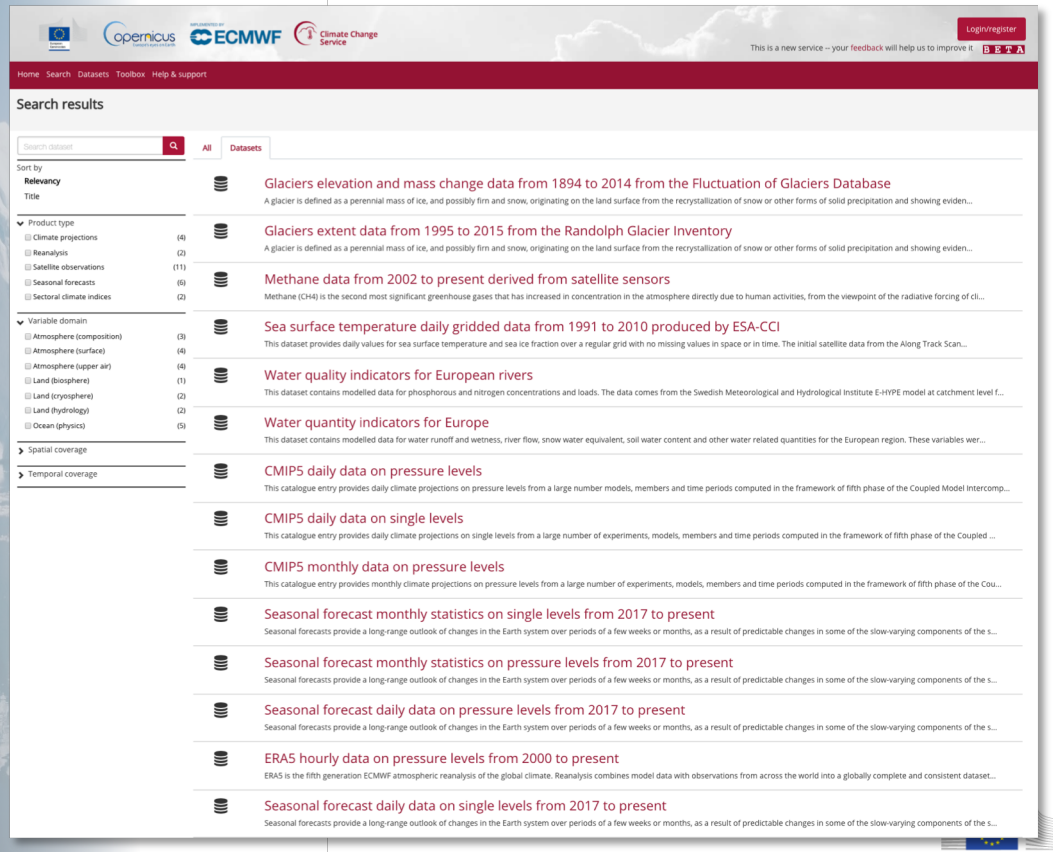
Catalogue of climate datasets



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ECV products from Earth observations

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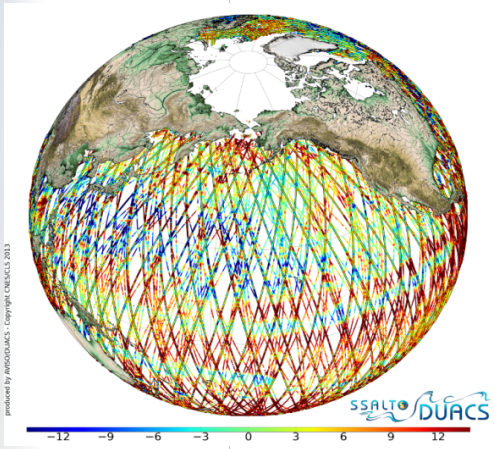
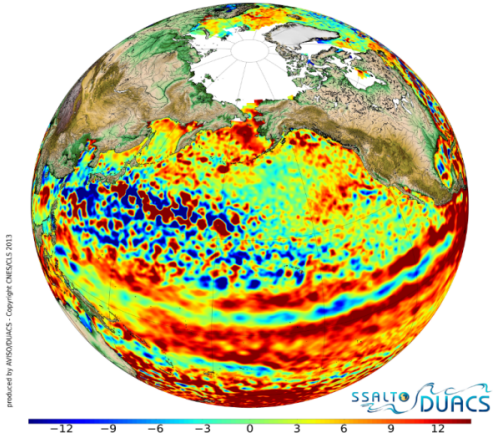
From satellite tracks to long-term global coverage

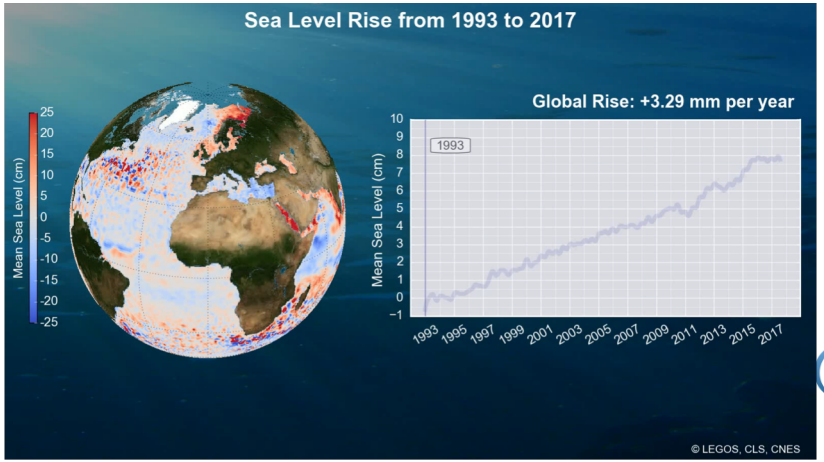


From satellite **along-track** measurements…

… to **sea level gridded maps**…



… to derive Ocean Monitoring Indicators



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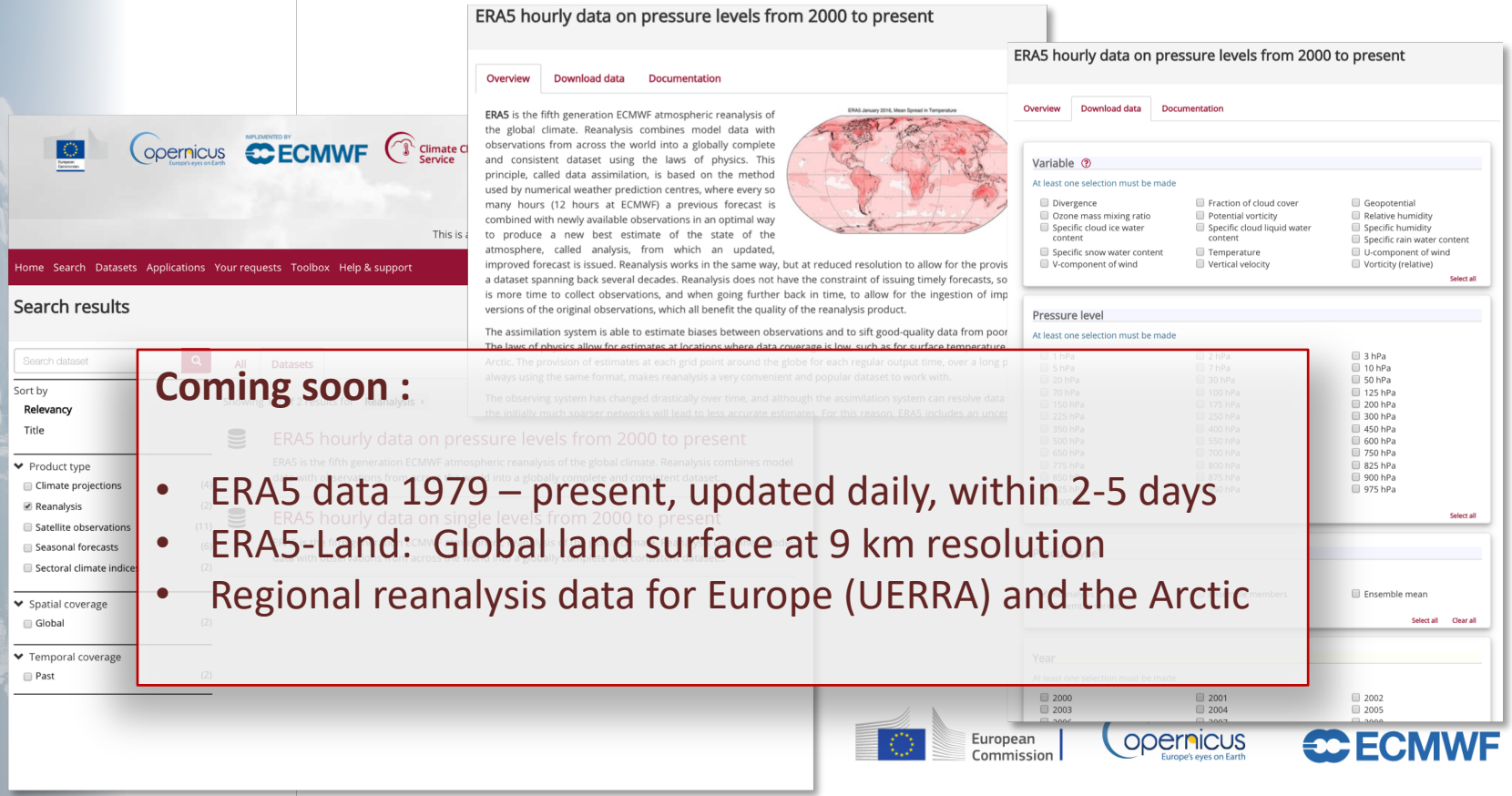
Climate reanalysis

Climate Change



Coming soon :

- ERA5 data 1979 – present, updated daily, within 2-5 days
- ERA5-Land: Global land surface at 9 km resolution
- Regional reanalysis data for Europe (UERRA) and the Arctic

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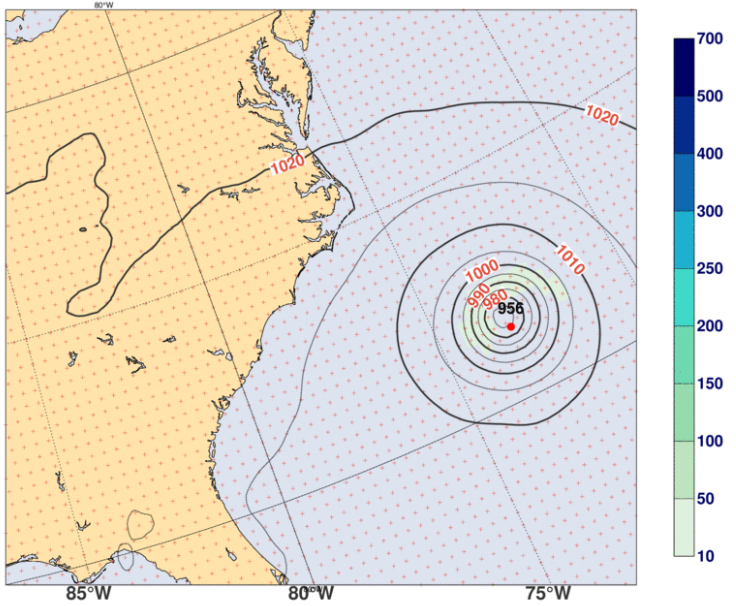
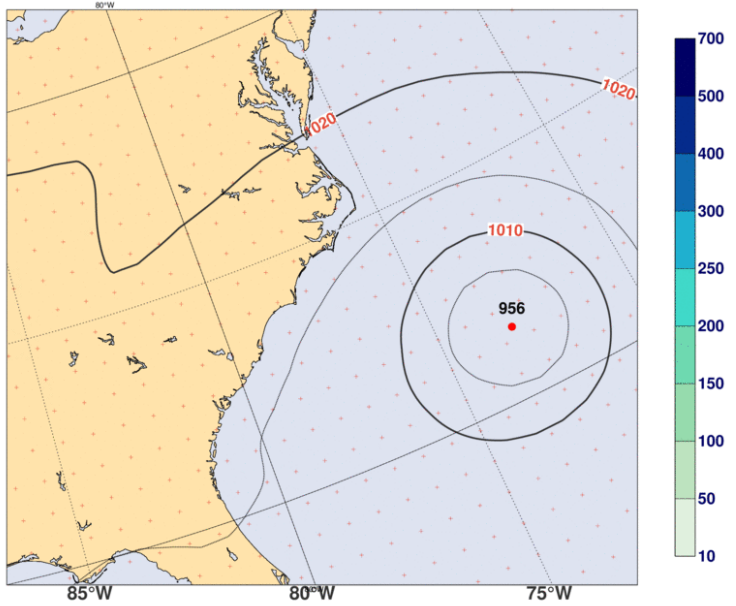
Going from ERA-Interim to ERA5

Florence Thu 13 Sep 2018, 01 UTC for ERA5



Florence Thu 13 Sep 2018, 01 UTC for ERA-Interim



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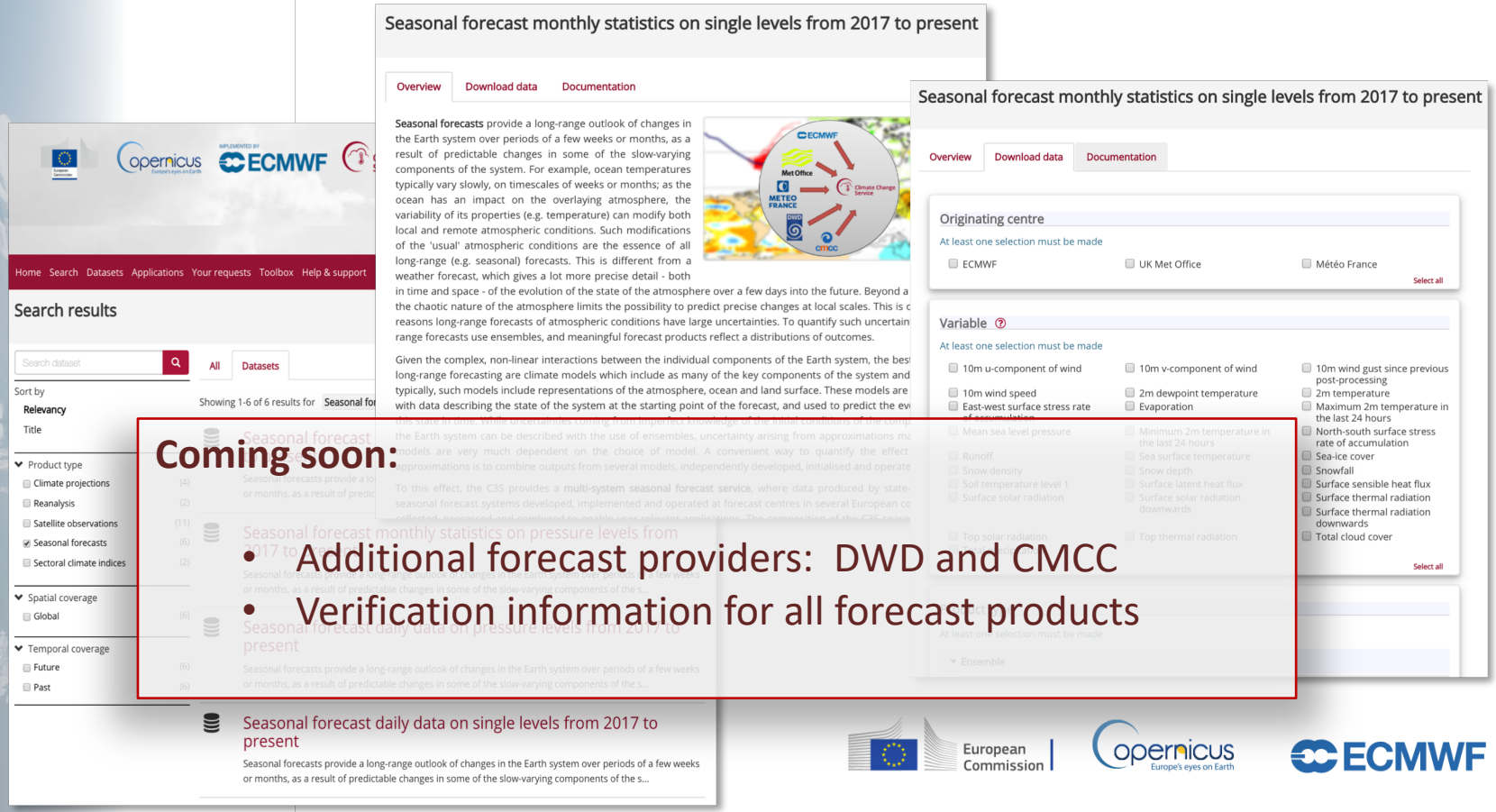
Multi-system seasonal forecasts



Coming soon:

- Additional forecast providers: DWD and CMCC
- Verification information for all forecast products

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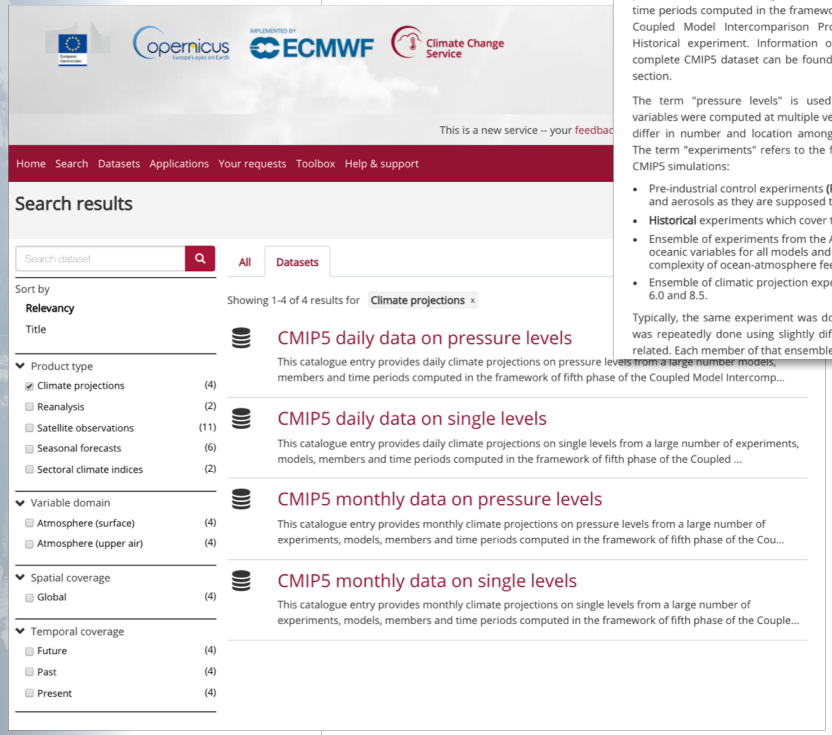
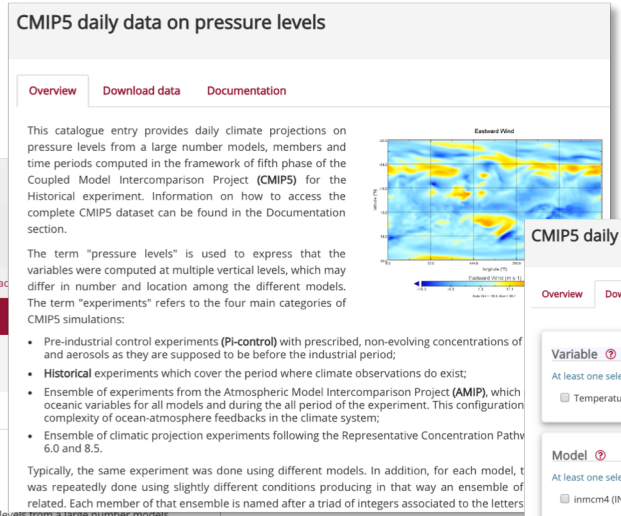
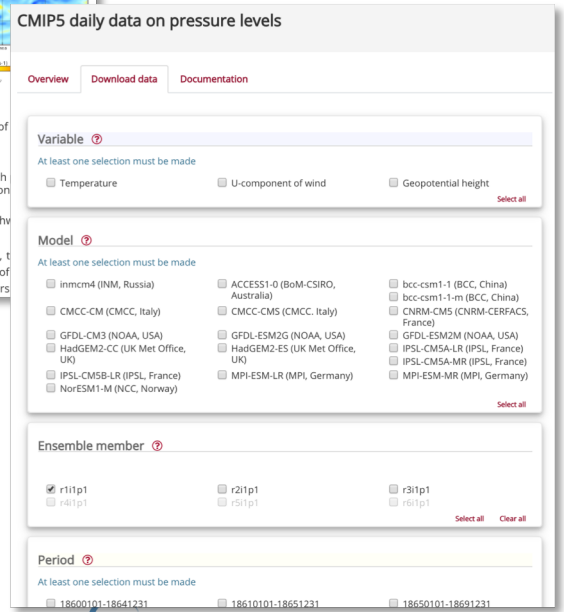
Climate projections from CMIP5







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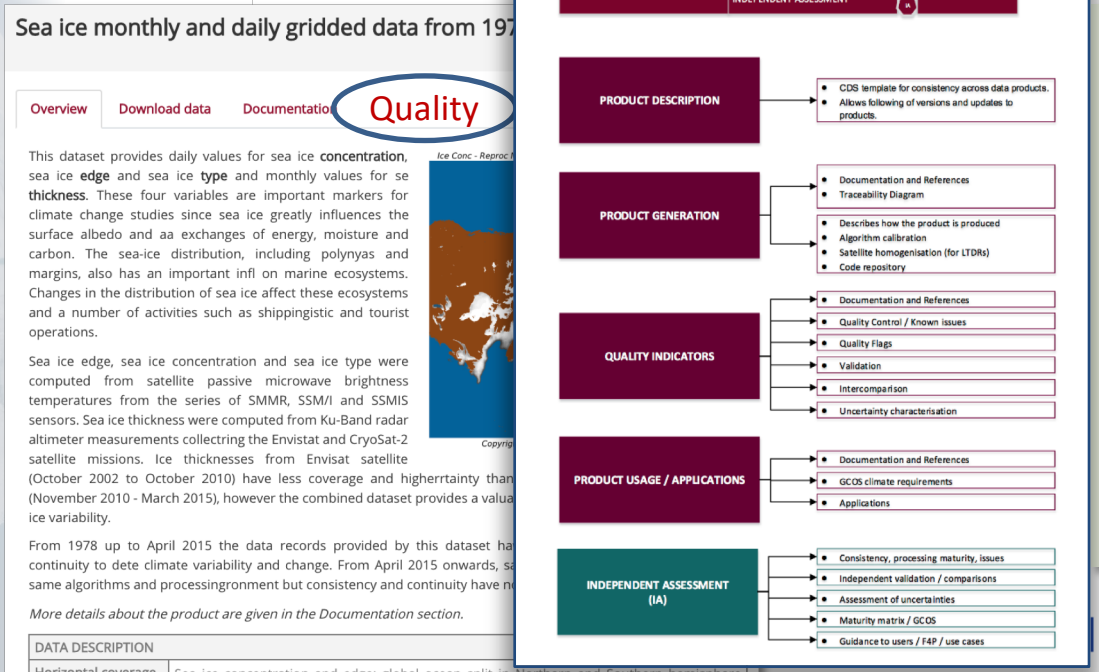
Evaluation and Quality Control (EQC)

A suitable EQC framework has been developed for quality assurance of CDS datasets

Key feature: Quality Assurance R… S



Quality of data:
- assessments
- user guidance
- gaps and limitations

Quality of tools:
- fitness for purpose
- best practices

Quality of service:
- speed, responsiveness
- system availability, …

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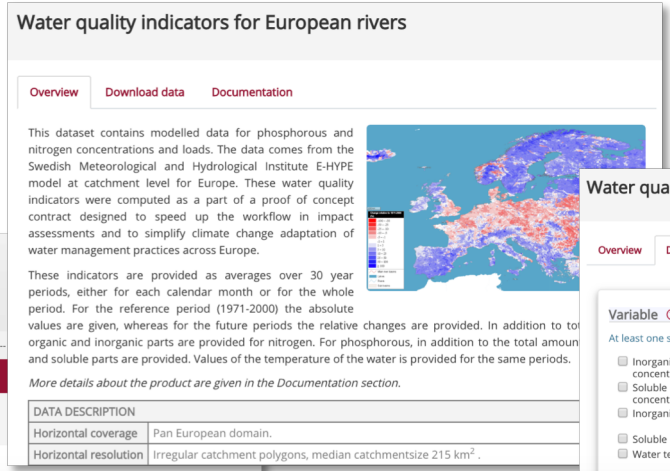
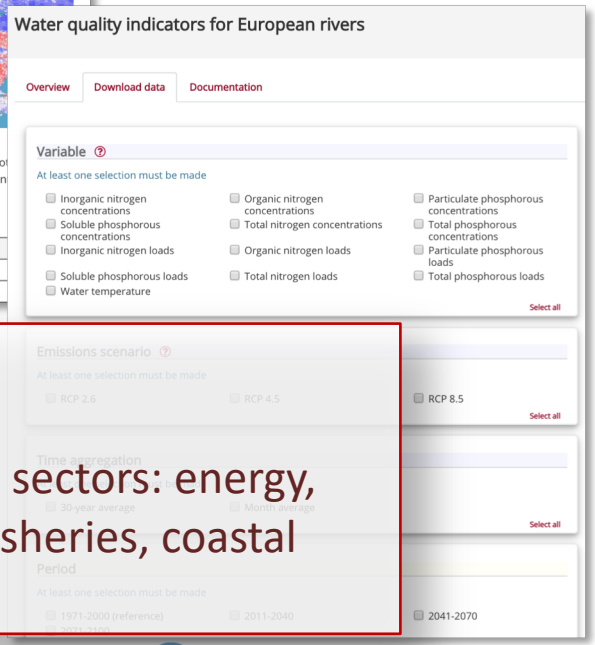
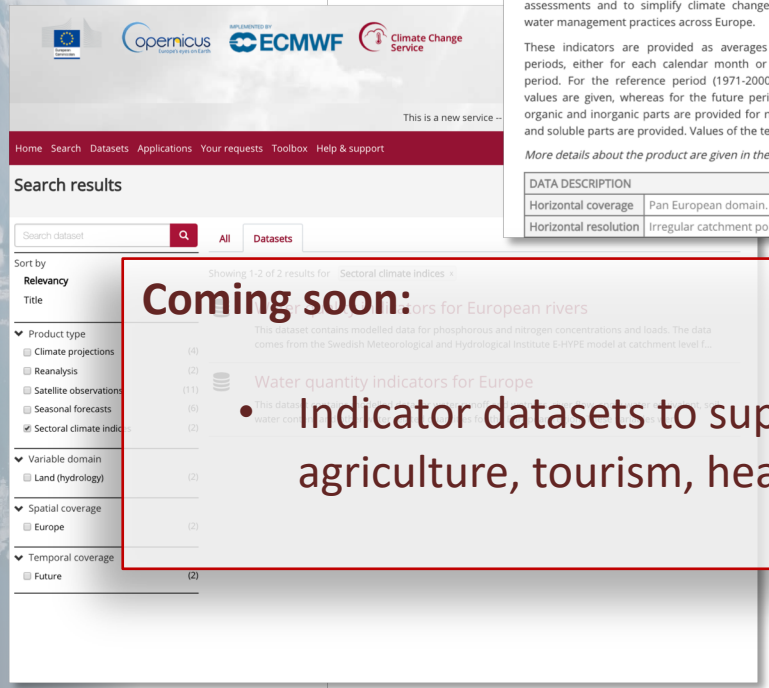
Data on sectoral impacts







Coming soon:

- Indicator datasets to support additional sectors: energy, agriculture, tourism, health, shipping, fisheries, coastal

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C3S reanalysis data: A use case

C3S reanalysis data as a business model for an SME in the renewable energy sector

Video 2

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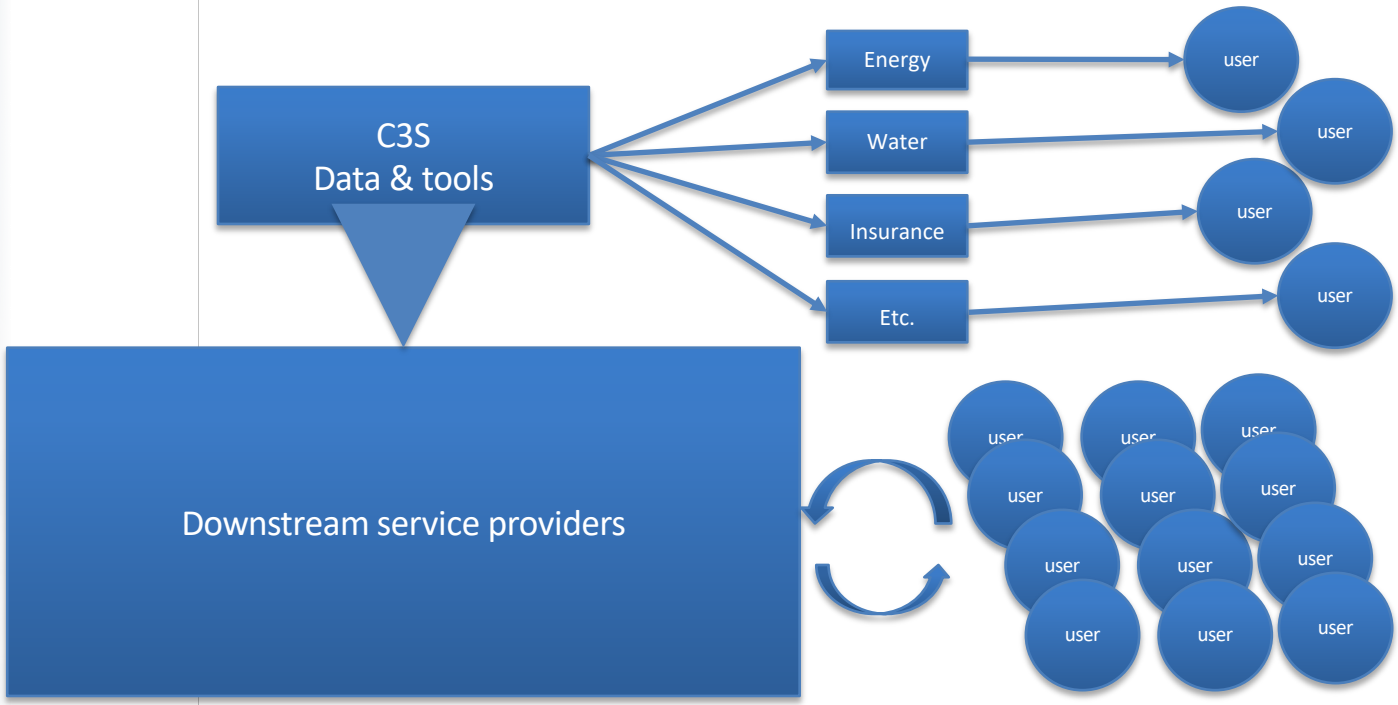
Enabler for downstream exploitation



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Sectoral Information System

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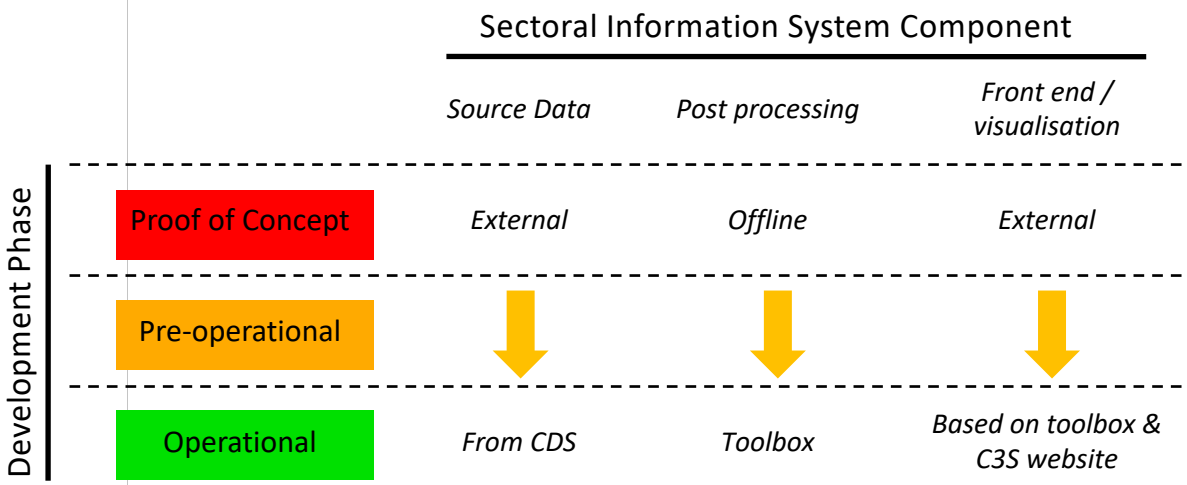

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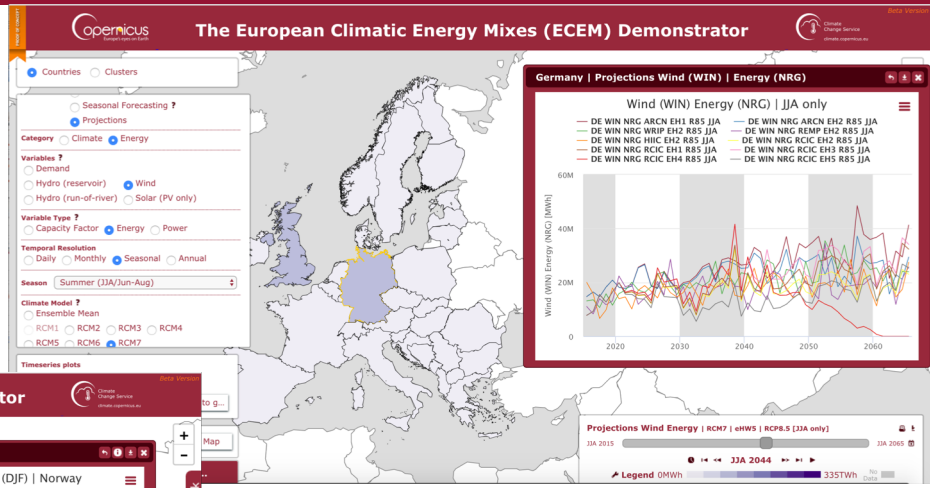
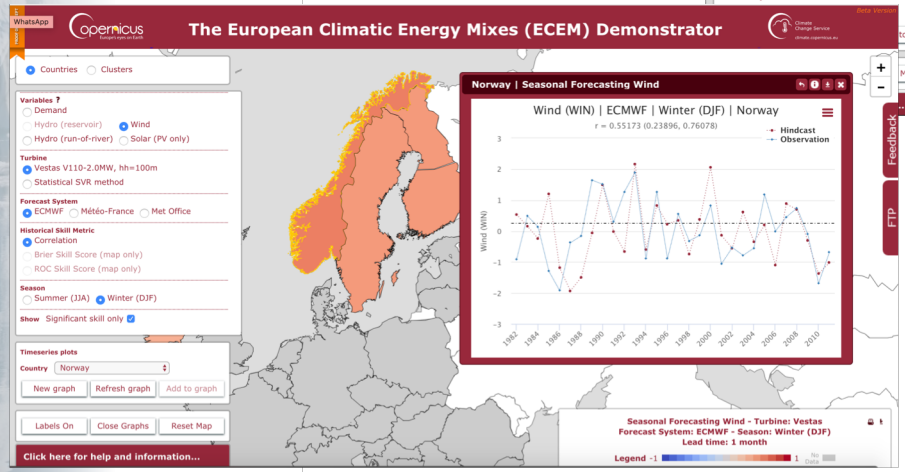
Energy

Integrating climate and energy scenarios to learn how well prepared our infrastructure is to cope with the climate of the future. Will the renewable dominated energy mix of the future able to cope with the expected change in the energy demand profile?





Using a combination of historical data, reanalysis, seasonal predictions and climate projections the SIS contracts have demonstrated how it will be possible to address some of these questions through the CDS.

Contract led by UEA

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Health exposure demonstrator

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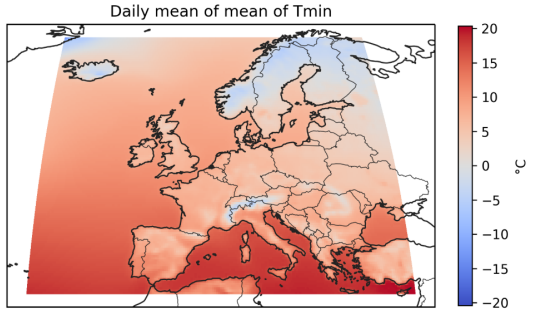
Secure | https://cds.climate.copernicus.eu/apps/355/heat_exposure?sdk_version=2.8.1

Heat_exposure



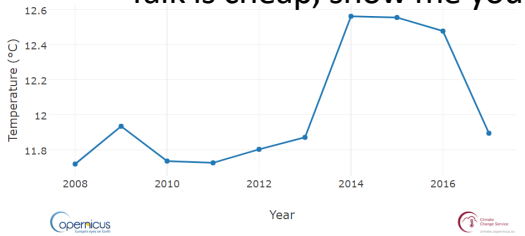
Variable: Tmin

City: Rome

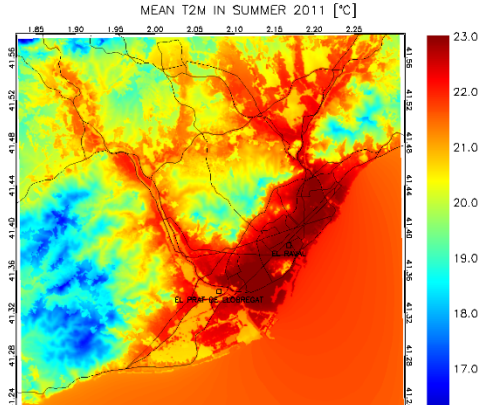
Statistic: Mean

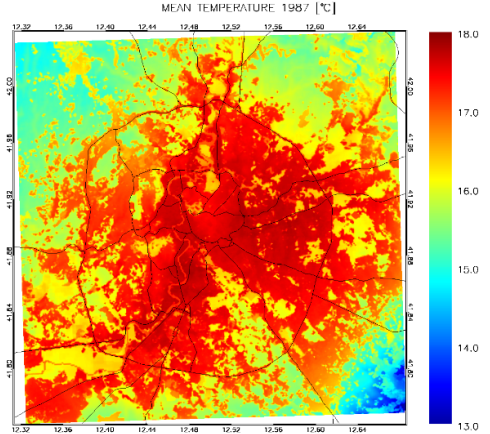
Period: Annual

Timeseries of mean of Tmin for Rome



"Talk is cheap, show me your code" *Linus Torvalds 2000-05-02*





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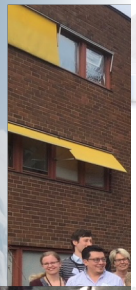
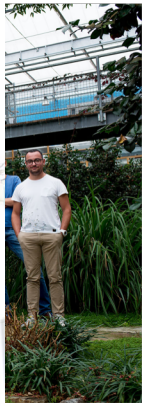
Our strength





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Indicators, global agriculture contract

- Biologically Effective Degree Days, Growing Season Length, Maximum number of consecutive dry days, Maximum number of consecutive frost days (Cold spell), Cold Spell Duration Index , Maximum number of consecutive summer days (Hot spell), Maximum number of consecutive wet days (Wet spell), Mean of diurnal temperature range, Frost Days, Ice Days, Heavy precipitation days, Very heavy precipitation days, Precipitation sum, Wet Days, Simple Daily Intensity Index (Mean precipitation per wet day), Sumer Days, Mean of daily mean temperature, Mean of daily minimum temperature, Minimum value of the daily minimum temperature, Maximum value of the daily minimum temperature, Tropical nights, Mean of daily maximum temperature, Minimum value of daily maximum temperature, Maximum value of daily maximum temperature, Warm Spell Duration Index, Warm and wet days, AgERA5 wind speed, AgERA5 dewpoint temperature, AgERA5 air temperature, AgERA5 precipitation type, AgERA5 relative humidity, AgERA5 snow, AgERA5 solar radiation, AgERA5 cloud cover, AgERA5 precipitation, AgERA5 vapour pressure, Soybean development stage, Soybean Total above-ground production, Soybean Total weight storage organs (yield), Wheat development stage, Wheat Total above-ground production, Wheat Total weight storage organs (yield), Rice development stage, Rice Total above-ground production, Rice Total weight storage organs, (yield), Maize development stage, Maize Total above-ground production, Maize Total weight storage organs (yield), evapotranspiration

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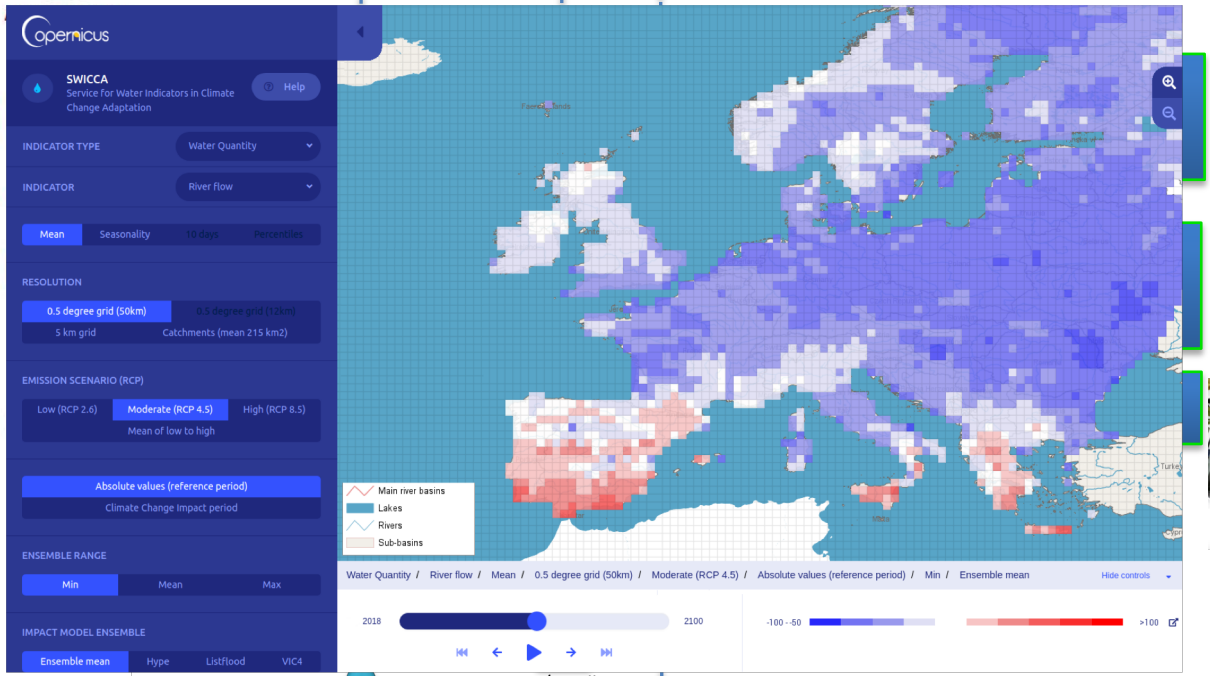
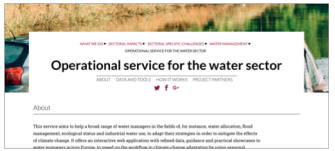
2016 2017 2018 2019 2020 2021

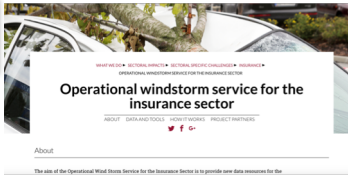
Proof of concept → Operational Phase

Agriclass

POC to Operations







Previous C3S GA March 2017

CDS / Toolbox launched

Present

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Global Services

- AGRICULTURE & FORESTRY
- WATER MANAGEMENT
- TRANSPORT

European Services

- FISHERIES
- TOURISM
- HEALTH
- COASTAL AREAS

2016 2017 2018 2019 2020 2021

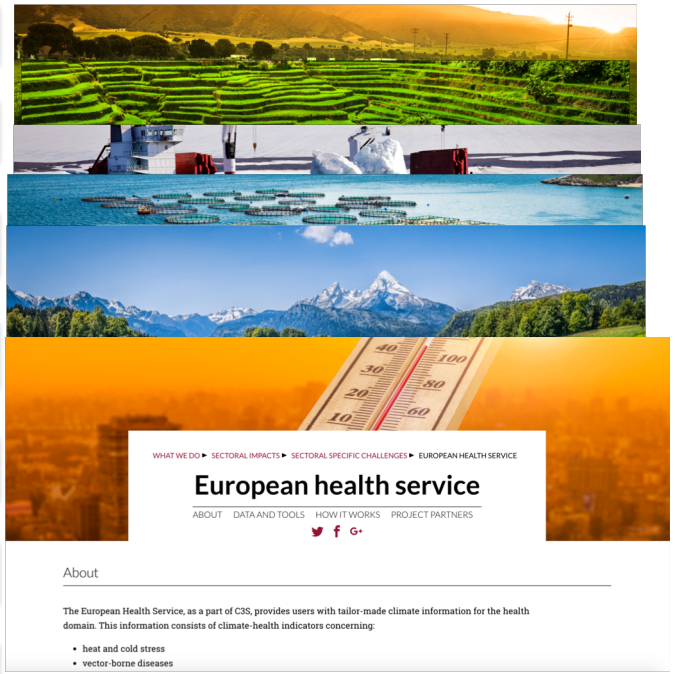
Proof of concept → Operational Phase

- Agriclass
- Global Agriculture (WenR)
- Global Impacts (SMHI)
- Global Shipping (OSM)
- European Fisheries (PML)
- European Tourism (TEC)
- European Health (VITO)
- European Storm Surges (Deltares)

Previous C3S GA March 2017

CDS / Toolbox launched

Present



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2016 2017 2018 2019 2020 2021

Proof of concept → Operational Phase

DISASTER RISK REDUCTION

BIODIVERSITY

INFRASTRUCTURE

DRR

Biodiversity

Standards & Infrastructure

Application development (TBC)

Evaluation & Quality Control SIS

User Cases

Demo Cases

Demo Cases

Demo Cases

Toolbox launched

Present

Have a look at:
https://climate.copernicus.eu/complete-list-tenders-issued-c3s

And develop a Use/Demo Case!

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CDS user uptake (dashboard)

Last registration update

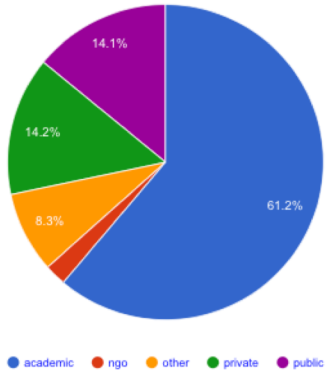
users
New users in the last 24h: 29
Number of registered users: 3790
Represented countries: 130
Last registration at: 2018-11-06 14:24:00+00 from: Italy

Ranking of registered users by country

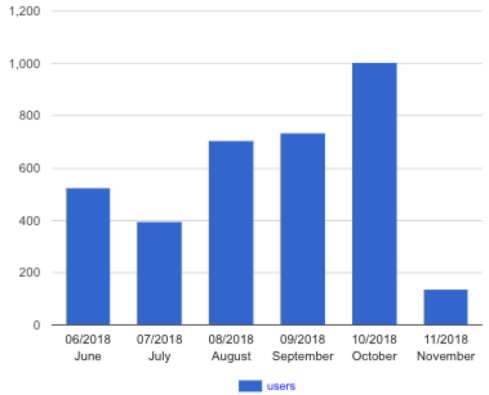
country	users	last_registration	last_access
United Kingdom	434	Nov 5, 2018, 2:51:19 PM	Nov 6, 2018, 2:41:01 PM
China	342	Nov 6, 2018, 1:12:40 PM	Nov 6, 2018, 2:40:24 PM
United States	304	Nov 5, 2018, 5:08:38 PM	Nov 6, 2018, 2:40:58 PM
Germany	291	Nov 6, 2018, 12:50:30 PM	Nov 6, 2018, 2:39:26 PM
France	247	Nov 6, 2018, 2:22:50 PM	Nov 6, 2018, 2:40:38 PM
Italy	225	Nov 6, 2018, 2:24:00 PM	Nov 6, 2018, 2:40:37 PM
Spain	189	Nov 6, 2018, 7:12:28 AM	Nov 6, 2018, 2:39:56 PM
Netherlands	156	Nov 5, 2018, 1:37:25 PM	Nov 6, 2018, 2:23:58 PM
Brazil	83	Nov 5, 2018, 6:26:29 PM	Nov 5, 2018, 6:33:26 PM
Switzerland	73	Nov 1, 2018, 10:51:43 AM	Nov 5, 2018, 8:34:16 AM

1 2 10 14

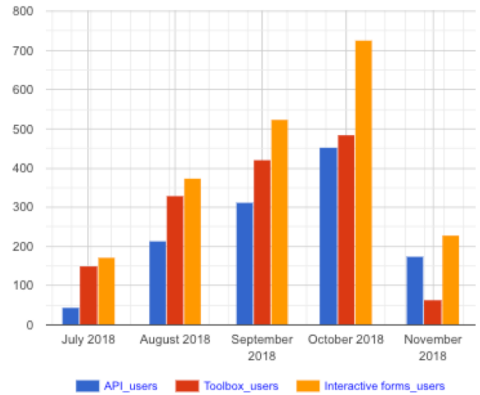
Distribution by sector



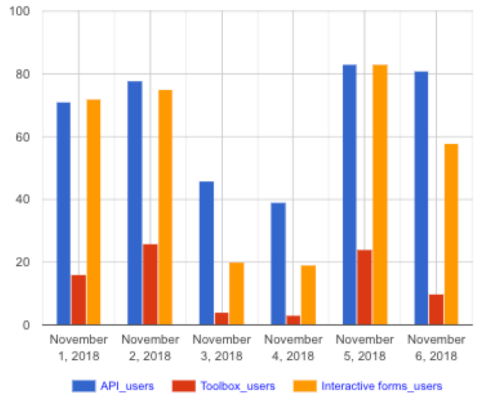
Monthly distribution of registrations



Monthly distribution of users accessisng the CDS by component



Distribution of access to the service by component in the last 5 days



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CDS data access (dashboard)

Overall status

concept
Total volume retrieved (downloaded from data sources): 727.45 TBs
Total number of data requests (sent to data sources): 1267823
Total number of active users: 2796
Total number of data requests in the last 24h: 8449
Active users in the last 24h: 178
Total volume retrieved in the last 24h: 7558.43 GBs
Rate of requests failure: 1.68%

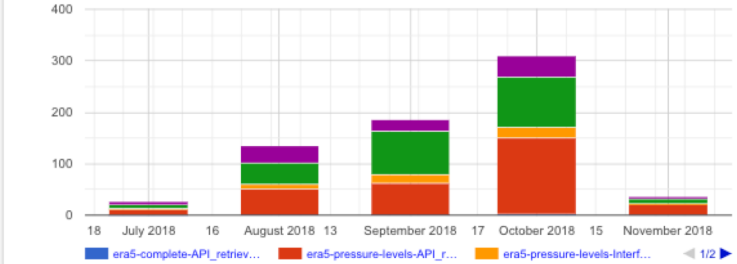
Data access by product type (User Interface)

product_type	last_access	users	requests	retrieved_gbs
insitu	Nov 1, 2018, 8:28:47 AM	66	121	17.06
projections	Nov 6, 2018, 10:05:58 AM	119	376	301.06
reanalysis	Nov 6, 2018, 2:48:43 PM	1,130	11,637	159,552.23
satellite	Nov 6, 2018, 2:08:17 PM	224	775	2,185.57
seasonal	Nov 6, 2018, 12:30:37 PM	180	886	1,978.69
sis	Nov 6, 2018, 2:34:28 PM	73	191	241.82

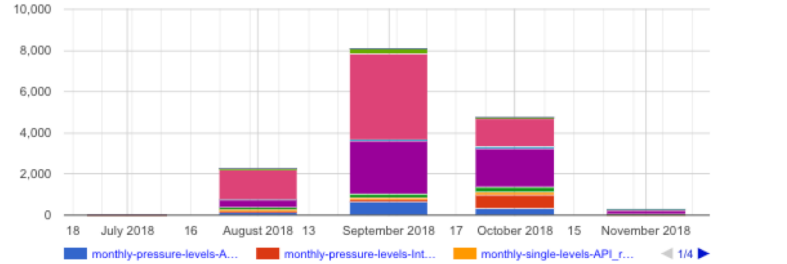
Data access by product type (API)

product_type	last_access	users	requests	retrieved_gbs
insitu	Nov 6, 2018, 7:57:44 AM	20	220	59
projections	Nov 5, 2018, 6:00:59 PM	12	287	194.51
reanalysis	Nov 6, 2018, 2:49:51 PM	704	1,186,524	536,160.05
satellite	Nov 5, 2018, 3:05:45 AM	21	917	273.09
seasonal	Nov 6, 2018, 2:47:57 PM	69	43,970	13,452.58
sis	Nov 6, 2018, 12:35:17 PM	6	269	0.81

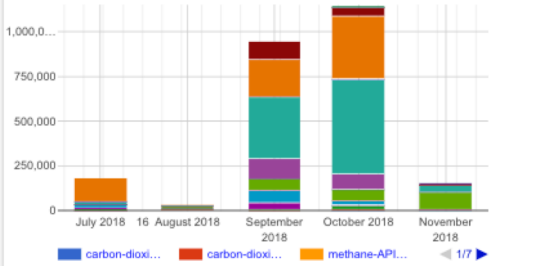
Reanalysis: Accumulated monthly TBs retrieved by origin and product



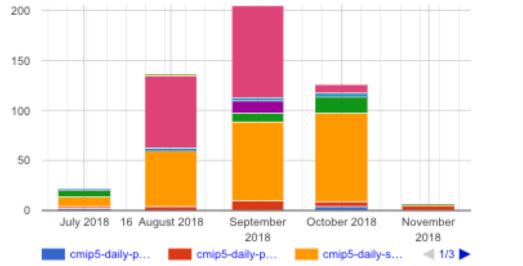
Seasonal: Accumulated monthly GBs retrieved by origin and product



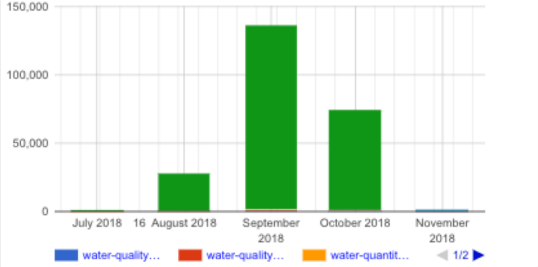
Satellite: Accumulated monthly MBs retrieved by origin and product



Projections: Accumulated monthly GBs retrieved by origin and product



SIS: Accumulated monthly MBs retrieved by origin and product



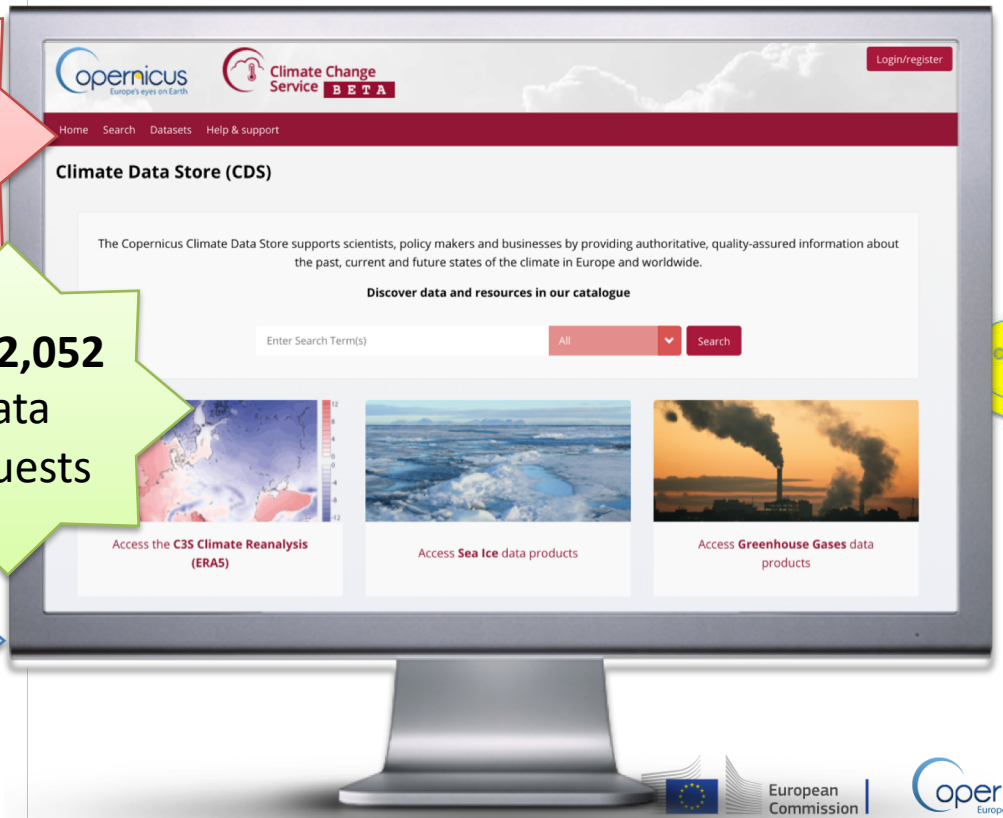
Climate Change

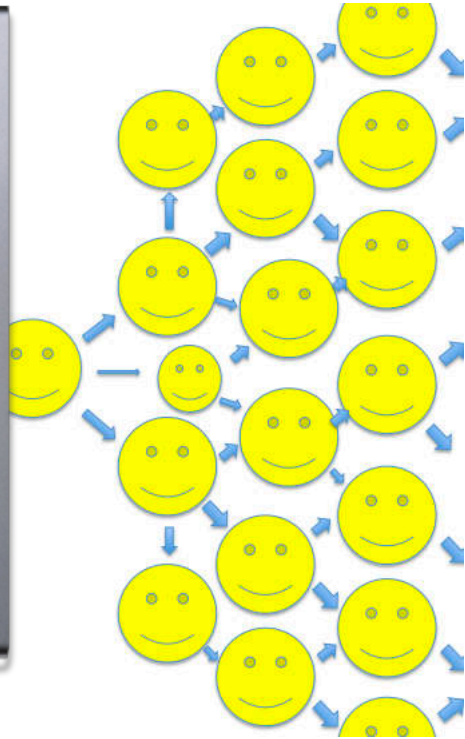
CDS out of the starting blocks… (13 November 2018)

4,073 registered users

1,452,052 data requests

780 Tb data volume delivered





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ECMWF

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C3S for climate monitoring

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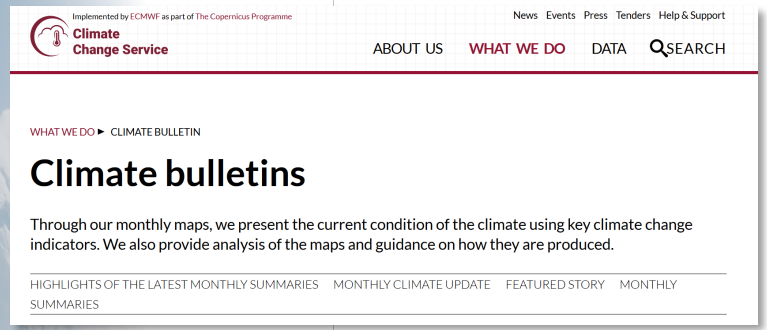
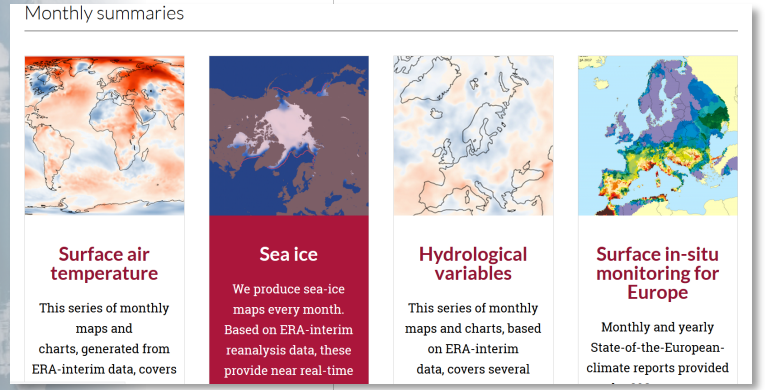
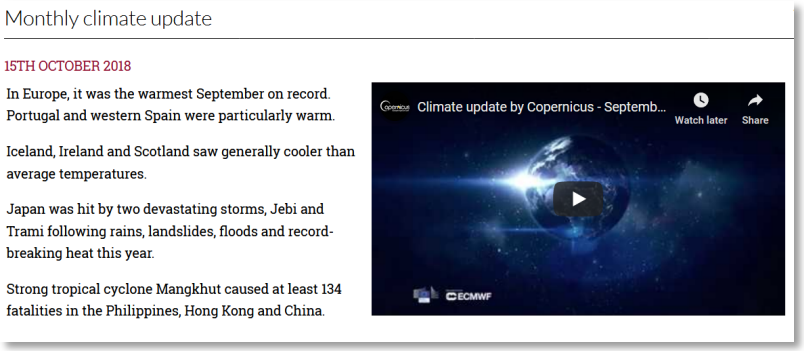
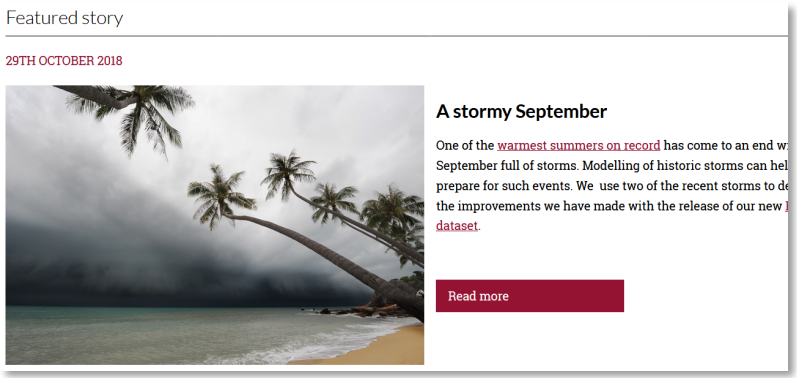
Monthly climate bulletins

Climate Change









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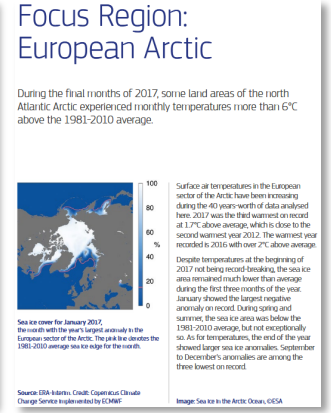
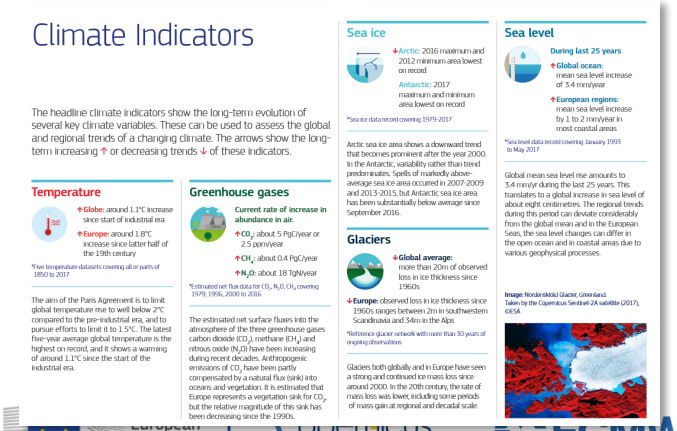
➢ climate.copernicus.eu/climate-bulletins

European State of the Climate

Climate Change





2 main sections

- Climate in 2017
- Headline climate indicators

Based on

- Reanalysis, in-situ, satellite data

With contributions from

- CAMS, CMEMS, EEA and GCOS
- 13 further European research institutions

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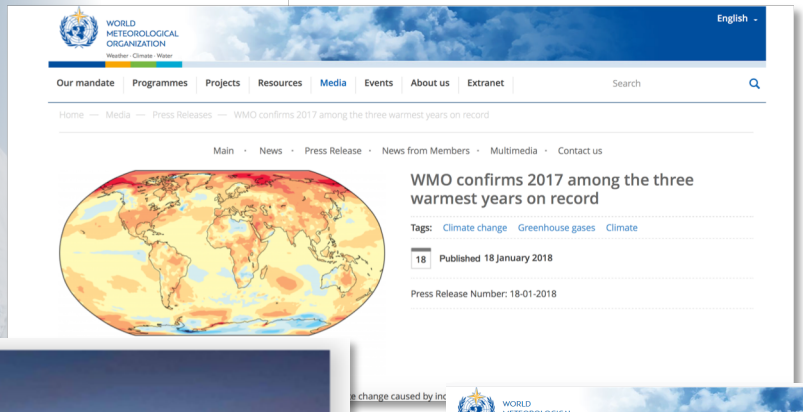
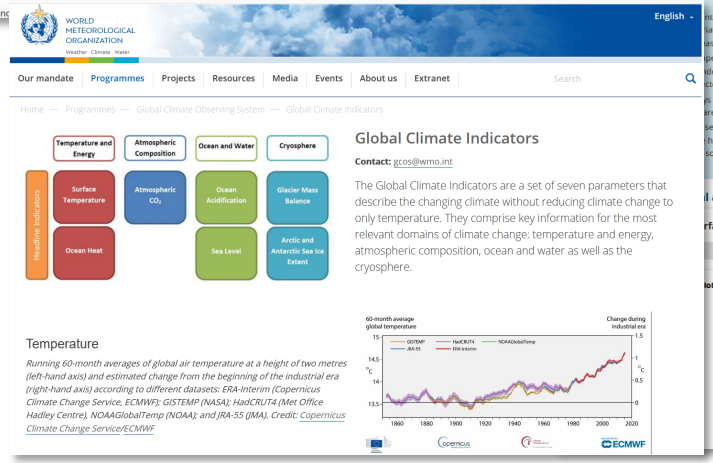
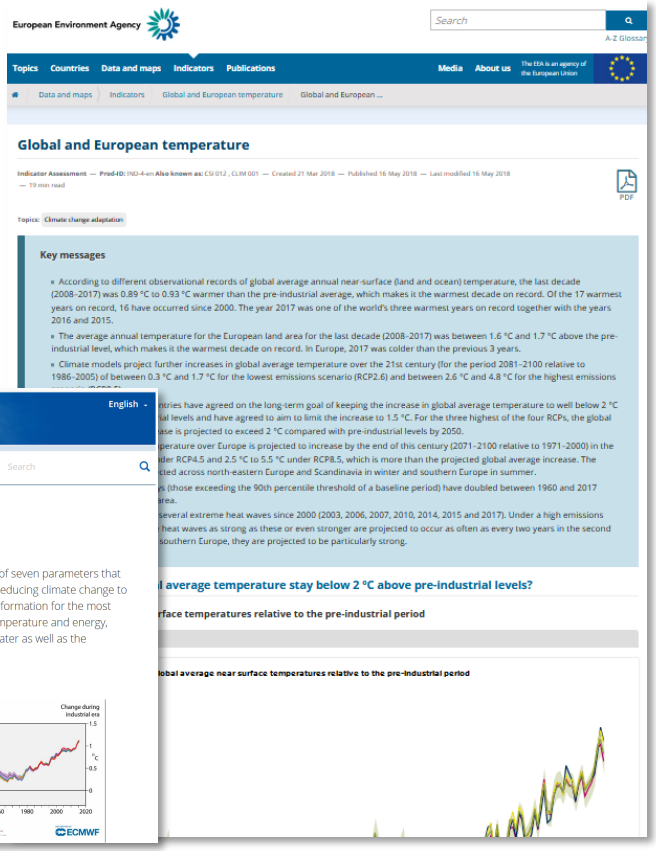
Contributing to EEA, GCOS and the WMO







C3S latest press coverage highlights

Climate Change

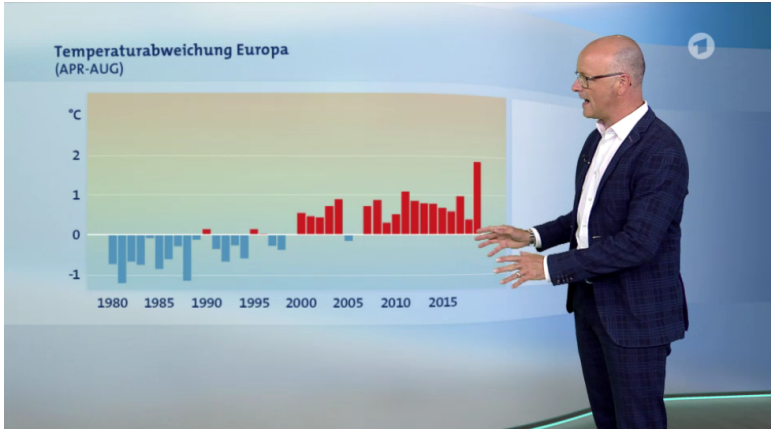
TV presenters around Europe continue to use C3S monthly maps – latest example was from German national TV broadcaster

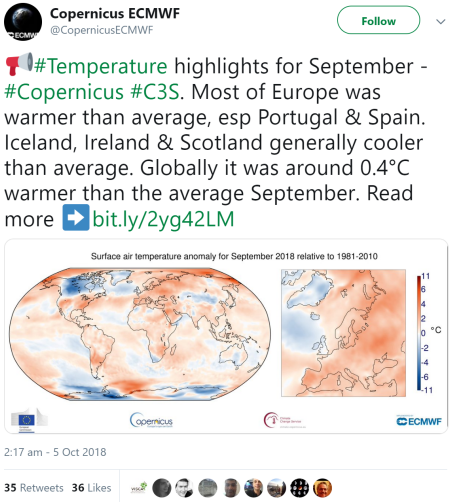
ARD where C3S data and maps were shown at **prime time** evening news.

Reach: 8m

https://www.daserste.de/information/nachrichten-wetter/wetter/videos/rueckblick-sommer-2018-100.html

- C3S Monthly maps are also regularly featured via social media channels such as Twitter





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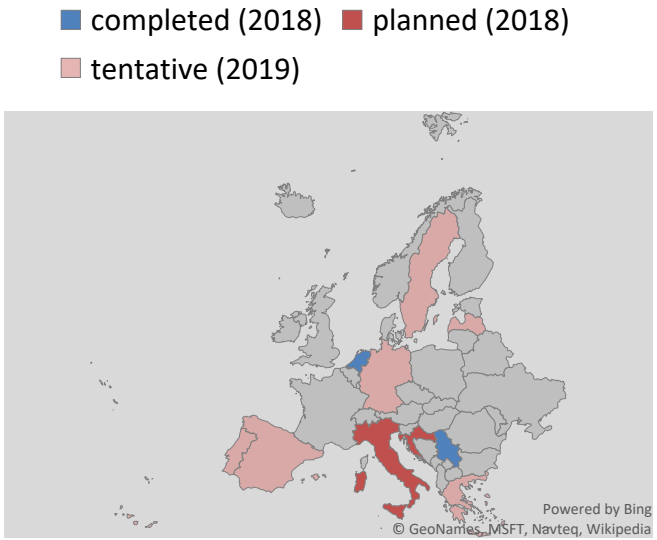
C3S outreach activities

- Presence at conferences, meetings and fairs
- Press tour
- Hackathon
- User workshops
- C3S user learning services

Train the trainer events



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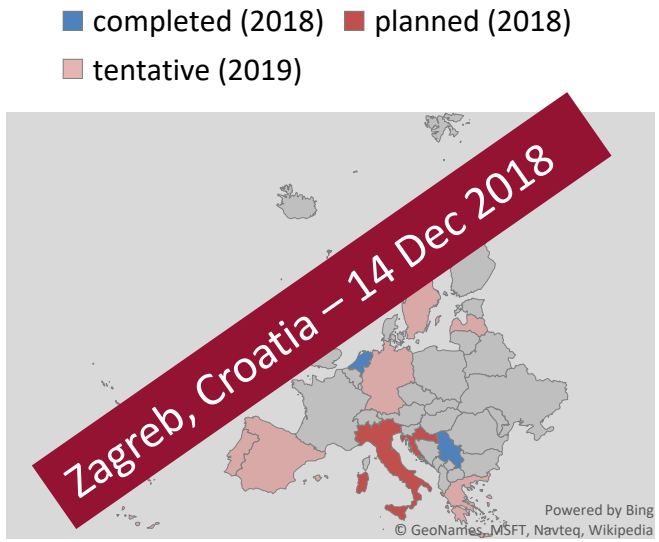

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Climate Change

C3S outreach activities

- Presence at conferences, meetings and fairs
- Press tour
- Hackathon
- User workshops
- C3S user learning services
- “Ad-hoc“ training (TODAY!)

Train the trainer events

completed (2018) planned (2018)

tentative (2019)

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Implemented by ECMWF as part of The Copernicus Programme

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News Events Press Tenders Help & Support

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Questions?