



Climate Change

Climate Change Service

Status Update

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European
Commission





Climate Change

C3S in a nutshell

Evaluation & QC function

Quality assurance
Integrity of Service
User requirements

from European commission
e.g., FP7 Space call, H2020

from EU Member States,
ESA, EUMETSAT, EEA,
WMO..

Climate Data Store

Sectoral Information System

Outreach & Dissemination

Stakeholders & users





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C3S - Development timeline

Stage 0/I - Proof of Concept/Pre-Operational
Stage II - Operational ~20 ECVs, ~5-6 Sectors
Stage III - Operational ~30 ECVs, ~10 Sectors

2014

2015

2016

2017

2018

2019

2020

2021

Stage 0/I

Stage II

Stage III





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Climate Data Store Content





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Climate Data Store content



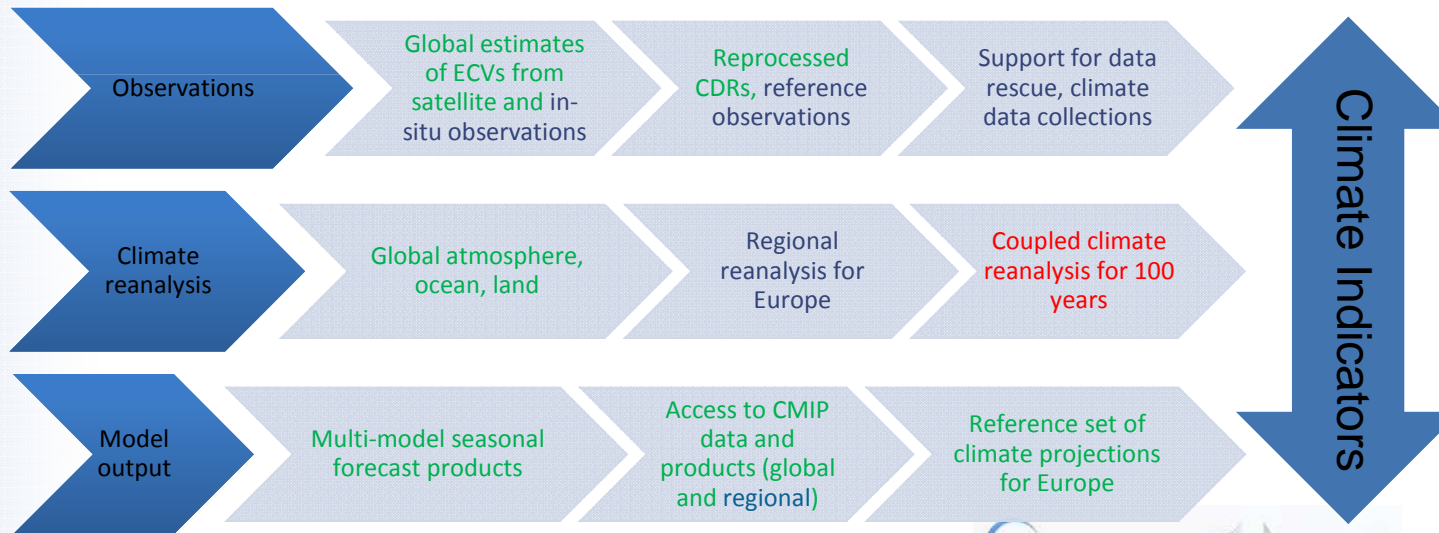
Scientific basis:

- 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





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ECV products for CDS

- Initial set of ~ 30 ECVs planned for stages II and III
- Products will become available via the CDS during 2017/2018
- Additional/alternative ECV products to follow (e.g. NOAA CDRs, GPCP, ...)



Action engaged



In preparation
(PIN or ITT out)

C3S_312a	ECV products from observations	9 contracts, 12 ECVs	Started 2016Q4
C3S_311a	In situ observations (Lot 4)	High-resolution ECV products for Europe	Likely start 2017Q1
C3S_312b	ECV products from observations	Additional 8-10 ECVs	ITT in preparation
ERA5	Global atmospheric reanalysis	Atmosphere, land, sea state	Started 2016Q1
ORA5	Global ocean reanalysis	Ocean, sea ice	Complete



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Status for Atmospheric ECVs

	GCOS Status Report	C3S Technical Annex	CDS	Reanalysis	Observations
Atmosphere (surface)					
Air temperature	4.3.1	Stage III	2017	ERA5	C3S_311a
Wind speed and direction	4.3.2	Stage II	2017	ERA5	C3S_311a
Water vapour	4.3.3	Stage II	2017	ERA5	C3S_311a
Pressure	4.3.4		2017	ERA5	C3S_311a
Precipitation	4.3.5	Stage II	2017	ERA5	C3S_311a
Surface radiation budget	4.3.6	Stage II	2017	ERA5	
Atmosphere (upper air)					
Temperature	4.5.1		2017	ERA5	
Wind speed and direction	4.5.2	Stage II	2017	ERA5	
Water vapour	4.5.3		2017	ERA5	
Cloud properties	4.5.4	Stage II	2017	ERA5	
Earth radiation budget	4.5.5	Stage II	2017	ERA5	
Atmosphere (composition)					
Carbon dioxide	4.7.1	Stage II	2017		C3S_312a
Methane	4.7.2	Stage II	2017		C3S_312a
Other long-lived greenhouse gases	4.7.3	Stage III	2018		C3S_312b
Ozone	4.7.4	Stage II	2017	ERA5	C3S_312a
Aerosol	4.7.5	Stage II	2017		C3S_312a

- Action engaged
- In preparation (PIN or ITT out)

Not yet included:

- Existing ECV products (e.g. NOAA CDRs, CM-SAF products, GPCP, ...)
- Regional reanalysis products



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Status for Oceanic ECVs

	GCOS Status Report	C3S Technical Annex	CDS	Reanalysis	Observations
Ocean (physics)					
Sea surface temperature	5.3.1	Stage II	2017	ORA5	C3S_312a
Subsurface temperature	5.4.1	Stage II	2017	ORA5	
Sea surface salinity	5.3.2		2018	ORA5	
Subsurface salinity	5.4.2	Stage III	2018	ORA5	
Sea surface currents	5.3.6		2018	ORA5	
Subsurface currents	5.4.3	Stage III	2018	ORA5	
Sea level	5.3.3	Stage II	2017	ORA5	C3S_312a
Sea state	5.3.4		2018	ERA5	
Sea ice	5.3.5	Stage II	2017	ORA5	C3S_312a
Ocean surface stress	NEW		2018	ORA5	
Ocean surface heat flux	NEW		2018	ORA5	
Ocean (biochemistry)					
Inorganic carbon	NEW		2018		C3S_312b
Ocean colour	5.3.7	Stage II	2018		C3S_312b



Action engaged



In preparation
(PIN or ITT out)



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Status for Terrestrial ECVs

	GCOS Status Report	C3S Technical Annex	CDS	Reanalysis	Observations
Land (hydrology)					
Lakes	6.3.4	Stage III	2018		C3S_312b
Soil moisture	6.3.16	Stage III	2017	ERA5	C3S_312a
Land (cryosphere)					
Snow	6.3.5	Stage II	2017	ERA5	
Glaciers	6.3.6	Stage II	2017		C3S_312a
Ice sheets and ice shelves	6.3.7	Stage II	2018		C3S_312b
Permafrost	6.3.8	Stage III	2018		C3S_312b
Land (biosphere)					
Albedo	6.3.9	Stage II	2017		C3S_312a
Land cover (including vegetation type)	6.3.10	Stage III	2018		C3S_312b
Fraction of absorbed photosynthetically	6.3.11	Stage II	2017		C3S_312a
Leaf area index	6.3.12	Stage III	2017		C3S_312a
Fire	6.3.15	Stage II	2018		C3S_312b



Action engaged



In preparation (PIN or ITT out)



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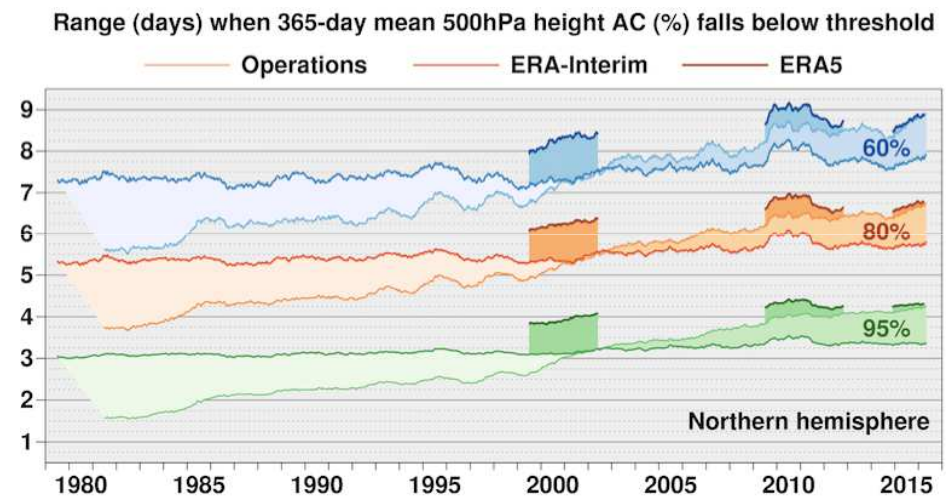
Climate Data Store: Reanalyses

ERA5 global reanalysis:

- Atmosphere/land/wave parameters
- 31 km global resolution, 137 levels
- Hourly output from 1979 onward
- Based on IFS Cy41r2 (March 2016)
- Using improved input observations
- Ensemble data assimilation
- Providing uncertainty estimates

Regional reanalysis:

- European + Arctic domains
- Higher spatial resolution
- Workshop organised 2016 Q2
- Competitive call issued 2016 Q4, bids under evaluation





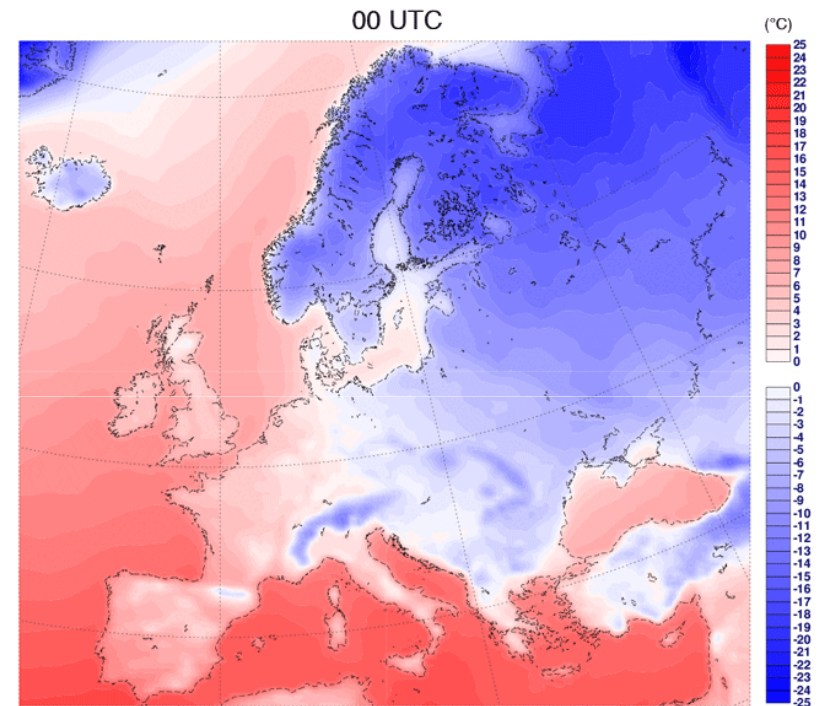
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ERA5: Data release schedule

ERA5 release plan:

- Nov 2016 **Test data (Jan-Feb 2016)**
- Apr 2017 **Hourly data from 2010 - 2016**
- May 2017 **Daily updates at short delay**
- Apr 2018 **Complete from 1979 onward**

Reanalysis is now an operational
service provided by ECMWF



ERA5 hourly temperatures for January 2016



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Seasonal forecasts - first release 12/2016

The screenshot shows the Copernicus Climate Change Service website. At the top, there is a navigation bar with the Copernicus logo (Europe's eyes on Earth) and the Climate Change Service logo. A search bar and a 'Contact us' button are also present. Below the navigation bar is a main menu with links: ABOUT C3S, NEWS & MEDIA, EVENTS, TENDERS, PRODUCTS, SERVICES, and USER SUPPORT. The main content area is titled 'Seasonal forecasts' and includes a breadcrumb trail 'home » products'. There are four graphical forecast products displayed: a line graph showing a red trend, a world map with green and yellow areas, a world map with orange and yellow areas, and a map of Europe with a yellow circle. To the right, there is a 'NEWS' section with a 'More News' button and an 'EVENTS' section with a list of dates and titles. A 'Graphical forecast products' button is located at the bottom left of the main content area.

home » products

The Copernicus Climate Change Service (C3S) is developing seasonal forecast products, with a target publication date of 15th of each month. These products are based on data from several state-of-the-art seasonal prediction systems.

The current proof-of-concept phase includes graphical forecast products for a number of variables (air and sea-surface temperature, atmospheric circulation and precipitation); the forecasts are updated every month and cover a time range of 6 months. The interface to the list of products offers links to maps or timeseries for the forecast variables, and the facility to navigate the full set of graphics. Multi-system combinations, as well as predictions from the individual component systems, are available.

The centres currently providing forecasts to C3S are ECMWF, The Met Office and Météo-France; at a later stage Deutscher Wetterdienst and Centro Euro-Mediterraneo sui Cambiamenti Climatici will be added to the list.

Graphical forecast products

- AVERAGE SURFACE AIR TEMPERATURE MONTHLY MAPS
- CLIMATE REANALYSIS
- SEASONAL FORECASTS

NEWS

- 13 Dec 2016 #OpenDataHack: @ECMWF - explore creative uses of open data
- 06 Dec 2016 Report Reassesses Variations in Global Warming
- 28 Nov 2016 Copernicus at Wissenswerte
- 17 Nov 2016 C3S and CAMS at COP22
- 01 Nov 2016 ODI Summit and Awards 2016

More News

EVENTS

- 13 Nov 2017 5th International Conference on Reanalysis
- 06 Mar 2017 C3S General Assembly
- 22 Feb 2017

<http://climate.copernicus.eu/seasonal-forecasts>





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Seasonal forecasts - content

Variables:

- sea-level pressure
- geopotential height
- precipitation
- air temperature

Type of plots:

- maps:
 - global
 - pre-defined regions
- time series

Publication schedule:

- monthly updates
- published on each 15th

The screenshot displays the Copernicus Climate Change Service website interface. At the top, the Copernicus logo and 'Europe's eyes on Earth' tagline are visible alongside the Climate Change Service logo. A navigation menu includes links for 'ABOUT C3S', 'NEWS & MEDIA', 'EVENTS', 'TENDERS', 'PRODUCTS', 'SERVICES', and 'USER SUPPORT'. A search bar and 'Contact us' link are also present. The main content area is titled 'C3S seasonal charts' and shows '28 matching items' with 'No filters applied'. A filter sidebar on the left allows users to select parameters (MSLP, SST, T2m, T850, geopotential height 500hPa, precipitation), plot types (Maps, Time series), and centres (C3S multi-system, ECMWF, Met Office, Meteo-France). The main display features a grid of 28 thumbnail images, each representing a different seasonal forecast chart, such as 'C3S multi-system MSLP', 'ECMWF T2m', and 'Met Office precipitation'.



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Climate Data Store

Infrastructure and toolbox





CDS infrastructure and toolbox

CDS infrastructure (Telespazio UK):
alpha version Jan 2017, beta version
summer 2017

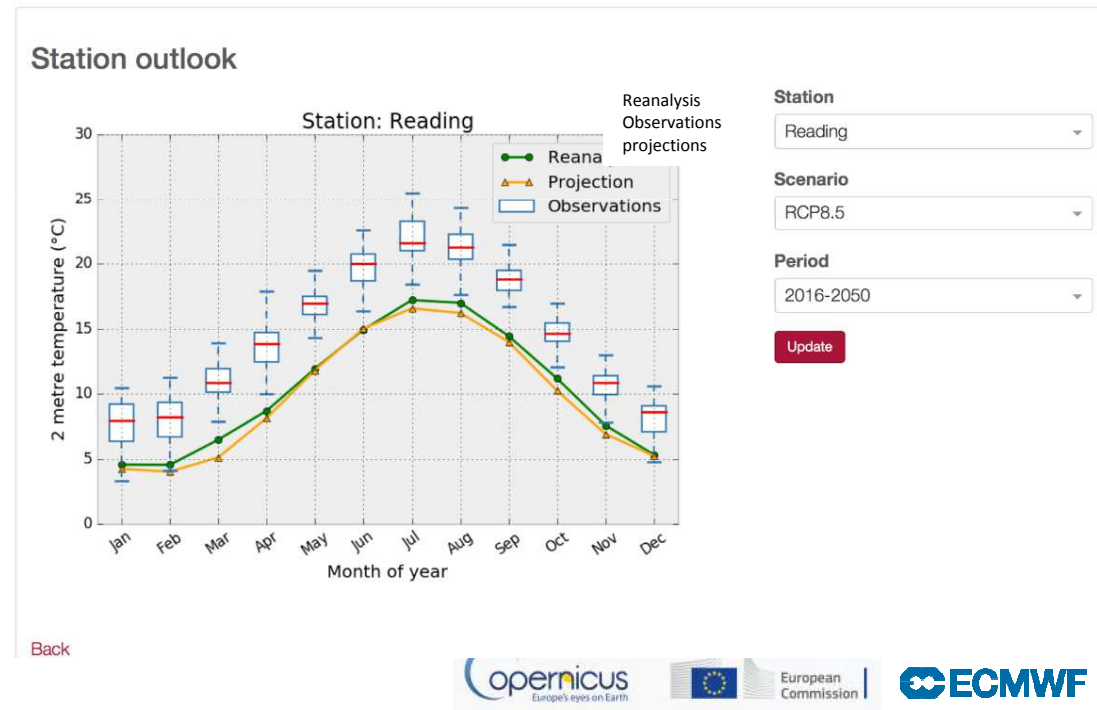
CDS toolbox (B-open, IT): incremental
until 2019

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



CDS Toolbox demo.

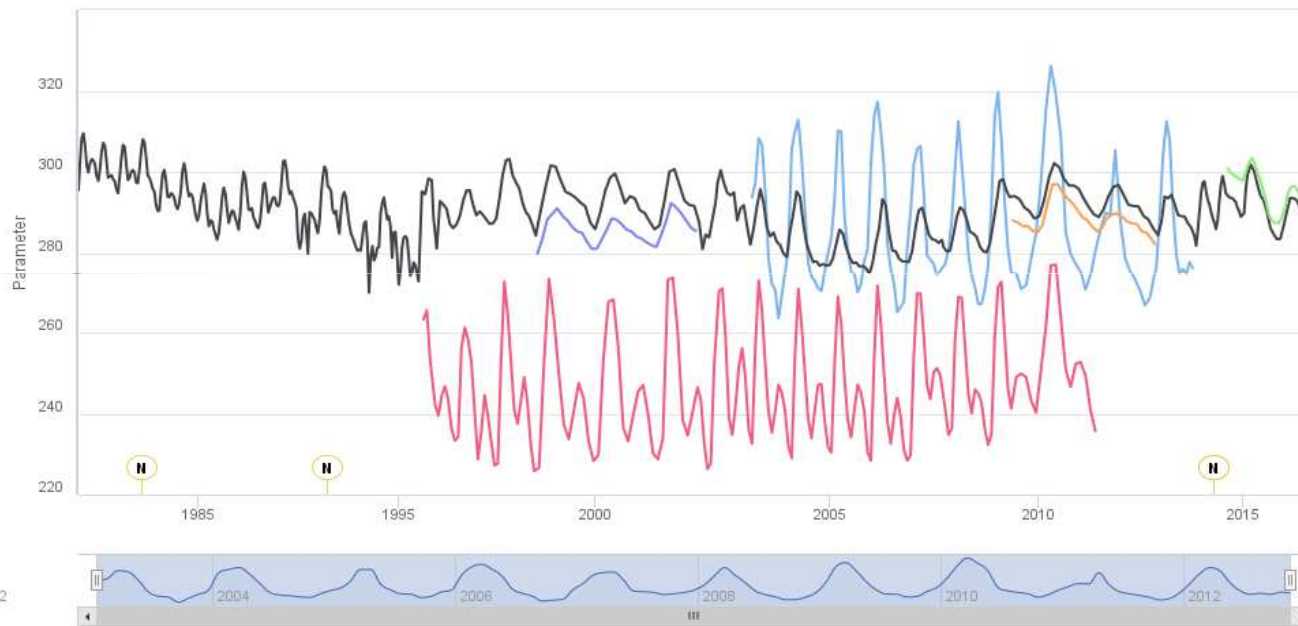




CDS toolbox: Climate Monitoring Facility

Global Total Column Ozone

Zoom 1m 3m 6m YTD 1y All



MACC (CAMS) reanalysis

ERA-interim

ERA5 (stream I)

(stream II)

(stream III)

ESA-CCI

Volcanic eruptions



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S e c t o r a l I n f o r m a t i o n S y s t e m





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Sectoral Information System

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:

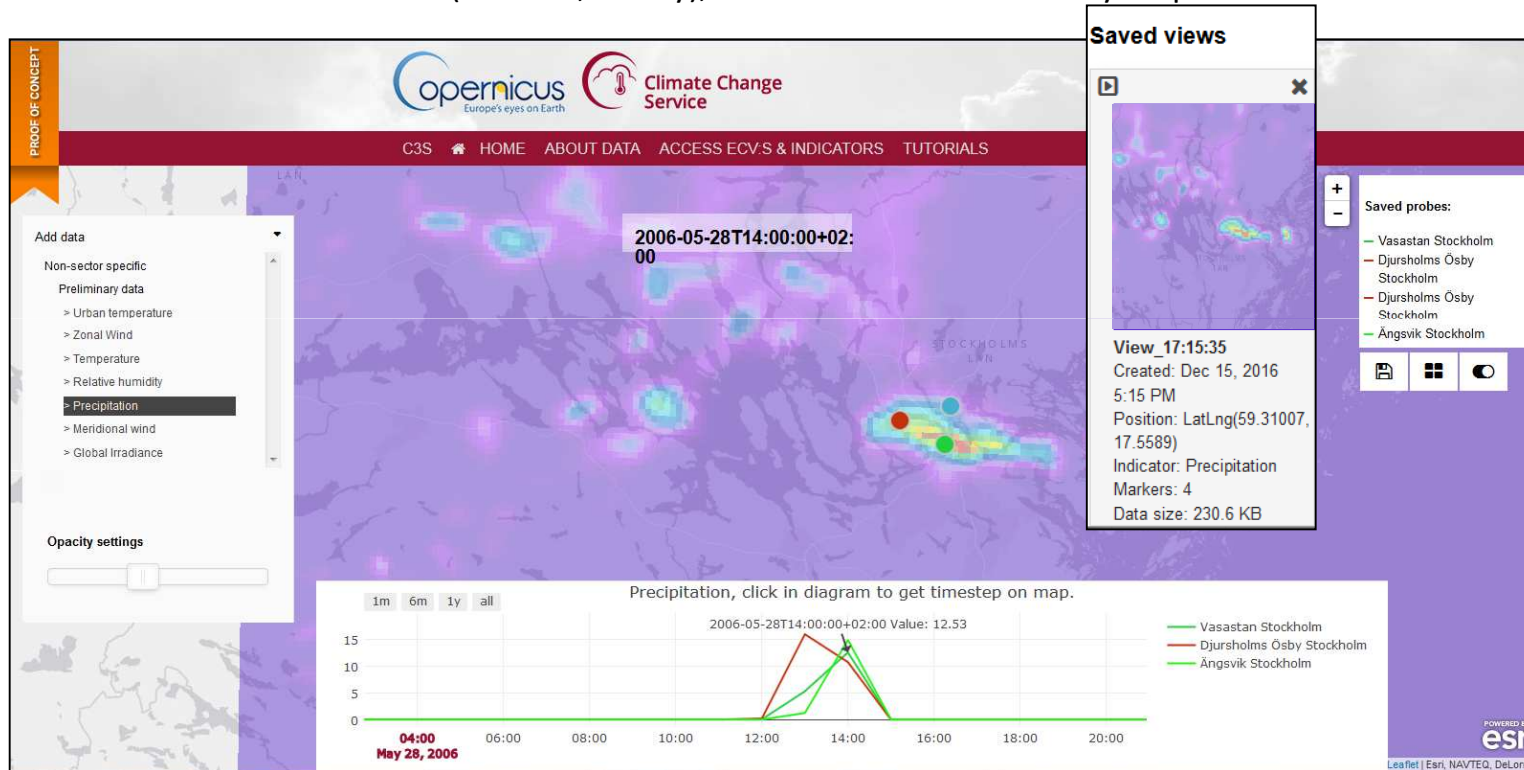
- 1** **INFORMING**
POLICY DEVELOPMENT TO PROTECT CITIZENS FROM CLIMATE-RELATED HAZARDS SUCH AS HIGH-IMPACT WEATHER EVENTS
- 2** **IMPROVING**
PLANNING OF MITIGATION AND ADAPTATION PRACTICES FOR KEY HUMAN AND SOCIETAL ACTIVITIES
- 3** **PROMOTING**
THE DEVELOPMENT OF NEW SERVICES FOR THE BENEFIT OF SOCIETY



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Urban SIS - a climate service for European cities

Access, view and download climate - air quality - hydrological ECV data and impact indicators on the urban scale (1x1 km², hourly), for historical and future 5-year periods





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Evaluation and Quality Control

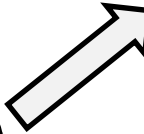
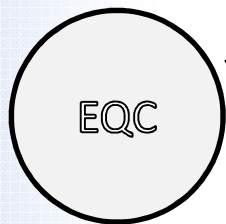




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EQC: Engaged and future activities

- Action engaged
- In preparation (PIN or ITT out)
- Not started



Quality assurance for seasonal forecasts

Quality assurance framework for earth observations

Quality assurance for climate projections

Quality assessment of ECV products and reanalyses

Sectoral gap analysis and user requirements

EQC of operational SIS

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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CDS Evaluation & Quality Control

C3S_51 Lot 2: ECV products derived from observations

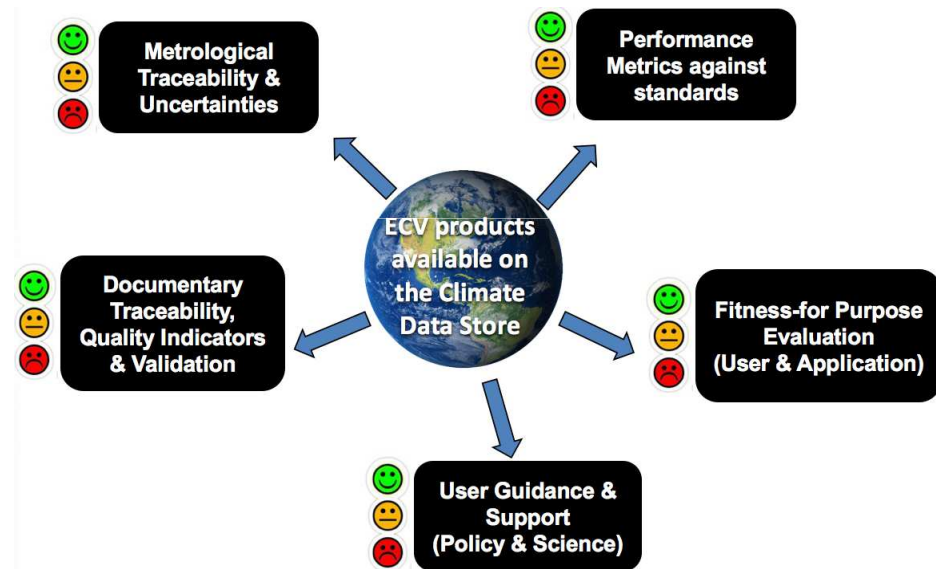
Contract started 2016Q4

C3S_511: Quality assessments of ECV products

- Single-product assessments
- Multi-products assessments
- Thematic product assessments

ITT has been published

Deadline for proposals: 14 March 2017





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Outreach & Communication





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Events

Event	Date	Location	C3S contribution
SIS workshop	17-19 October 2016	Hampshire, UK	Presentations, workshops
Open Data Institute Summit 2016	1 November	London, UK	Expo stand, branding, sponsoring
GEOXII	9-11 November	St. Petersburg, Russia	Expo stand, posters, video,
COP22	7-18 November	Marrakesh, Morocco	Poster session, panel discussion
Conference for Young Scientists “Meteorology, Hydrology and Environment Monitoring”	16-17 November	Kiew, Ukraina	Brochure article, branding, sponsoring, promotional material
Wissenswertes	28-30 November	Bremen, Germany	Expo stand promotional talks, branding, sponsoring, promotional material
C3S European Climatic Energy Mixes webinar	14 December	Online	Presentations + Q&A
C3S General Assembly	6-10 March 2017	Toulouse, France	Presentations, workshops
EQC workshop	Spring 2017	TBC	Presentations, workshops
Attribution workshop	October 2017	Prague (TBC)	Presentations, workshops
5th International Reanalysis Conference (with WCRP)	13-17 November 2017	Rome, Italy	Presentations, workshops



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Media activity

COP22: Copernicus 'Europe's eyes on earth' observes a year of extremes

Temperatures, wildfires and CO2 acceleration monitored throughout 2016

Monday, November 14, 2016 —

- January to October 2016 the warmest period on record
- Wildfires linked to high temperatures and dry conditions
- CO2 concentrations pass and remain above 400 ppm

On 4 November 2016, the Paris Agreement on climate change entered into force, but despite this historic achievement the heat is still on to keep the rise in global temperature below 2°C.

The Copernicus Climate Change Service (C3S) and Atmosphere Monitoring service (CMS), part of the EU's Copernicus earth observation programme, recorded, re-analysed and released significant climatic information throughout 2016, noting the effect and impact of a still changing climate.

Discover more on Copernicus <http://prezly/RY2v>



Audrey Lebas
Junior Media Relations Officer
ICF (Mostra)

Silke Zollinger
Copernicus Communication Press and
Events Manager
European Centre for Medium-Range
Weather Forecasts

COP22: Temperatures, wildfires and CO2 – Copernicus 'Europe's eyes on earth' observes a year of extremes



Mon, 14/11/2016 - 03:19
The Copernicus Climate Change Service (C3S) and Atmosphere Monitoring service (CMS), part of the EU's Copernicus earth observation programme, recorded, re-analysed and released significant climatic information throughout 2016, noting the effect and impact of a still changing climate.

Read more

New milestone in climate change monitoring: ECMWF unveils ERA5 preview



Wed, 02/11/2016 - 20:37
One year after the Paris Agreement, the European Centre for Medium-Range Weather Forecasts (ECMWF) launches its most powerful global climate monitoring tool to date, ERA5.

Read more

What's in store? Copernicus Climate Change Service meets industry partners to present interim results on climate change data accessibility



Thu, 13/10/2016 - 12:38
The European Union's Copernicus Climate Change Service (C3S) convenes the first meeting of its Sectoral Information System (SIS) network of partners on 17-19 October, officially sharing the progress to date of seven groundbreaking projects to provide enhanced free climate change data and information.

Read more

We continue to promote C3S activity to the media – sectoral and mainstream - where appropriate to do so. We have recently experimented with multi-media releases via our Press & PR agency to make information easier for the media to consume. <https://ecmwf.prezly.com/cop22-copernicus-europes-eyes-on-earth-observes-a-year-of-extremes#>

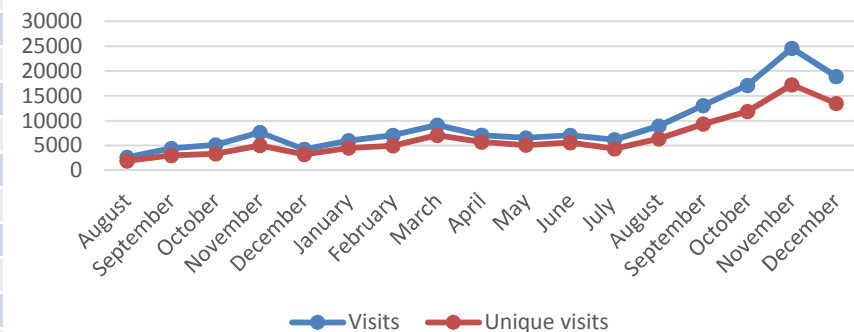


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Number of visitors

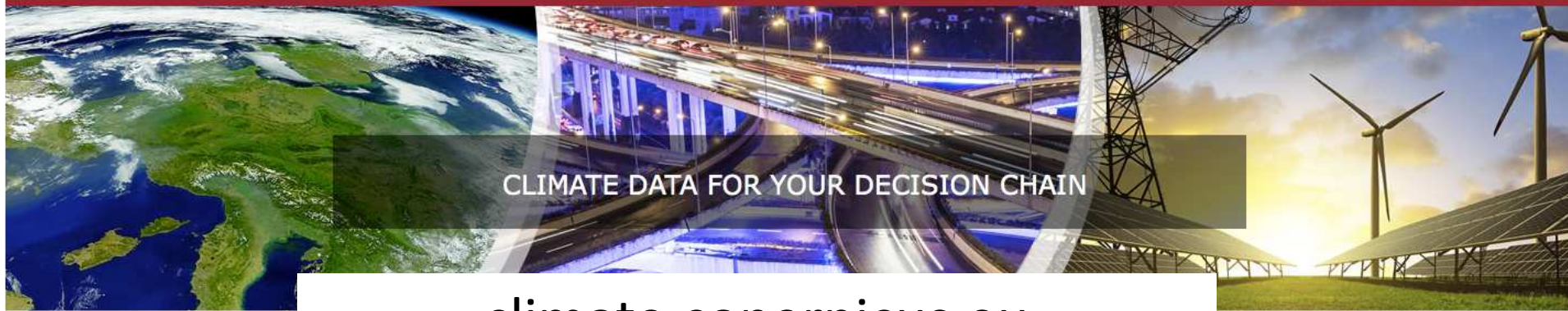
Unique visits			Overall visits		
August 2015	1903		August 2015	2642	
September	3007	+58%	September	4423	+67%
October	3344	+11%	October	5134	+16%
November	5021	+50%	November	7640	+49%
December	3217	-36%	December	4261	-44%
January 2016	4528	+41%	January 2016	5998	+41%
February	4964	+10%	February	7072	+18%
March	7043	+42%	March	9122	+29%
April	5704	-19%	April	7101	-22%
May	5099	-11%	May	6534	-8%
June	5580	+9%	June	7049	+8%
July	4341	-22%	July	6195	-12%
August	6360	+47%	August	8940	+44%
September	9342	+47%	September	13050	+46%
October	11857	+27%	October	17102	+31%
November	17225	+45%	November	24569	+44%
December	13485	-22%	December	18897	-23%

C3S website traffic - visits and unique visits



- Visitor numbers increased after the summer lull, peaking in November. Our monthly temperature maps, numerous events and press releases drove a significant amount of traffic to the site.
- The ERA5 test dataset release and its accompanying press release meant the Climate Reanalysis page jumped to the top of the popular pages list in November overtaking the monthly temperature maps.
- The COP22 press release drove significant traffic to the site as well.





CLIMATE DATA FOR YOUR DECISION CHAIN

climate.copernicus.eu

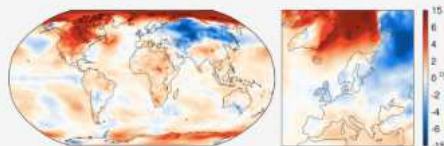
IN FOCUS



#OpenDataHack @ECMWF - explore creative uses of open data

13 Dec 2016

MONTHLY MAPS



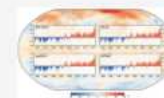
Average surface air temperatures for November 2016

November 2016

NEWS



13 Dec 2016
#OpenDataHack @ECMWF - explore creative uses of open data



06 Dec 2016
Report Reassesses Variations in Global Warming



28 Nov 2016
Copernicus at Wissenswerte