Climate Change

Climate Change Service

Status Update

Jean-Noël Thépaut, Dick Dee, Joaquín Muñoz-Sabater

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C3S in a nutshell

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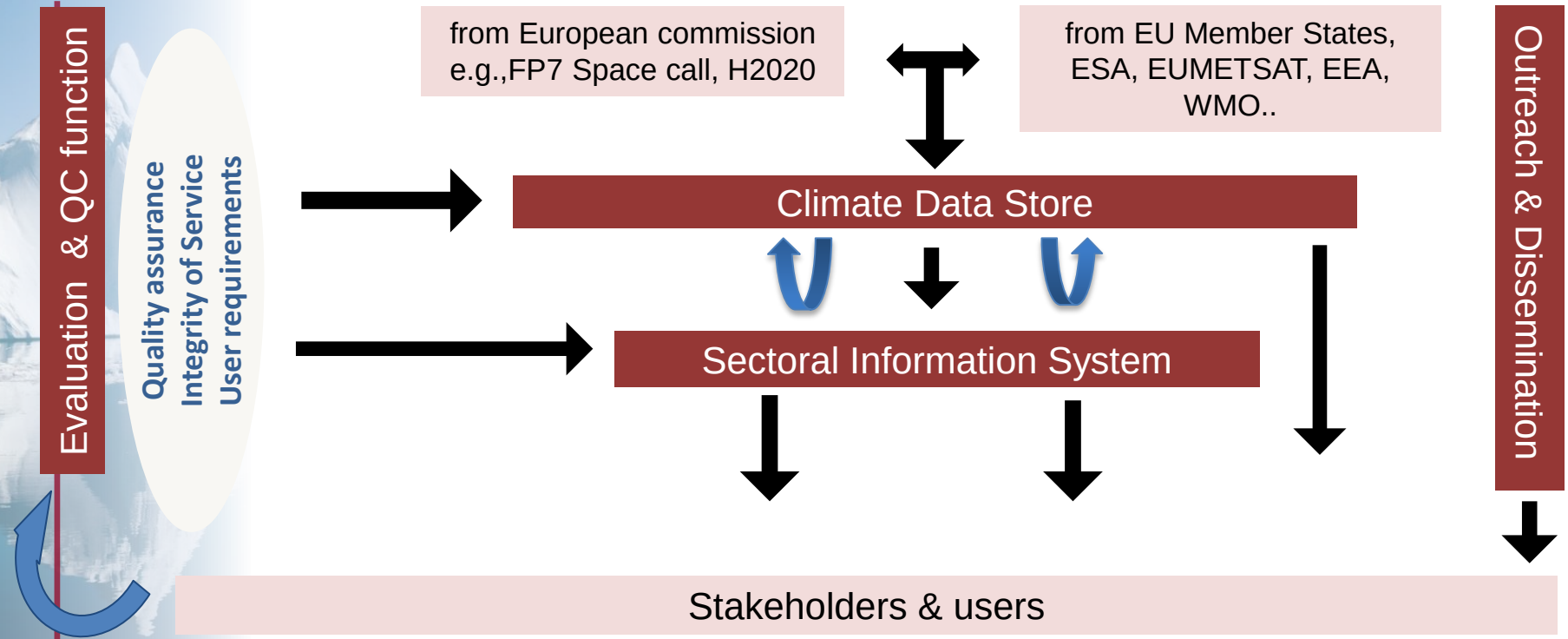

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C3S - Development timeline

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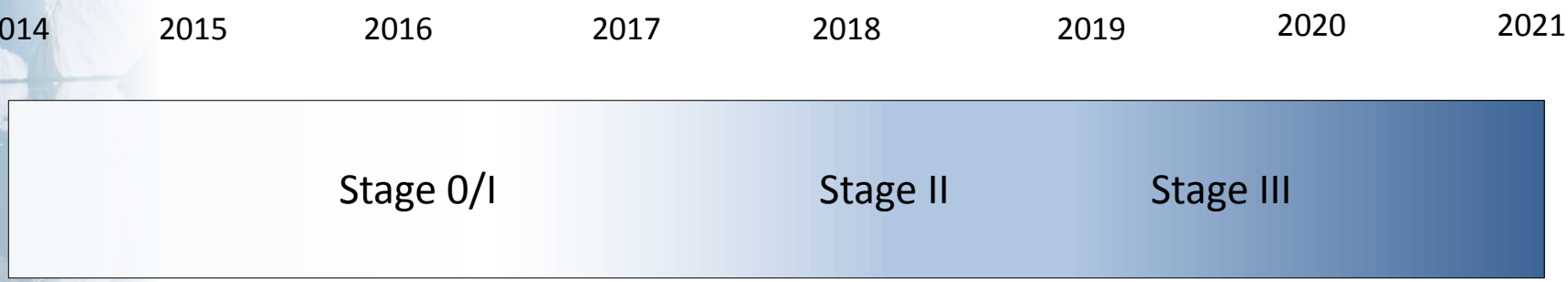
Stage 0/I - Proof of Concept/Pre-Operational
Stage II - Operational ~20 ECVs, ~5-6 Sectors
Stage III - Operational ~30 ECVs, ~10 Sectors



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Climate Data Store Content

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Climate Data Store content

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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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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)

Status for Terrestrial ECVs

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	GCOS Status Report	C3S Technical Annex	CDS	Reanalysis	Observations
Land (hydrology)					
Lakes	6.3.4	Stage II	2018		C3S_312b
Soil moisture	6.3.16	Stage II	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 II	2018		C3S_312b
Land (biosphere)					
Albedo	6.3.9	Stage II	2017		C3S_312a
Land cover (including vegetation type)	6.3.10	Stage II	2018		C3S_312b
Fraction of absorbed photosynthetically	6.3.11	Stage II	2017		C3S_312a
Leaf area index	6.3.12	Stage II	2017		C3S_312a
Fire	6.3.15	Stage II	2018		C3S_312b

Action engaged

In preparation (PIN or ITT out)

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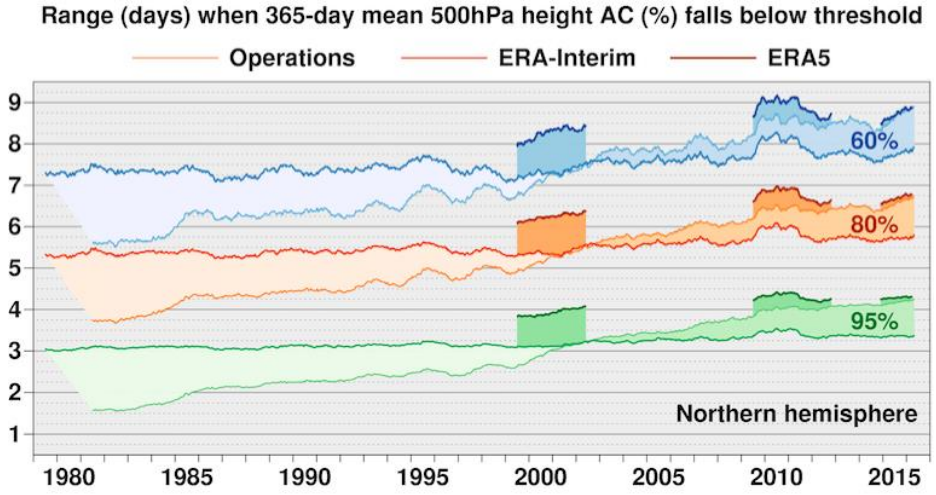
Climate Data Store: Reanalyses

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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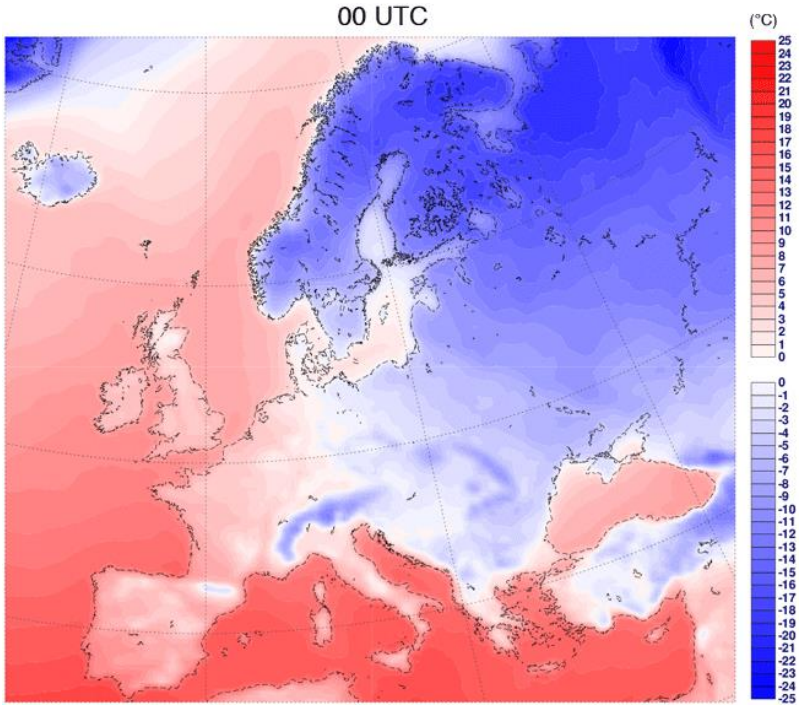
ERA5: Data release schedule

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

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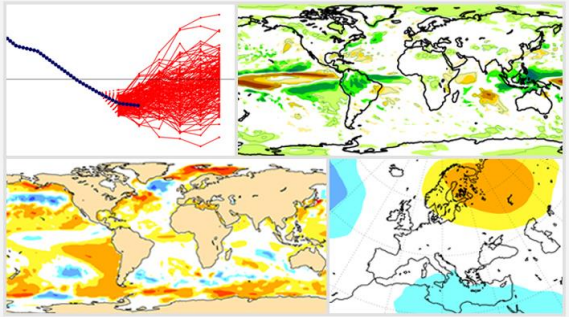
Seasonal forecasts

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
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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

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Variables:

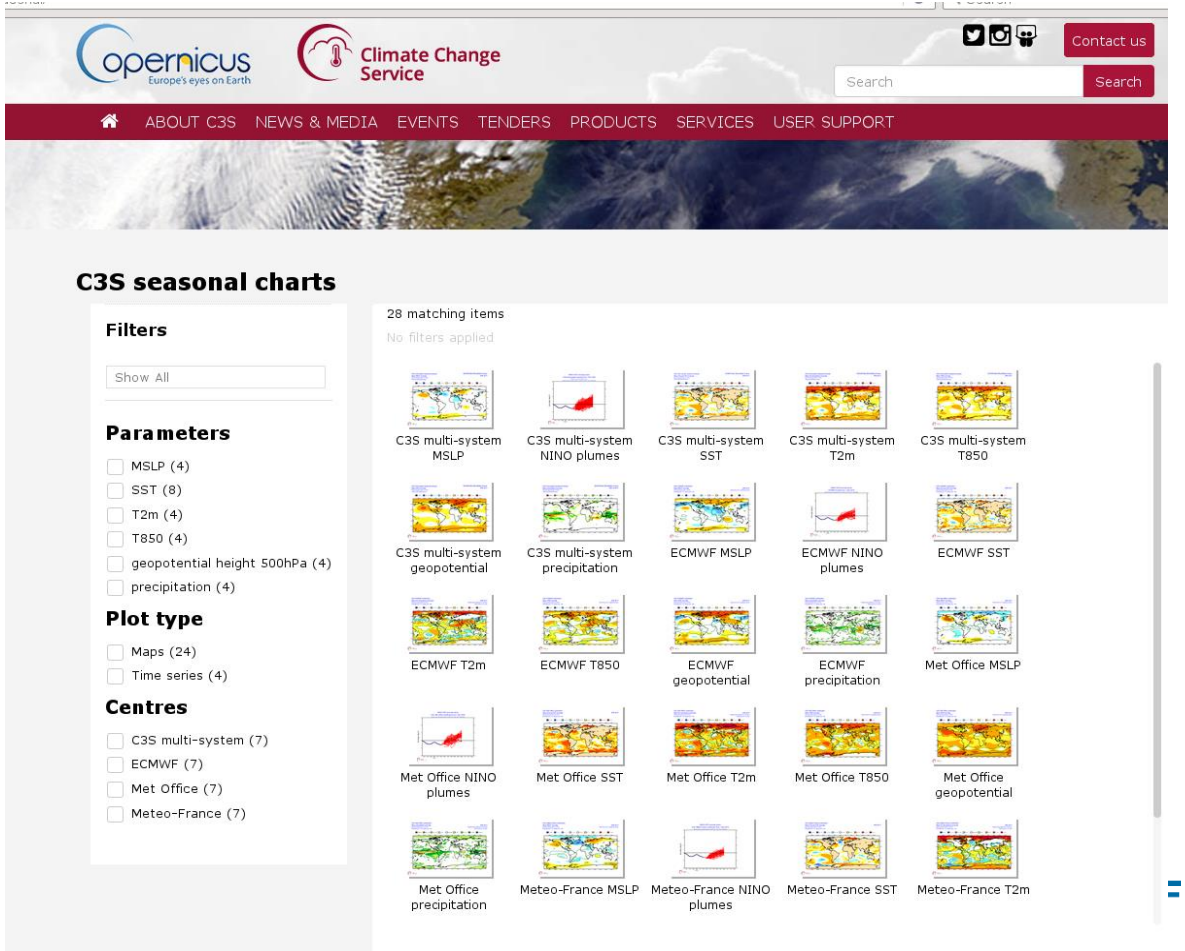
- sea-level pressure
- geopotential height
- precipitation
- air temperature

Type of plots:

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

Publication schedule:

- monthly updates
- published on each 15th



Climate Data Store

Infrastructure and toolbox

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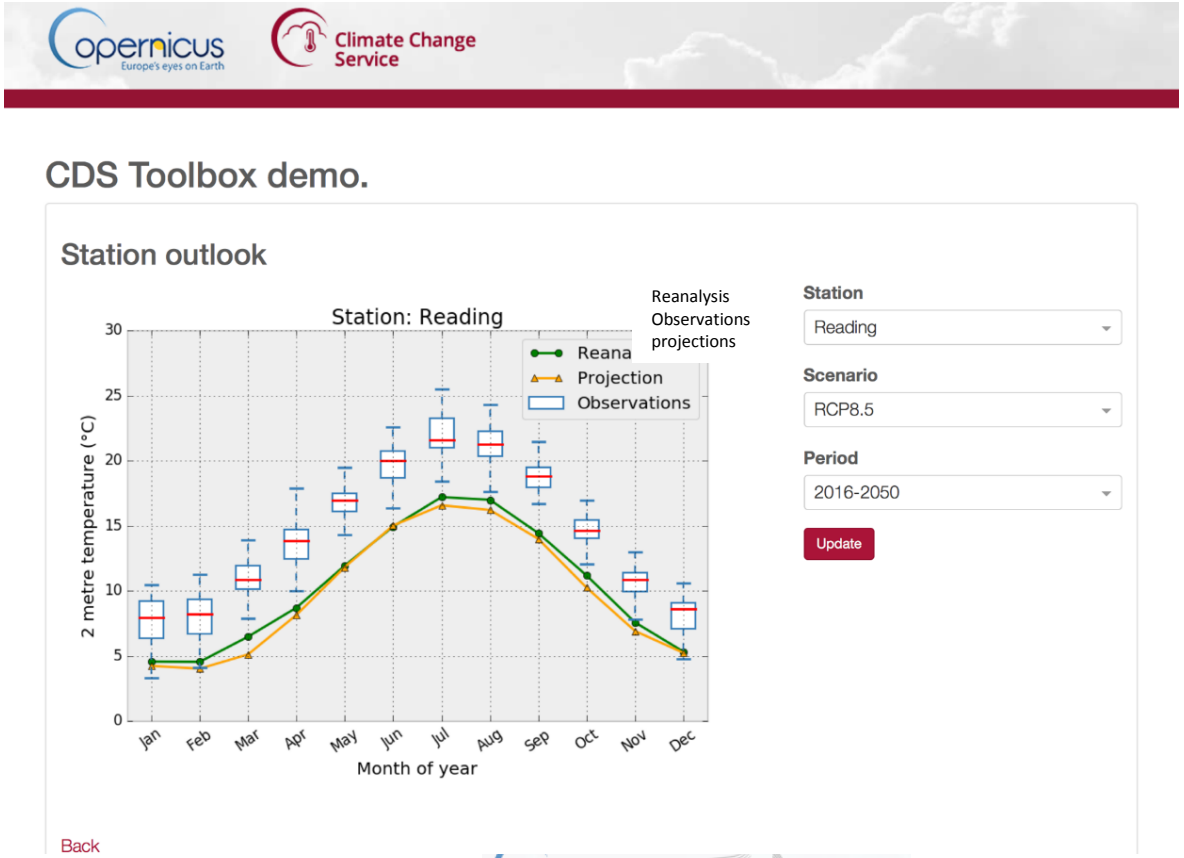
CDS infrastructure and toolbox

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

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

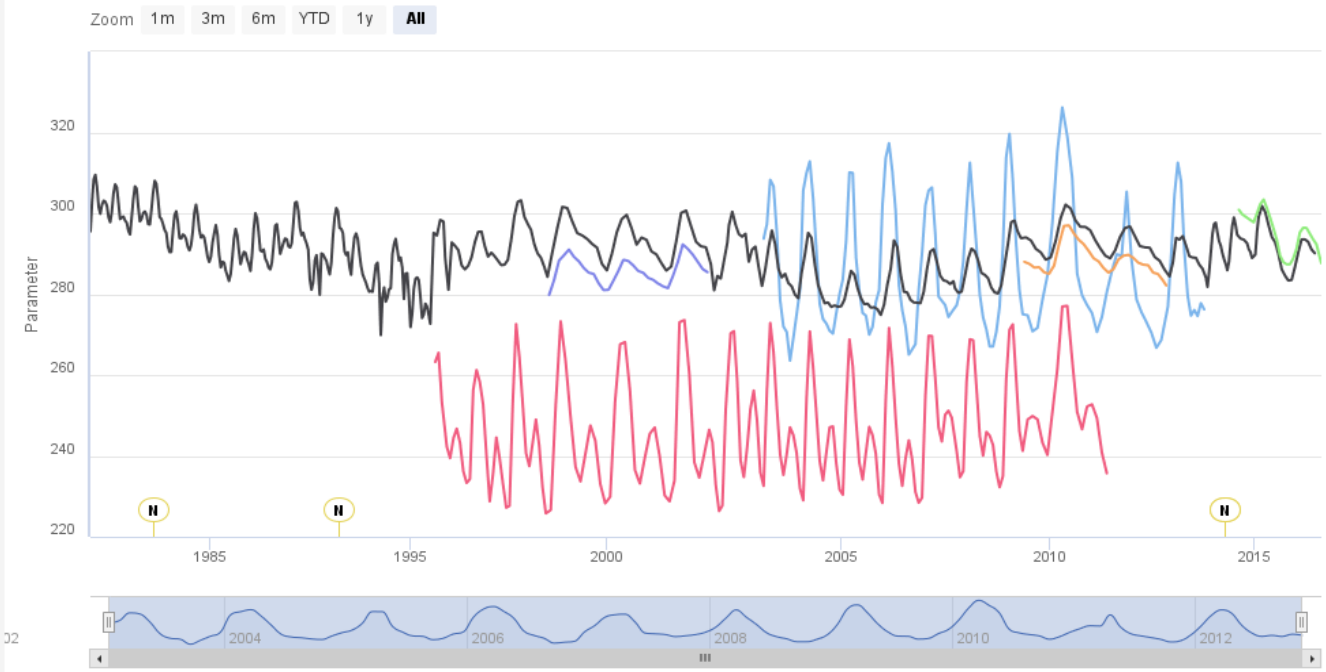
Technical challenges:

- 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: Climate Monitoring Facility

Global Total Column Ozone



MACC (CAMS) reanalysis
ERA-interim
ERA5 (stream I)
(stream II)
(stream III)
ESA-CCI

Volcanic eruptions

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Sectoral Information System

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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

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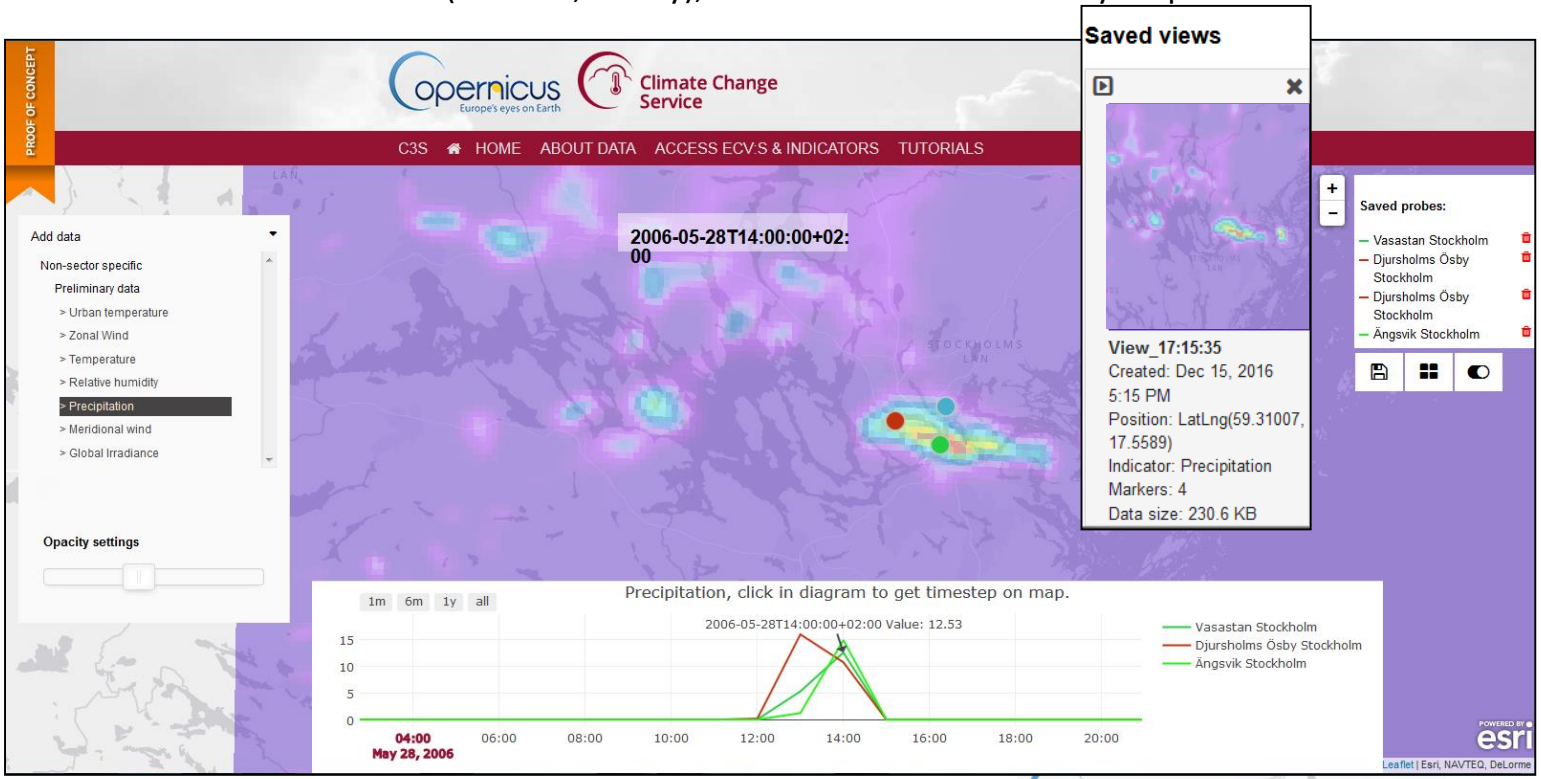
Access, view and download climate - air quality - hydrological ECV data and impact indicators on the urban scale (1x1 km^2, hourly), for historical and future 5-year periods



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Evaluation and Quality Control

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EQC: Engaged and future activities

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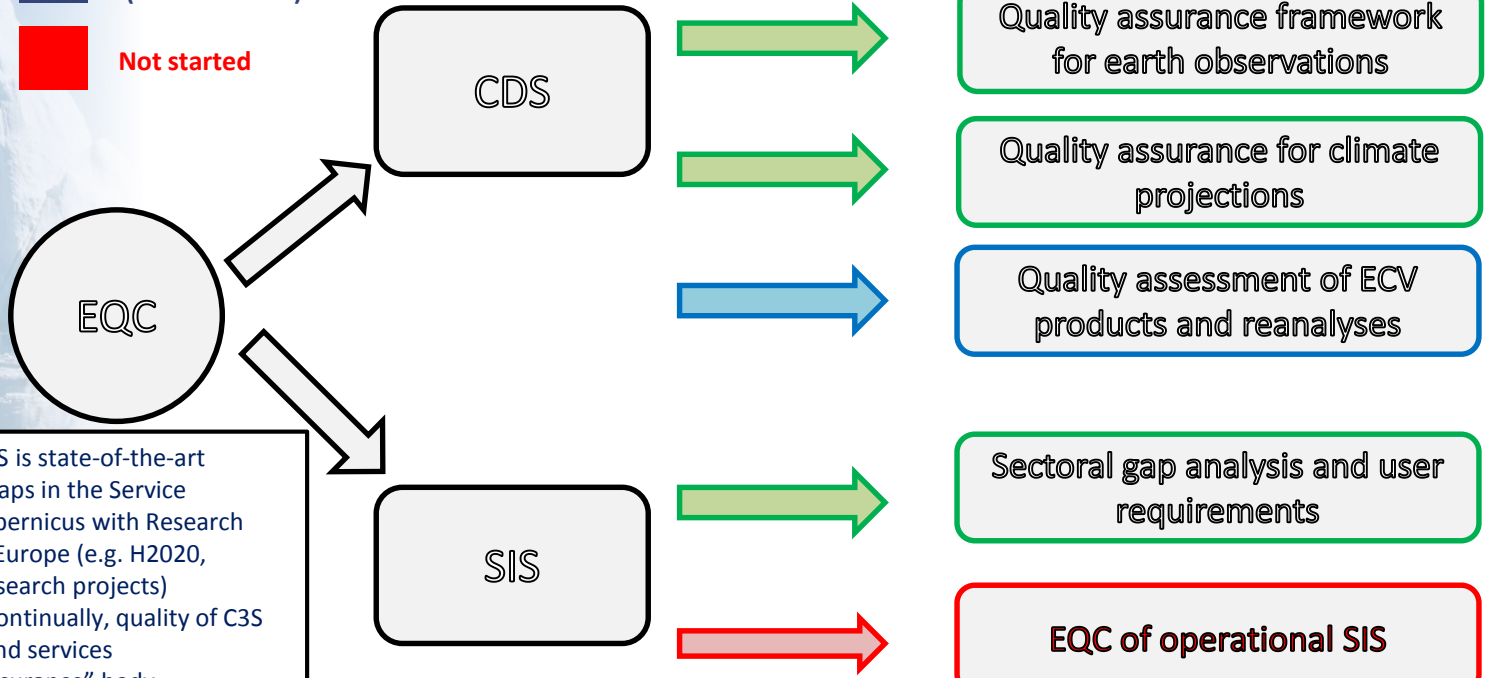
Action engaged

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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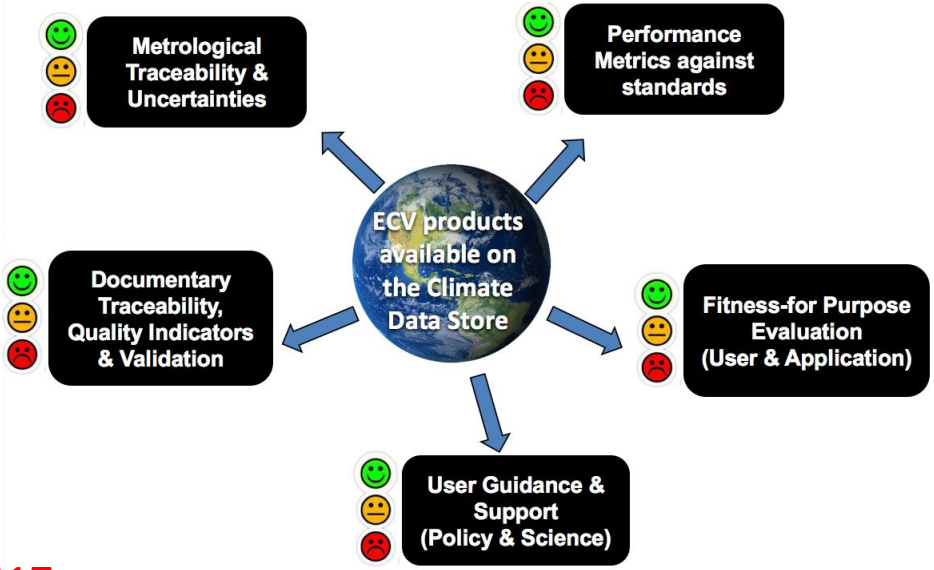
CDS Evaluation & Quality Control

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, Ukrainia	Brochure article, branding, sponsoring, promotional material
Wissenswerte	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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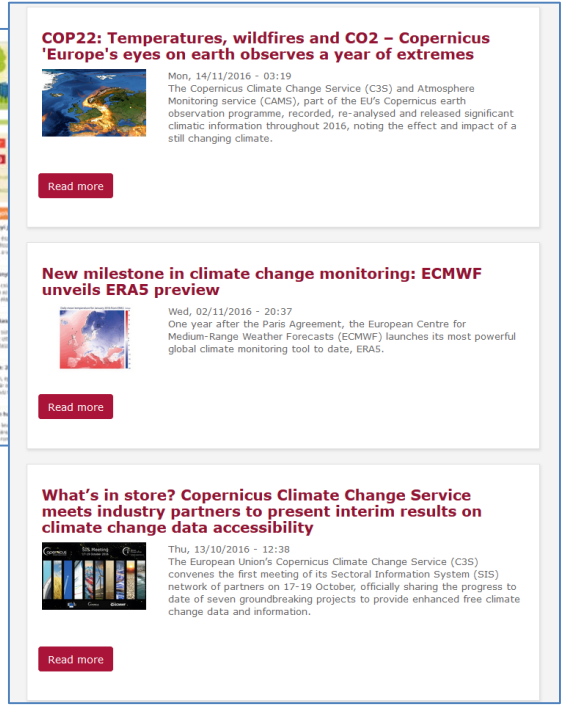
Media activity



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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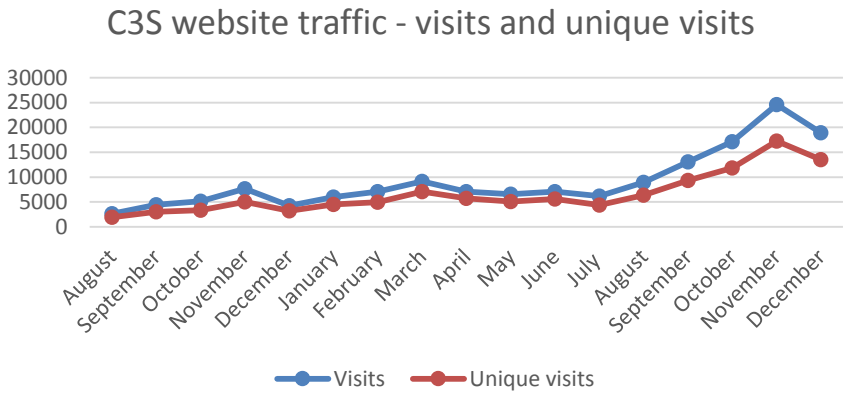
Number of visitors

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%



- 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.

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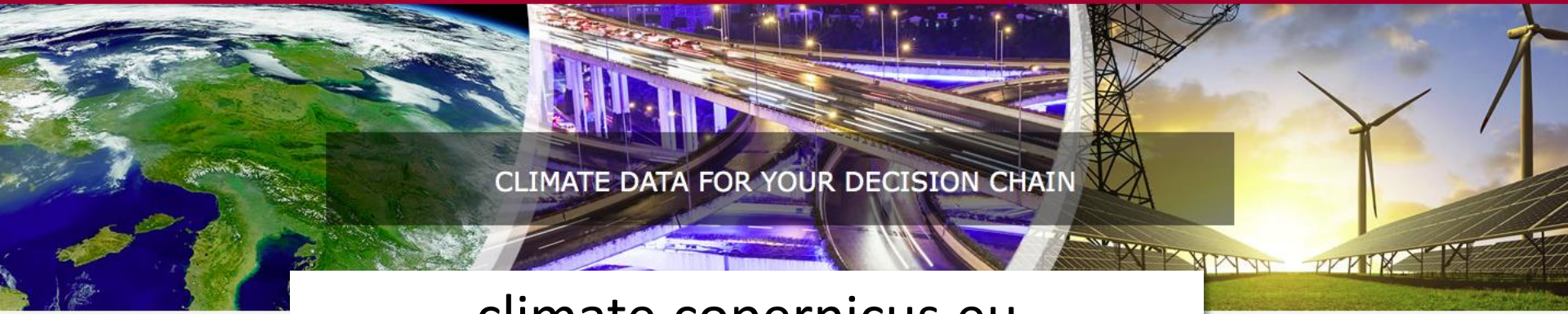

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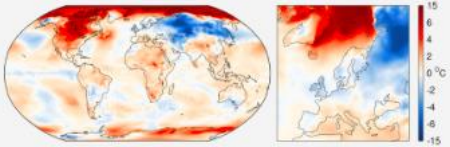
IN FOCUS

#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
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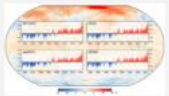

06 Dec 2016
Report Reassesses Variations in Global Warming

28 Nov 2016
Copernicus at Wissenswerte