Climate Change

Climate Change Service

Transition to operations in 2018

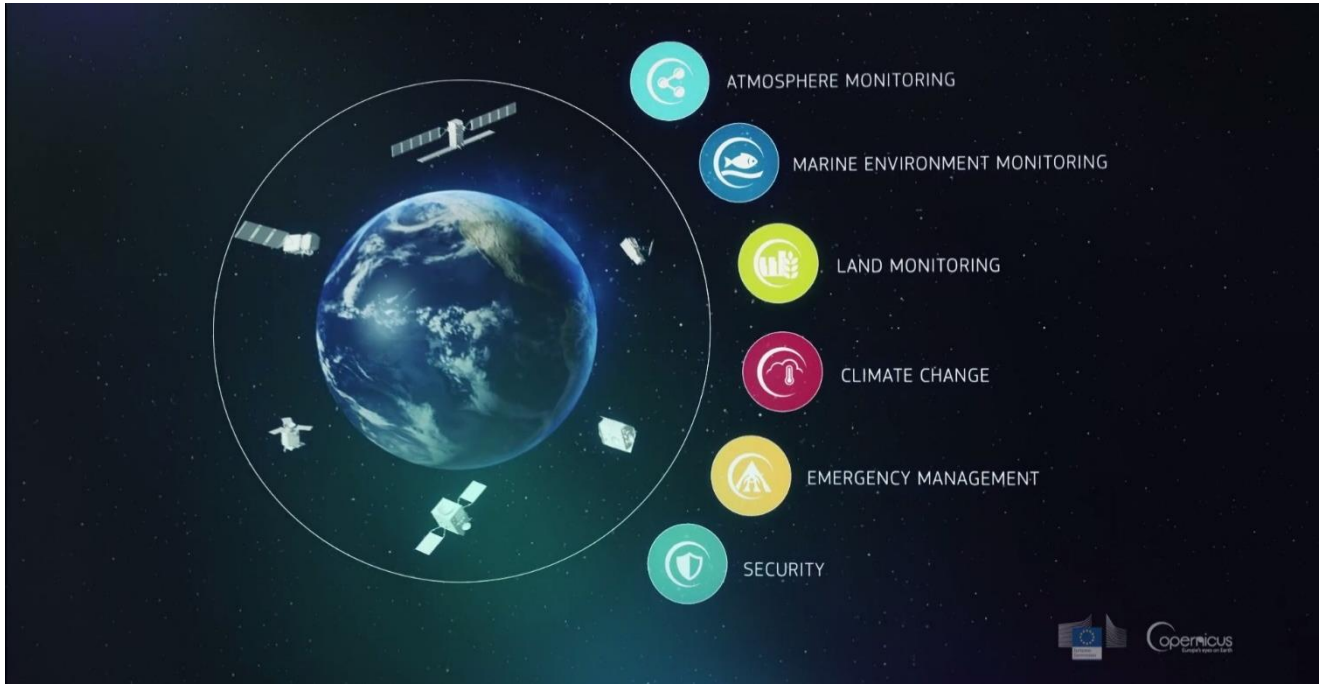
Joaquín Muñoz Sabater, Dick Dee, Jean-Noel Thepaut
ECMWF

16 April 2018

Copernicus Europe's eyes on Earth | European Commission | ECMWF

Climate Change

Copernicus: Earth observations and information services



Copernicus Europe's eyes on Earth | European Commission | ECMWF

Climate Change

The C3S mission

To support European adaptation and mitigation policies by:

- Providing consistent and authoritative information about climate
- Building on existing capabilities and infrastructures
- Stimulating the market for climate services in Europe

Copernicus Europe's eyes on Earth | European Commission | ECMWF

Components of C3S

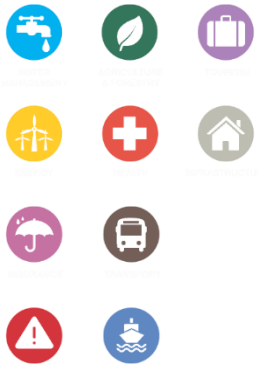
Climate Change

Climate Data Store

Essential Climate Variables (ECVs) for atmosphere, ocean, land and Climate Indicators:

- Observed, reanalysed and simulated
- In support of adaptation & mitigation policies at global and European level
- On a distributed system, single access portal
- Toolbox

Sectoral Information System



Evaluation & QC

- Ensures C3S delivers state-of-the-art climate information to end-users
- 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

Outreach Dissemination

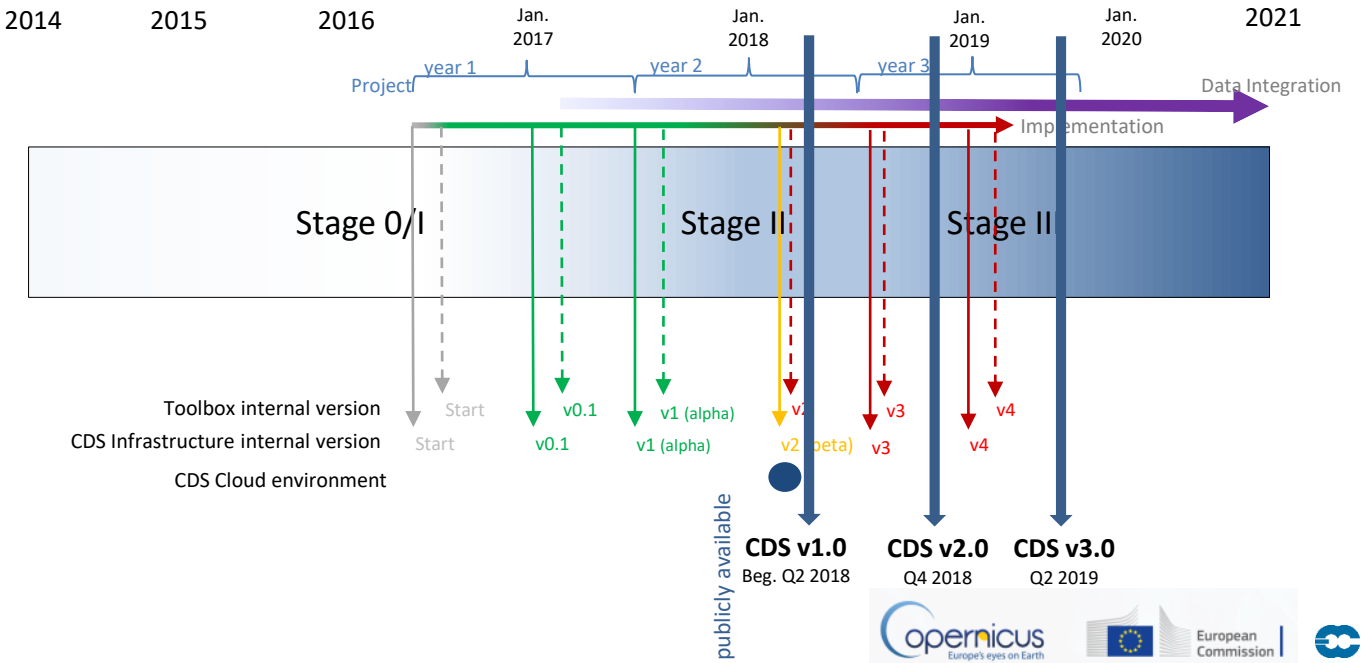
- Web content provision & management
- Public outreach
- Coordination with national outreach efforts
- Liaison with public authorities
- Events (conferences, seminars…)
- Training and education
- service

Copernicus Europe's eyes on Earth | European Commission | ECMWF

Climate Data Store - implementation

Climate Change

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



Done

Current

Not Done

Copernicus Europe's eyes on Earth

European Commission

ECMWF

Climate Change

Climate Data Store

Observations, forecasts, scenarios

Copernicus Europe's eyes on Earth

European Commission

ECMWF

Datasets for the Climate Data Store

Climate Change

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 reanalyses for Europe and Arctic	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	

Copernicus Europe's eyes on Earth

European Commission

ECMWF

Climate Change

In situ observations

Providing users with access to the *in situ* instrumental data record, in usable form for climate (re-)analysis and assessment

- Support services for data rescue (C3S_311a Lot 1)
- Harmonised access to climate data archives (C3S_311a Lot 2)
- Harmonised access to data from reference networks (C3S_311a Lot 3)
- Gridded ECV products for the European domain (C3S_311a Lot 4)

Copernicus Europe's eyes on Earth | European Commission | ECMWF

Climate Change

Satellite observations

Providing users with full and timely access to FCDRs and CDRs derived from satellite observations

- Access to global ECV products (C3S_312a, C3S_312b)
- Reprocessing of EUMETSAT level-1b satellite data records (C3S_311b)
- Satellite data rescue for input to climate reanalysis (C3S_311c)

Copernicus Europe's eyes on Earth | European Commission | ECMWF

ECV products based on Earth Observations

Climate Change

			C3S_312a				
				C3S_312b			
		GCOS	2017	2018	2019	2020	2021
Atmospheric physics							
	Precipitation	4.3.5		Lot 1			
	Surface Radiation Budget	4.3.6					
	Water Vapour	4.5.3					
	Cloud Properties	4.5.4					
	Earth Radiation Budget	4.5.5					
Atmospheric composition							
	Carbon Dioxide	4.7.1	Lot 6		Lot 2		
	Methane	4.7.2	Lot 6				
	Ozone	4.7.4	Lot 4				
	Aerosol	4.7.5	Lot 5				
Ocean							
	Sea Surface Temperature	5.3.1	Lot 3		Lot 3		
	Sea Level	5.3.3	Lot 2				
	Sea ice	5.3.5	Lot 1				
	Ocean Colour	5.3.7					
Land hydrology & cryosphere							
	Lakes	6.3.4			Lot 4		
	Glaciers	6.3.6	Lot 8				
	Ice sheets and ice shelves	6.3.7					
	Soil moisture	6.3.16	Lot 7				
Land biosphere							
	Albedo	6.3.9	Lot 9		Lot 5		
	Land Cover	6.3.10					
	Fraction of Absorbed Photosyntheti	6.3.11	Lot 9				
	Leaf Area Index	6.3.12	Lot 9				
	Fire	6.3.15					
			2017	2018	2019	2020	2021

C3S_312a:

- 12 ECVs in 9 Lots

C3S_312b:

- 22 ECVs in 5 Lots
- Continuity of service

Heritage/coordination:

- ESA CCI
- EUMETSAT SAFs
- Other Copernicus Services
- etc..

Copernicus Europe's eyes on Earth | European Commission | ECMWF

Climate Change

Service scope and requirements

- Generation and/or brokering of data products
- Quality assurance and documentation
- Providing access to products and documentation via the CDS
- Providing user support for all products delivered

- Providing products that are state-of-the-art and comparable
- Work together via the cross-CDR
- But also within your lot

- Same input data from satellite platforms
- Intercomparison among different variables
- Case studies

Climate Change

Climate reanalysis

Providing users with access to physically consistent estimates of multiple ECVs, by combining models with observations

- Production of global climate reanalysis (ERA5, ERA6)
- Higher-resolution reanalysis for Europe (C3S_322 Lot 1)
- Higher-resolution reanalyses for the Arctic (C3S_322 Lot 2)
- Lower-resolution centennial reanalysis (no action yet)

Copernicus Europe's eyes on Earth | European Commission | ECMWF

Climate Change

Status ERA5 production and publication

ERA5 1979–present

- Production will be completed in Q3 2018
- All streams up and running
- 4 catch-up streams (about 2 months/week each)
- One stream running 3 days behind real time

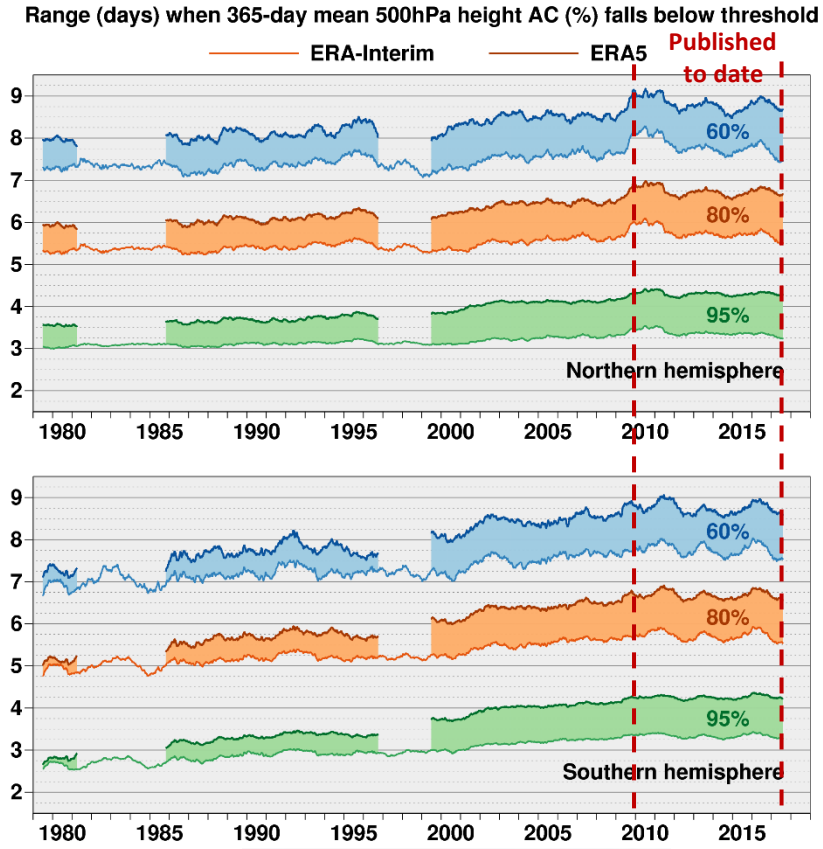
- 2008– Jan 2018 completed and published
- 2000–2009 stream completed one month ago
- Repairing 2000–2007 to fix an issue with sea ice

Public access

Now: ERA5 2010–2017 (monthly updates < 3 month delay)
2018 Q1: ERA5 2008–2017
2018 Q2: ERA5T (daily updates < 1 week delay)
2018 Q2: ERA5 2000–2018
2018 Q4: ERA5 1979–2018

ERA5 1950–1978

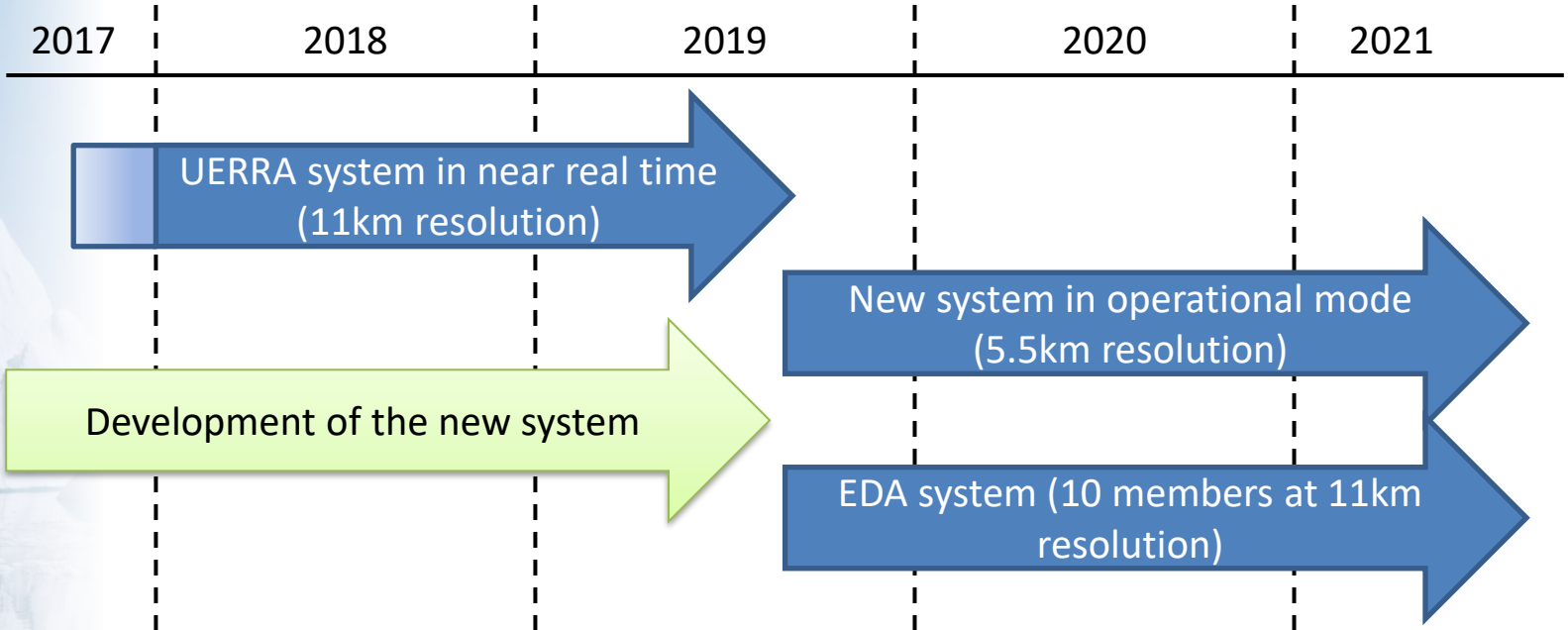
- Start production in Q2 2018, available late 2019



Copernicus Europe's eyes on Earth | European Commission | ECMWF

Climate Change

C3S_322 Lot 1: Regional reanalysis for Europe



- 11 km (500x500 grid points), 65 levels
- Surface downscaling analysis 5.5 km (MESCAN)
- Start in 1961 and operational from 2/2018

- 5.5 km (1100x1050 grid points), 100 levels
- Surface analysis at 5.5 km
- Plus 10 ensemble members at 11km
- Will start in the early 1980s

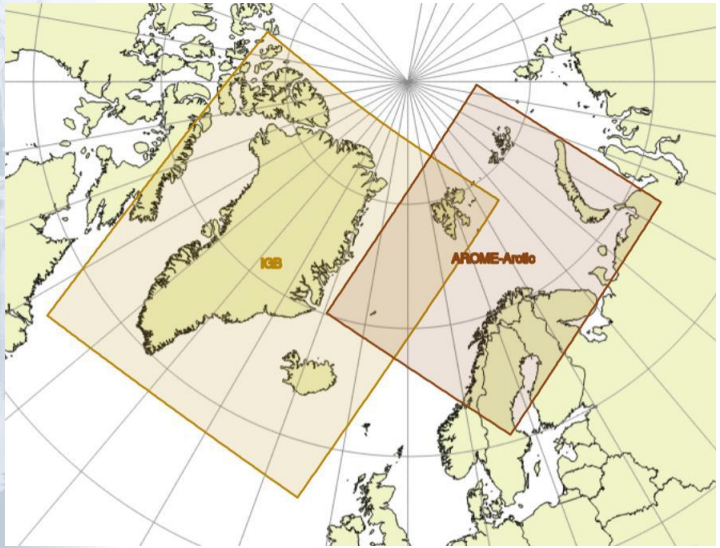
Copernicus Europe's eyes on Earth | European Commission | ECMWF

Climate Change

C3S_322 Lot 2: Regional reanalysis for the Arctic

- Warming in the Arctic (observational records and future scenarios) roughly twice as high as global average
- Need for understanding and management of change processes
- Increased economic activity in the region

(Animated gif: NASA)



Coverage in two domains, main areas of interest in the European sector of the Arctic

High resolution (2.5 km) adds value to global products

Extensive use of satellite data

Use of local surface observation datasets available in the partner countries

Special emphasis on NWP schemes and observations for the handling of "*cold surfaces*": Snow, sea ice, glaciers

Copernicus Europe's eyes on Earth | European Commission | ECMWF

Climate Change

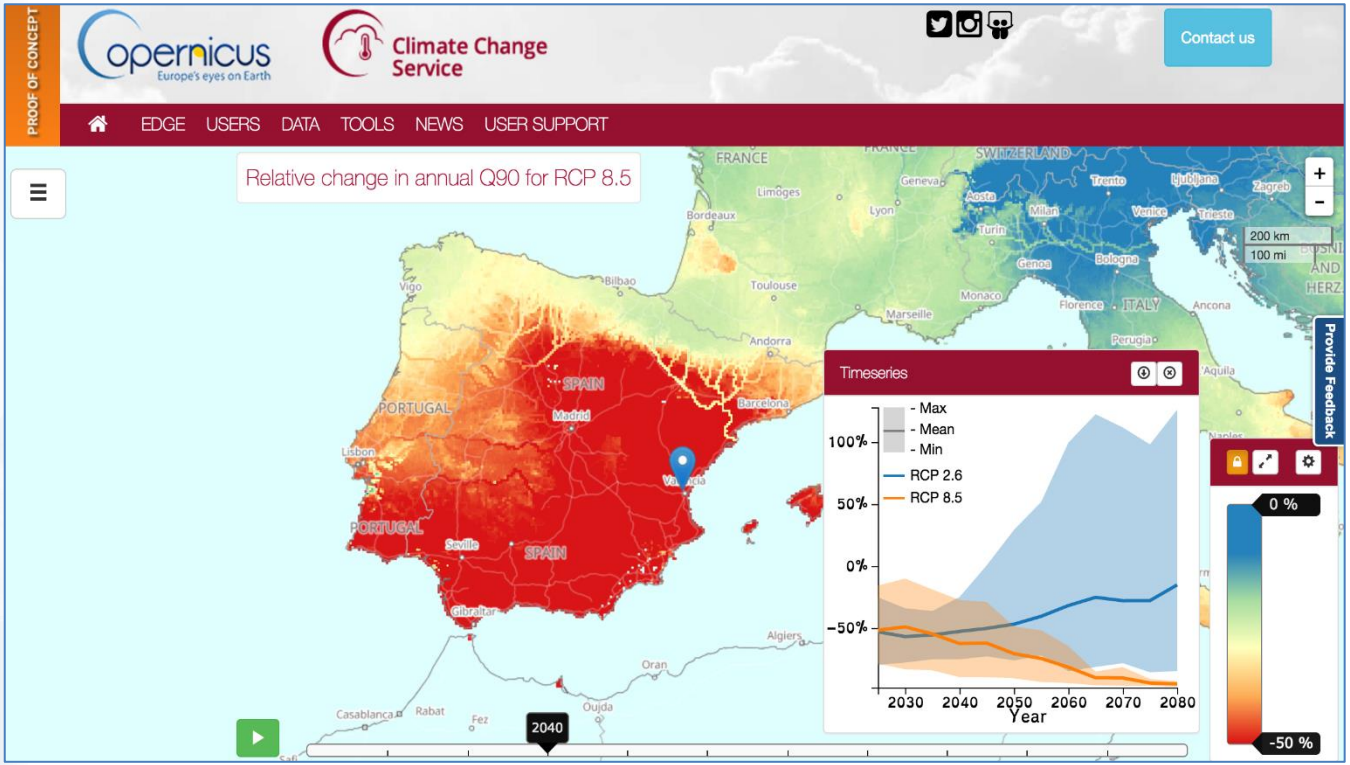
Sectoral Information System

Applications for adaptation

Copernicus Europe's eyes on Earth | European Commission | ECMWF

Climate Change

Sectoral indicators and tools to support adaptation



opernicus Europe's eyes on Earth | European Commission | ECMWF