Climate Change

Climate Change Service

State of Play - October 2017

Anca Brookshaw, ECMWF

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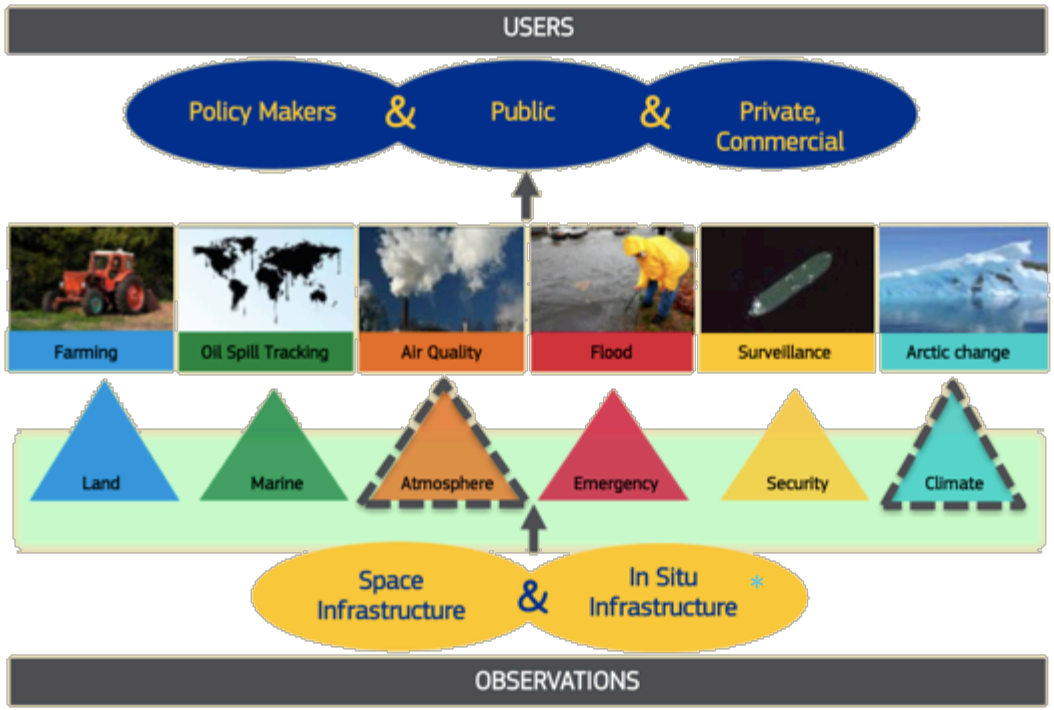
THE COPERNICUS VALUE-ADDING CHAIN

Space Component

Services led by ECMWF

* Mostly based on the principle of subsidiarity from EU Member states



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Climate Change Service: Vision

Climate Change

- 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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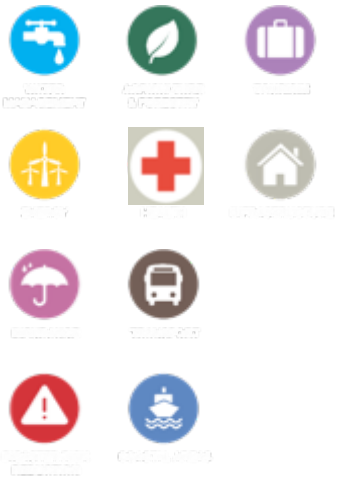
Climate Change Service (C3S) in a nutshell

Climate Change

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

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 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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Earth Observation based ECVs in C3S

			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

Heritage/coordination:

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

Monthly State of Climate: Global/European

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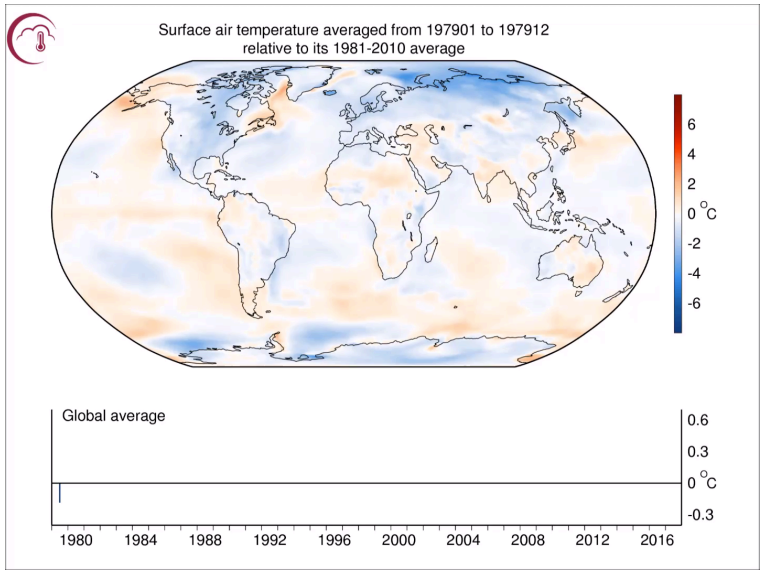
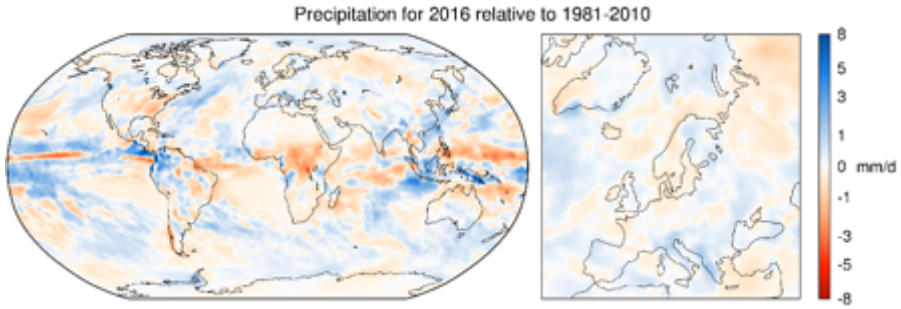
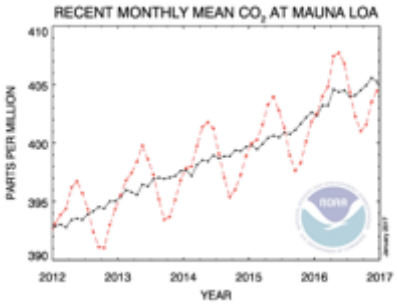




Climate drivers:

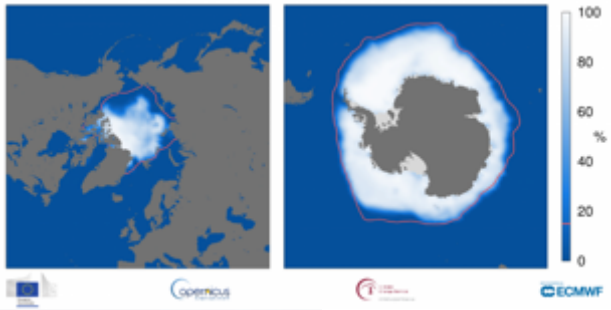
- Greenhouse gases, aerosols, …



Climate effects:

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

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



C3S seasonal forecasts

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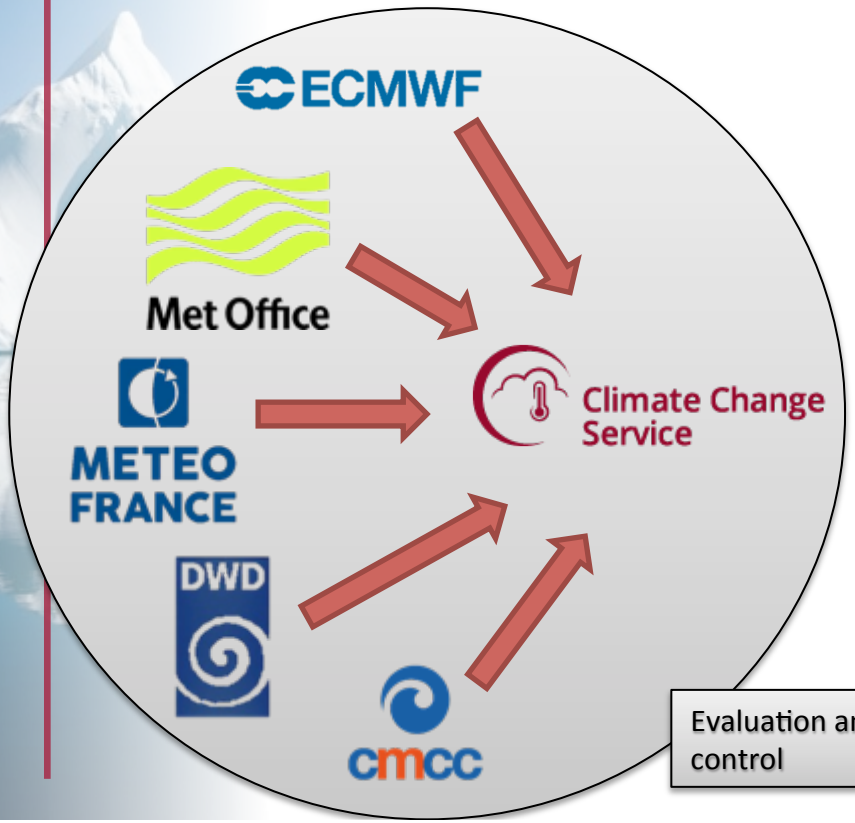
Aim: to generate seasonal forecast products based on the best information available, to an operational schedule, and make them publicly available.



Evaluation and quality control

Horizontal grid: global 1deg x 1deg
Ensemble size:

- Forecasts: ~50 members
- Hindcasts: ~25 members x 24 years (1993-2016)

Variables

- Surface
  - 7 vars every 6h
  - +30 vars every 24h
- Pressure (11 levels, from 925 hPa to 10 hPa)
  - 8 vars every 12 h

Agreed netCDF specification C3S-0.1 (based on CF)

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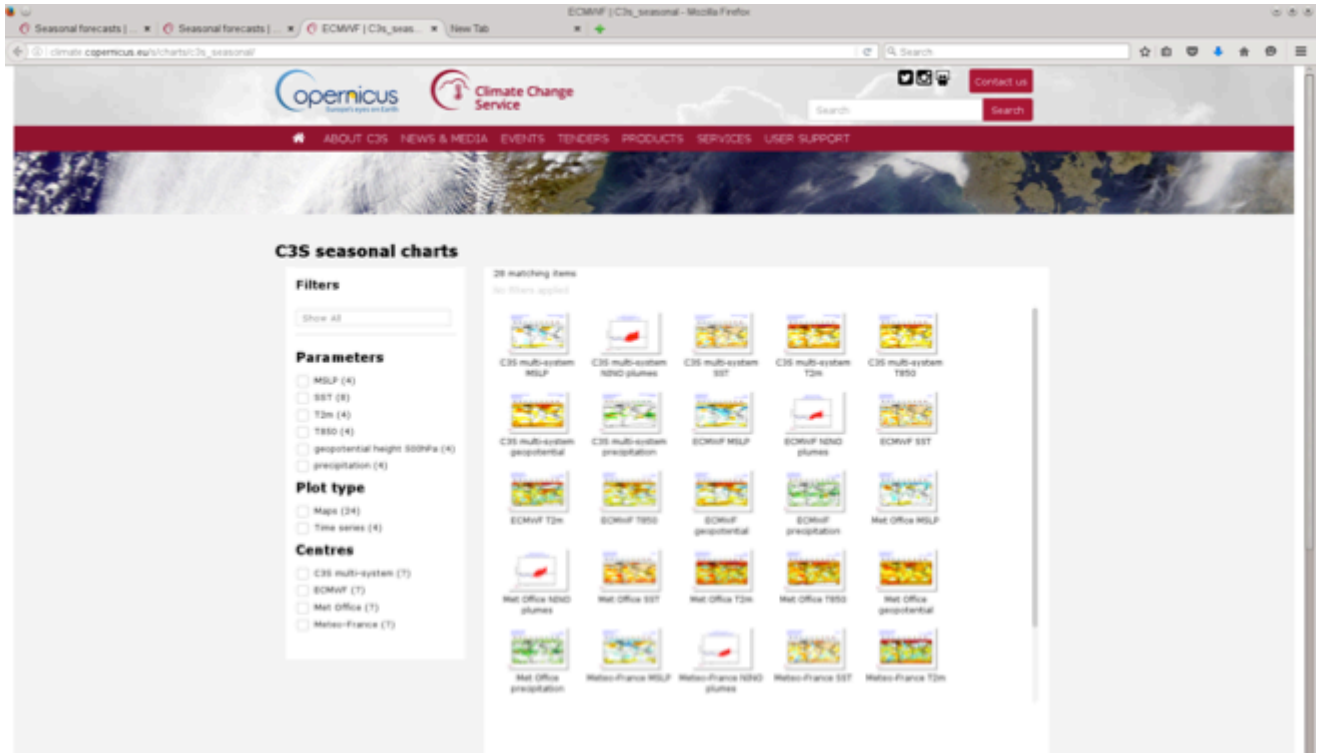
Seasonal forecasts- current contents

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



http://climate.copernicus.eu/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

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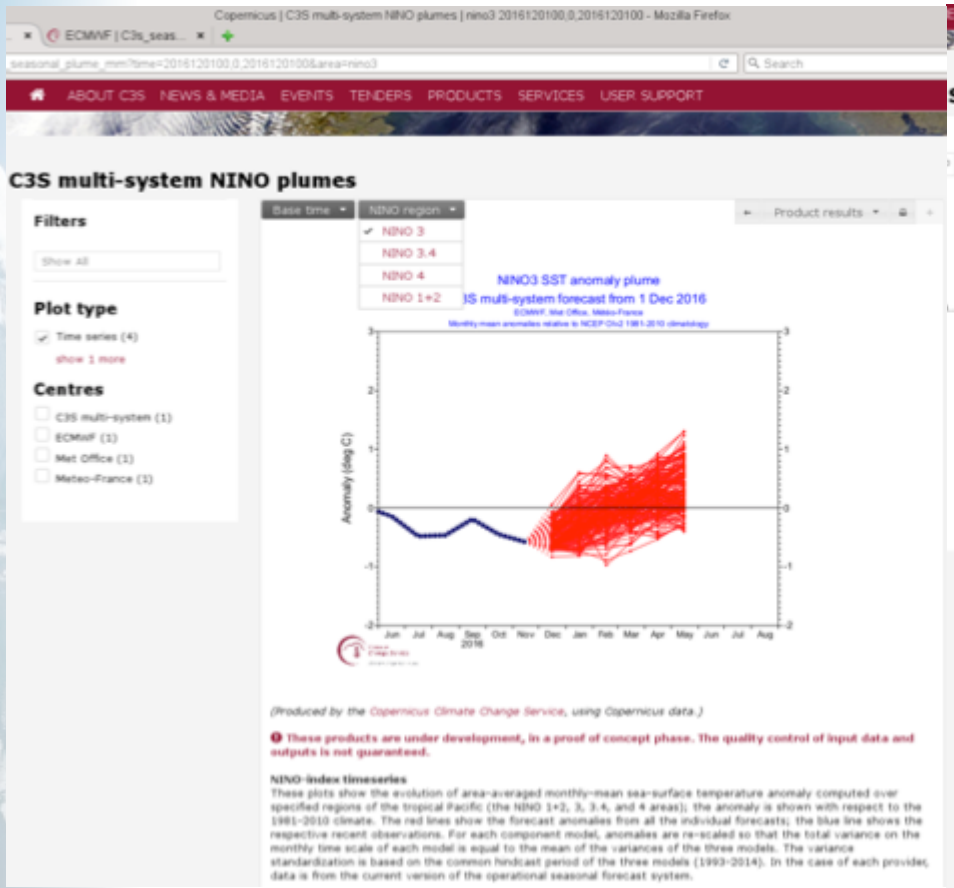
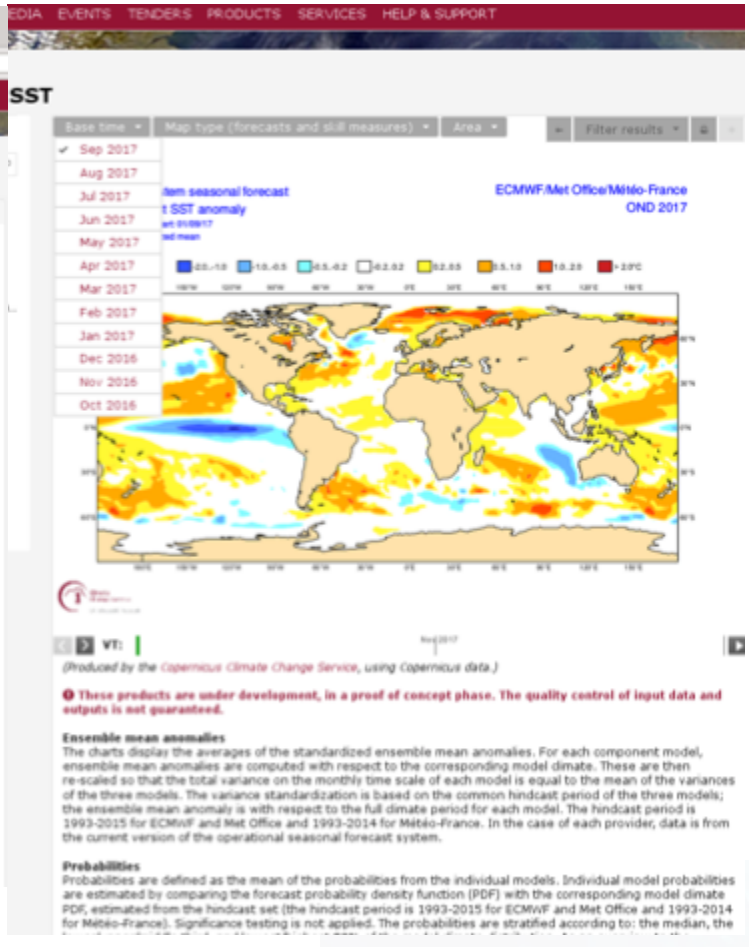
Seasonal forecasts- example





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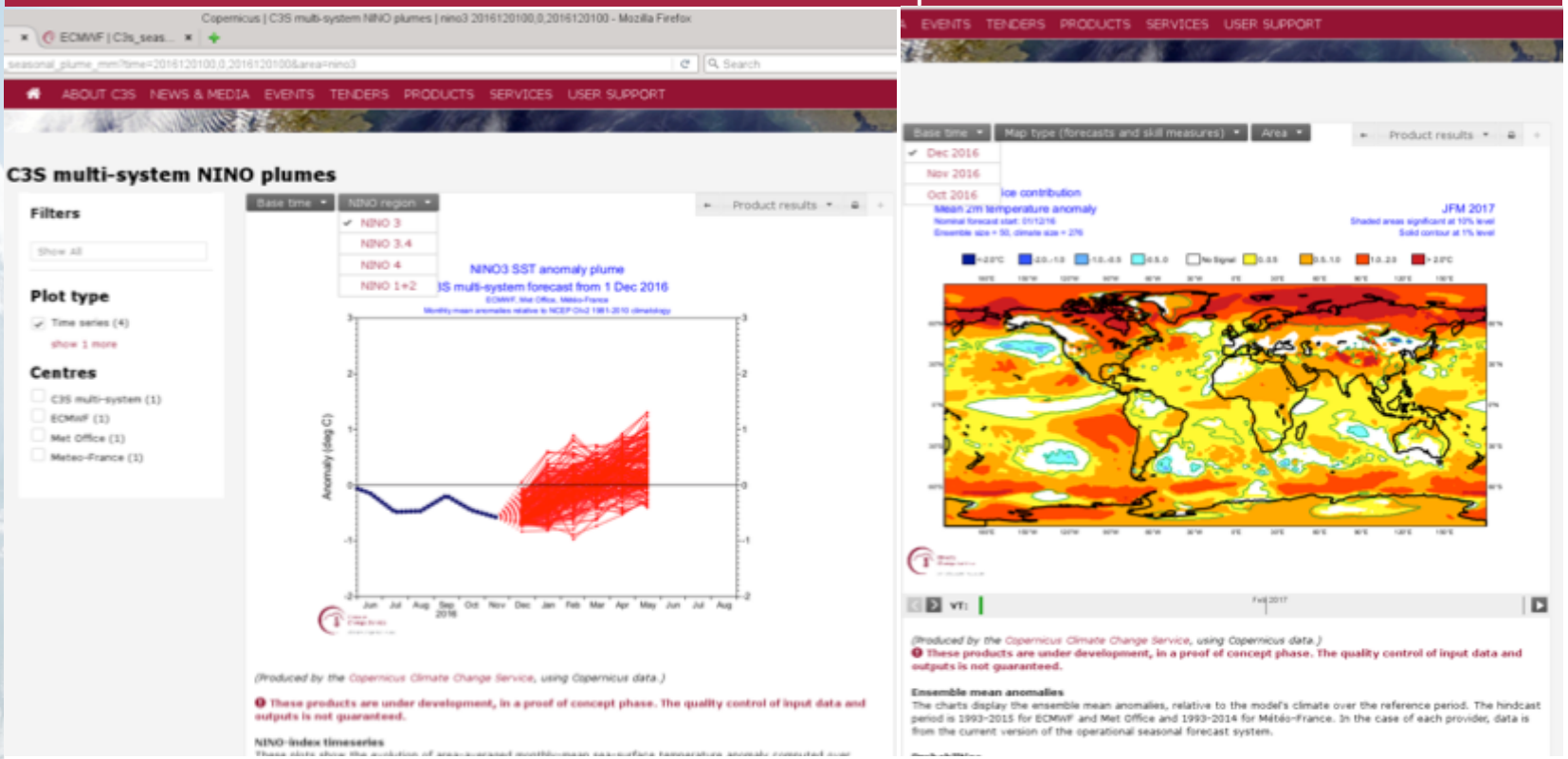
Seasonal forecasts- example



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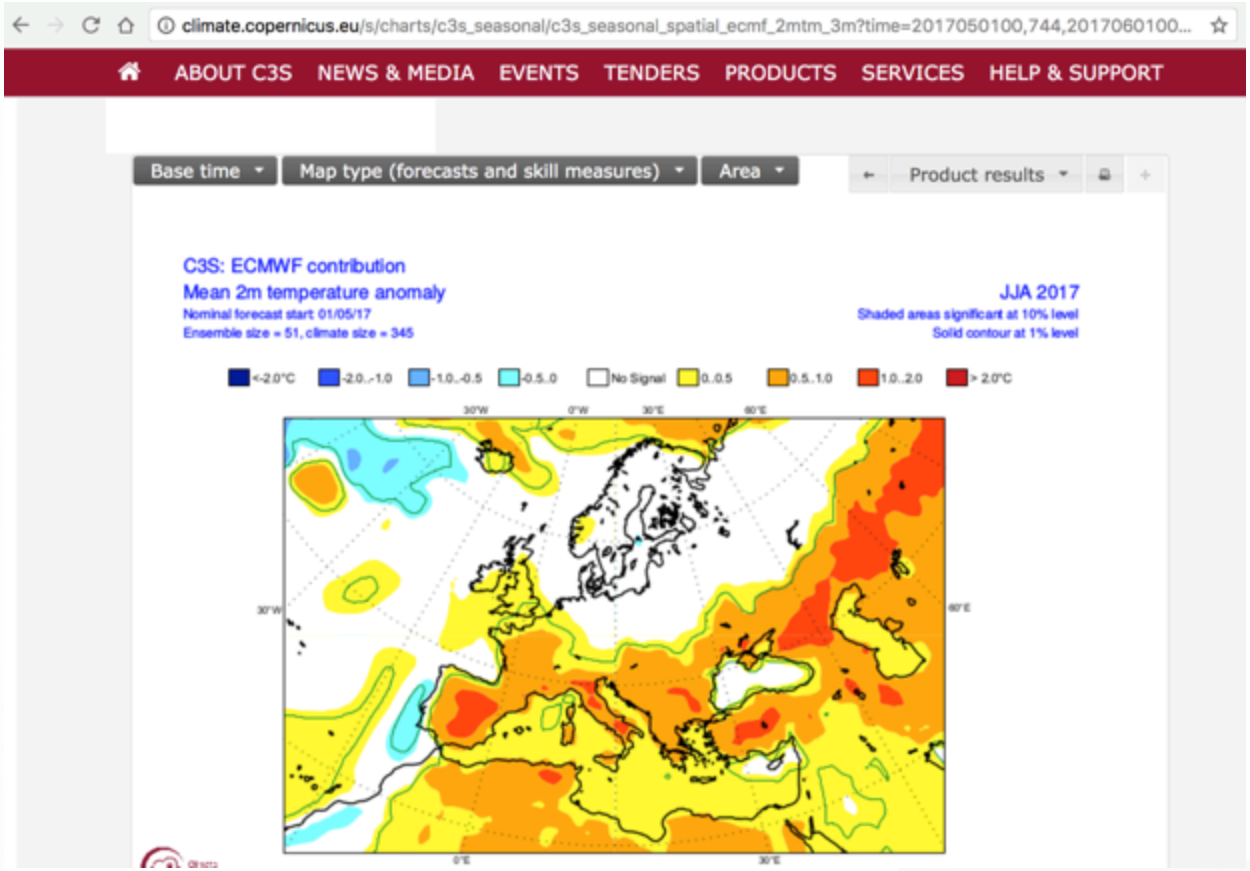
Seasonal forecasts- first release 12/2016



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Seasonal forecasts-forecast systems

Models

★ **Current model configurations:**

- ★ ECMWF (System 4): IFS atmosphere (TL255, ~70 km and 91 levels), NEMO ocean (1 deg, 42 levels)
- ★ Met Office (GloSea 5): UM atmosphere (N216, ~50 km and 85 levels) , NEMO ocean (¼ deg, 75 levels), CICE sea-ice
- ★ Météo France (System 5): ARPEGE atmosphere (TL255), NEMO ocean (1 deg, 42 levels), GELATO sea-ice
- ★ CMCC (SPS.v3): CSEM atmosphere (1 deg, ~100 km, 46 levels), NEMO ocean (¼ deg, 50 levels), CICE sea-ice
- ★ DWD (GCFS 1.0): ECHAM6 atmosphere (T63, ~300 km, 47 levels), MPIOM ocean (1.5 deg, 40 levels; includes sea ice)

★ **Versions planned for 2017/2018, where applicable:**

- ★ ECMWF (Seas5): IFS atmosphere (TCo319, equivalent to N320: ~30km and 91 levels), NEMO ocean (0.25 deg, 75 levels), LIM sea ice
- ★ Météo France (System 6): ARPEGE atmosphere (TL359, ~60km, 91 levels), NEMO ocean (1 deg, 75 levels), GELATO sea-ice
- ★ DWD (GCFS 2.0): ECHAM6 atmosphere (T127, ~150 km, 95 levels), MPIOM ocean (0.4 deg, 40 levels; includes sea ice)
- ★ Met Office: update likely, but not to resolution

Ensemble generation: lagged or burst, with or without perturbations to initial conditions.

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