Copernicus Climate Change Service (C3S)

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Copernicus Climate Change Service

Implemented by ECMWF

What is Copernicus?

Copernicus, previously known as GMES (Global Monitoring for Environment and Security), is the European Programme for the establishment of a European capacity for Earth Observation

Service Components

copernicus.eu

Users

Space Component

In-situ Component

Source: copernicus.eu, retrieved April 2014

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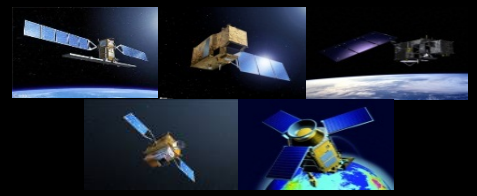
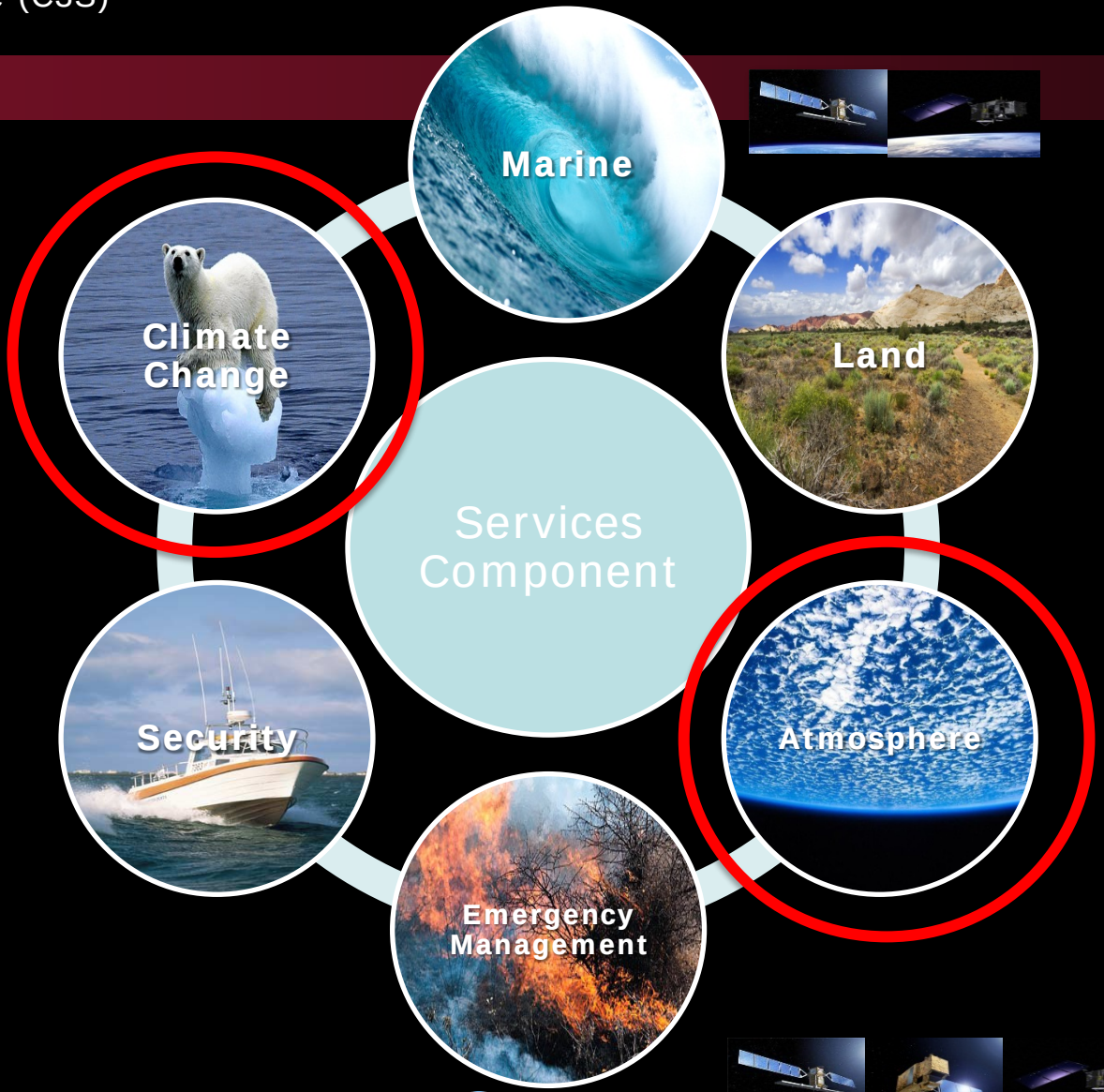
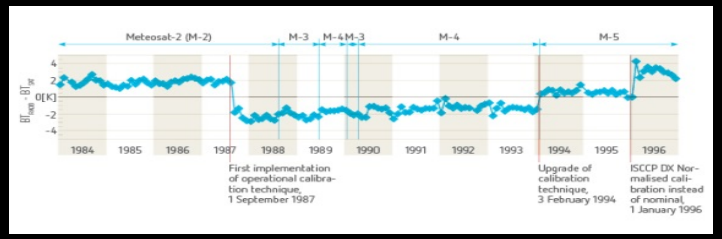


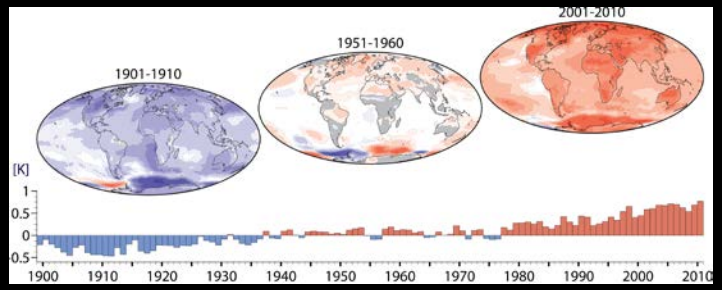


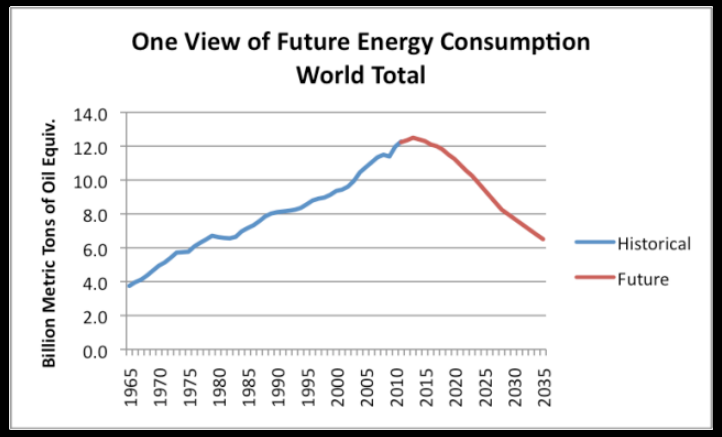
Source: ESA

C3S Vision

- To be an authoritative source of climate information for Europe
- To build upon national investments and complement national climate service providers
- To support the market for climate services in Europe







C3S Vision

How is climate changing?

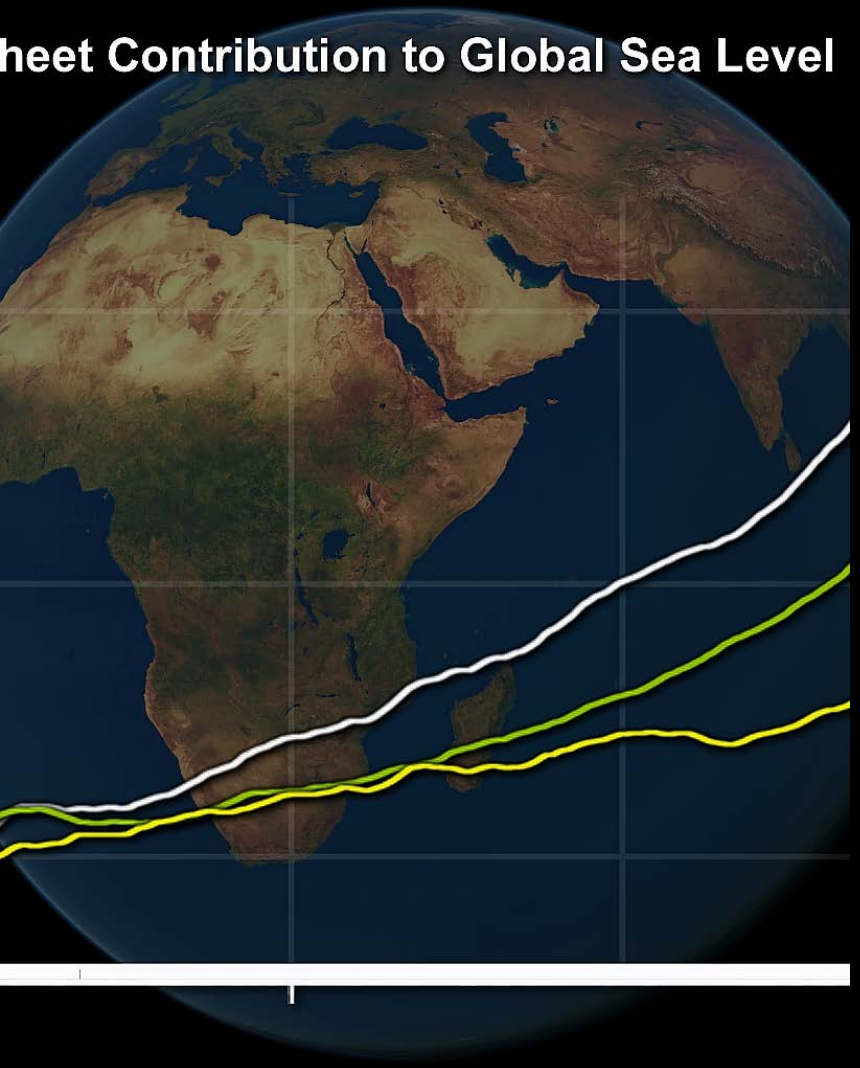
- Earth observations
- Reanalysis

Will climate change continue/accelerate?

- Predictions
- Projections

What are the societal impacts?

- Climate indicators
- Sectoral information



C3S Service elements:
Climate Data Store

- Essential Climate Variables for atmosphere, ocean, land and Climate Indicators
  - Observed, reanalysed and simulated
  - In support of adaptation/mitigation policies at global and European level

C3S seasonal forecasts: a multi-system framework

This service is currently in very early stages of planning and development, but some key principles are already established:

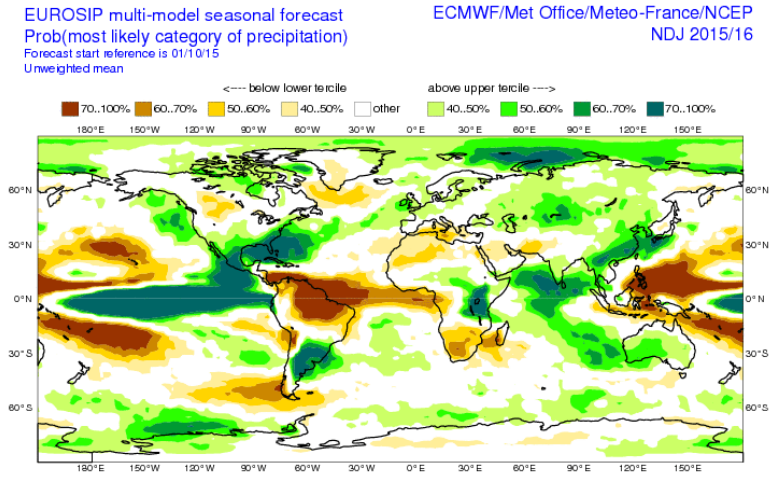
- It will be based on a selection of high-quality forecast systems; selection of providers is under way.
- At its core there is a well-defined protocol for forecast production and outputs.
- The information will be produced and disseminated according to an operational schedule; unlike previous multi-system combinations Copernicus Seasonal will be based on contractual commitment from contributors.
- The information will be freely available.

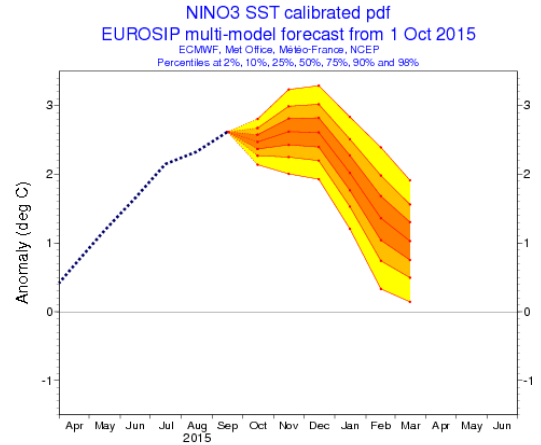
C3S seasonal forecasts: multi-system products

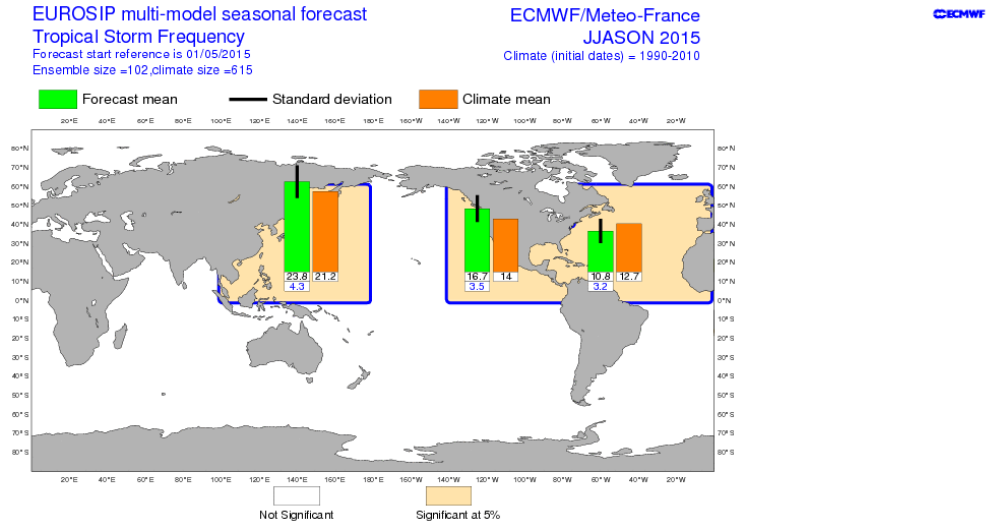
The service will provide:

- a large set of variables (atmosphere; later also ocean) with global coverage
- high temporal resolution (daily data)
- multi-model combinations
- relevant information on skill
- documentation

Example output from current multi-system combinations (EUROSIP)







Key points to address to ensure an effective service:

- relevance and value to end users
- interactions with existing similar services and sources of information

C3S Seasonal Forecasts – Invitation to Tender

- Current project:
  - proof of concept phase: 1 Oct 2015 – 31 Dec 2016 (15 months)
  - pre-operational phase: 1 Jan 2017 – 31 Dec 2017 (12 months)
- Contributors:
  - up to 3 core providers (one of which is ECMWF)
  - up to 2 additional providers

- Requirements for Core Providers:
  - Well established seasonal systems, with proven track record of production and delivery, ready to provide data in October 2015
  - Specific technical, service-related and quality-related requirements
    - quality: ENSO skill and quality of model climate
- Additional providers are expected to provide operational system by mid-2017, with focus on high scientific and operational quality.

Technical requirements

- *model resolution*
  - no specific requirements in POC phase
  - around 50km atmosphere or better, preferably with comparable ocean resolution, in Pre-ops phase
- *spatial resolution of data*
  - 1 deg or original grid
- *temporal resolution of data*
  - daily or sub-daily
- *ocean data*
  - not required in POC phase
  - required in Pre-ops phase; gridding to be agreed during implementation

Current status

- Responses to the relevant invitation to tender have been evaluated and potential contributors for this phase have been identified; their identity will be revealed when contracts are signed (likely before the end of this year).
- Data policy issues are being addressed, to ensure compliance with the requirements of the Copernicus seasonal service.
- A team has been assembled at ECMWF, to deliver a prototype and take it to pre-operational status (leader: Anca Brookshaw)
- For further details, contact anca.brookshaw@ecmwf.int or dick.dee@ecmwf.int

Monitoring the atmospheric composition:

The increasing concentration of the greenhouse gases and the cooling effect of aerosol are prominent drivers of a changing climate, but the extent of their impact is often still uncertain.

At the Earth's surface, aerosols, ozone and other reactive gases such as nitrogen dioxide determine the quality of the air around us, affecting human health and life expectancy, the health of ecosystems and the fabric of the built environment. Ozone distributions in the stratosphere influence the amount of ultraviolet radiation reaching the surface. Dust, sand, smoke and volcanic aerosols affect the safe operation of transport systems and the availability of power from solar generation, the formation of clouds and rainfall, and the remote sensing by satellite of land, ocean and atmosphere.

The Service will deliver the following operational services:

Daily production of near-real-time analyses and forecasts of global atmospheric composition
Reanalyses providing consistent multi-annual global datasets of atmospheric composition with a frozen model/assimilation system
Daily production of near-real-time European air quality analyses and forecasts with a multi-model ensemble system
Reanalyses providing consistent annual datasets of European air quality with a frozen model/assimilation system, supporting in particular policy applications
Solar and UV radiation products supporting the planning, monitoring, and efficiency improvements of solar energy production and providing quantitative information on UV irradiance for downstream applications related to health and ecosystems
Greenhouse gas surface flux inversions for CO2, CH4 and N2O, allowing the monitoring of the evolution in time of these fluxes
Climate forcings from aerosols and long-lived (CO2, CH4) and shorter-lived (stratospheric and tropospheric ozone) agents