Vincent-Henri Peuch

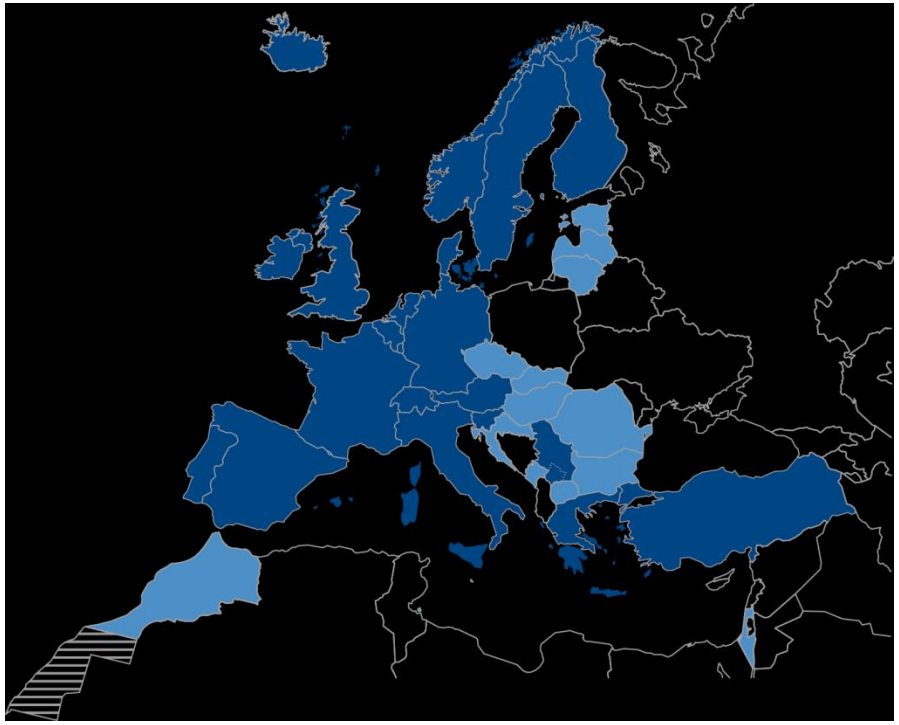
ECMWF, Head of Copernicus Atmosphere Monitoring Service

Copernicus Atmosphere Monitoring Service (CAMS)
Copernicus Climate Change Service (C3S)

Funded by the European Union

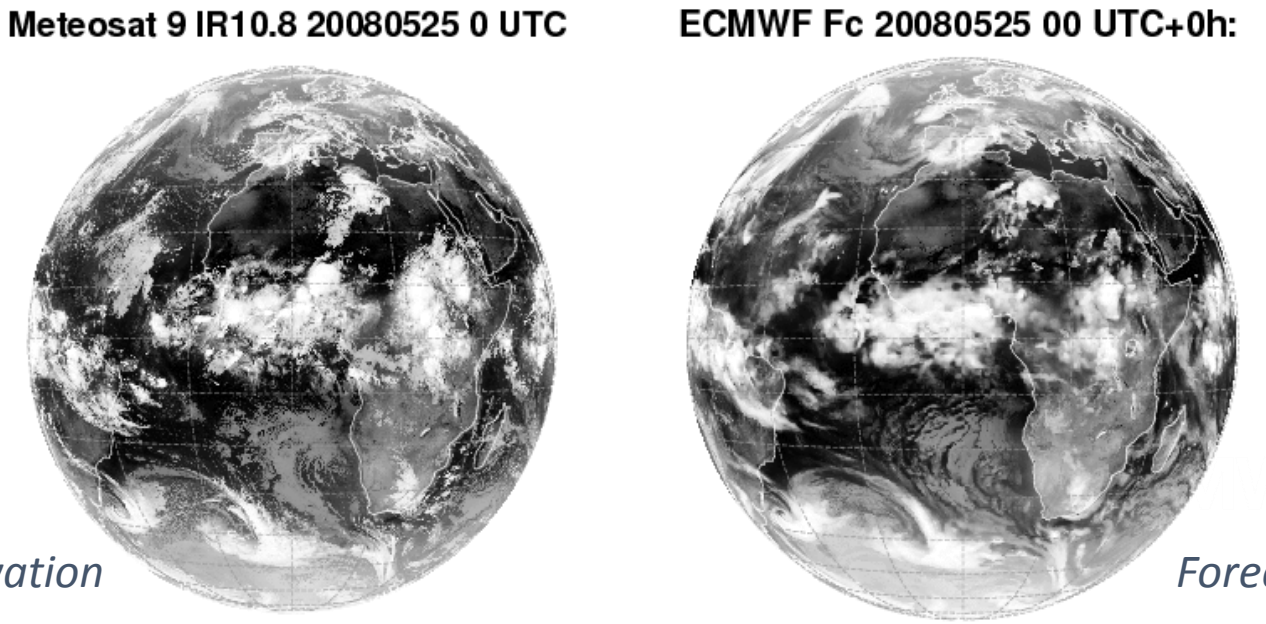
Implemented by ECMWF

European Centre for Medium-Range Weather Forecasts (ECMWF)



ECMWF is an independent intergovernmental organisation supported by 34 states (21 Member States and 13 Co-operating States).

ECMWF is both a research institute and a 24/7 operational service, producing and disseminating numerical weather predictions to its Member States.



Observation *Forecast*

ECMWF and Copernicus

ECMWF is operating two services on behalf of the European Union: the Copernicus Atmosphere Monitoring Service (CAMS) and the Copernicus Climate Change Service (C3S).

From the start, ECMWF has been strongly involved in the development of Copernicus information services. Currently, in addition to being the coordinator of the pilot atmosphere service (MACC, -II, -III) and of a precursor of the climate change service (ERA-CLIM2), ECMWF is also involved in the marine and emergency services, by running in particular the computational centre and hosting the information system platform of the European Flood Awareness System (EFAS).

Funded by the European Union

Implemented by ECMWF

Copernicus
Atmosphere Monitoring Service

MISSION

Supporting the European strategy "Living well within the boundaries of our planet" by combining models and observations to monitor and forecast atmospheric pollution.

Contributing to Europe’s green economy by providing timely and accurate information on aerosols, chemical pollutants and greenhouse gases.

Funded by the European Union

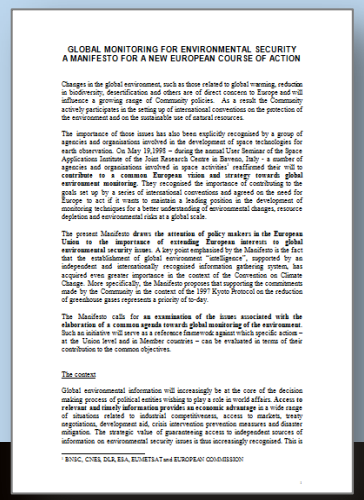
Implemented by ECMWF

Copernicus
Atmosphere Monitoring Service

A SIGNIFICANT HERITAGE

A decade-long series of R&D projects (“MACC”) and experience in engaging with users and potential users in Europe and across the world

Strategy


GLOBAL MONITORING FOR ENVIRONMENTAL SECURITY
A MANIFESTO FOR A NEW EUROPEAN COURSE OF ACTION

Changes in the global environment, such as those related to global warming, reduction in biodiversity, desertification and others are of direct concern to Europe and will influence a growing range of Community policies. As a result the Community actively participates in the setting up of international conventions on the protection of the environment and on the sustainable use of natural resources.

The importance of those issues has also been explicitly recognised by a group of agencies and organisations involved in the development of space technologies for earth observation. On May 19,1995 – during the annual User Seminar of the Space Applications Institute of the Joint Research Centre in Ispreso, Italy - a number of agencies and organisations involved in space activities' reaffirmed their will to **contribute to a common European vision and strategy towards global environment monitoring**. They recognized the importance of contributing to the goals set up by a series of international conventions and agreed on the need for Europe to act if it wants to maintain a leading position in the development of monitoring techniques for a better understanding of environmental changes, resource depletion and environmental risks at a global scale.

The present Manifesto draws **the attention of policy makers in the European Union to the importance of extending European interests to global environmental security issues**. A key point emphasised by the Manifesto is the fact that the establishment of global environment "intelligence", supported by an independent and internationally recognized information gathering system, has acquired even greater importance in the context of the Convention on Climate Change. More specifically, the Manifesto proposes that supporting the commitments made by the Community in the context of the 1997 Kyoto Protocol on the reduction of greenhouse gases represents a priority of to-day.

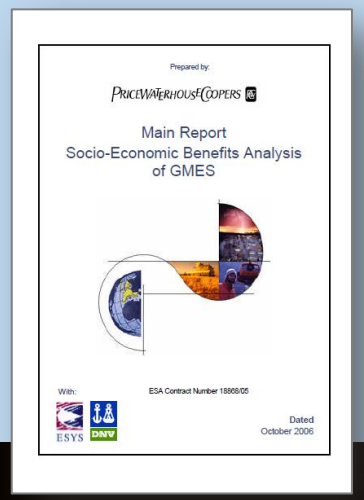
The Manifesto calls for **an examination of the issues associated with the elaboration of a common agenda towards global monitoring of the environment**. Such an initiative will serve as a reference framework against which specific actions – at the Union level and in Member countries – can be evaluated in terms of their contribution to the common objectives.

The context

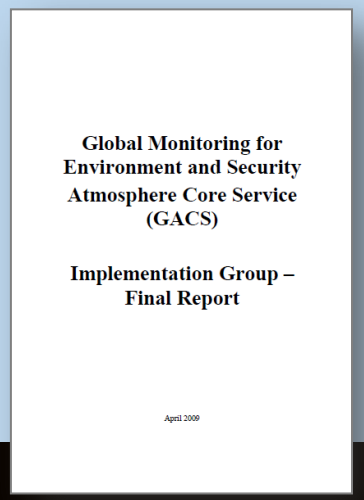
Global environmental information will increasingly be at the core of the decision making process of political entities wishing to play a role in world affairs. Access to **relevant and timely information provides an economic advantage** in a wide range of situations related to industrial competitiveness, access to markets, treaty negotiations, development aid, crisis intervention prevention measures and disaster mitigation. The strategic value of guaranteeing access to independent sources of information on environmental security issues is thus increasingly recognised. This is

BNSC, CNES, DLR, ESA, EUMETSAT and EUROPEAN COMMISSION

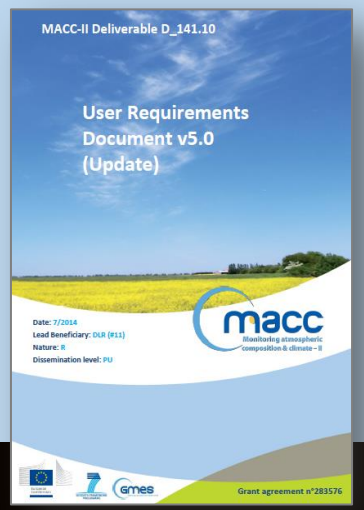
Socio-eco. impact


Prepared by:
PRICEWATERHOUSECOOPERS
Main Report
Socio-Economic Benefits Analysis of GMES
With:
ESA Contract Number 18868/05
ESYS
DNV
Dated
October 2006

Experts


Global Monitoring for Environment and Security
Atmosphere Core Service (GACS)
Implementation Group – Final Report
April 2009

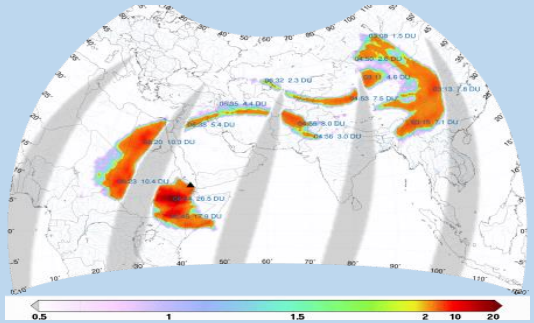
Users

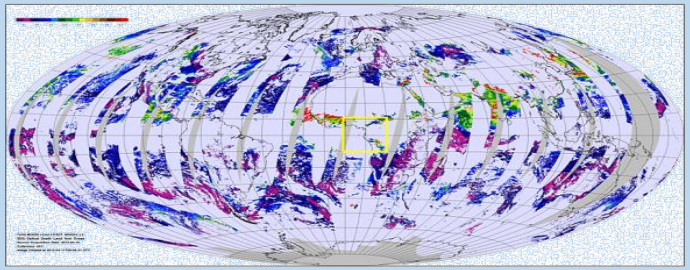

MACC-II Deliverable D_141.10
User Requirements Document v5.0 (Update)
Date: 7/2014
Lead Beneficiary: DLR (#11)
Nature: R
Dissemination level: PU
macc
Monitoring atmospheric Composition & climate – II
GMES
Grant agreement n°283576

Funded by the European Union

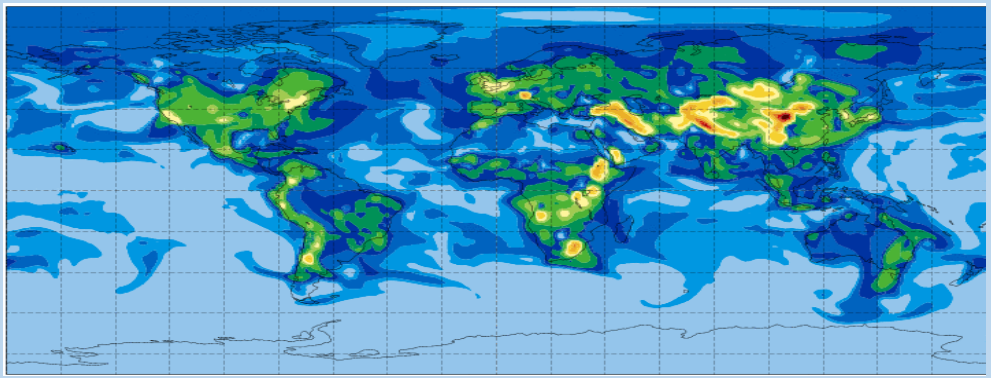
Implemented by ECMWF

From EO to policy-relevant products

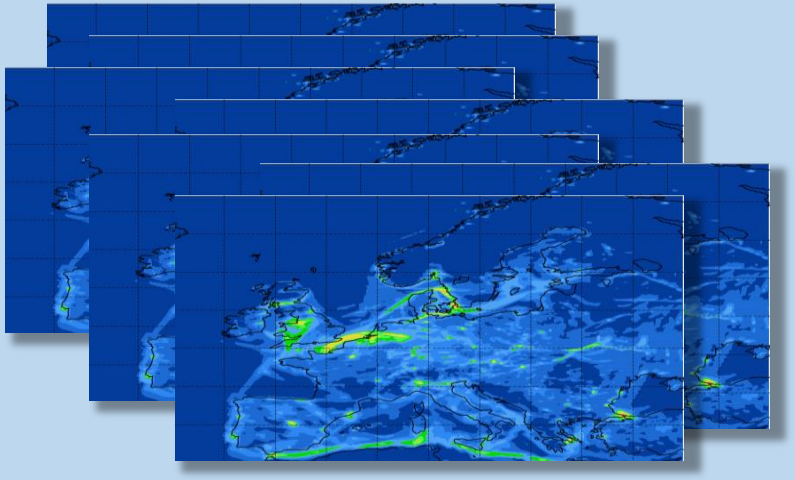




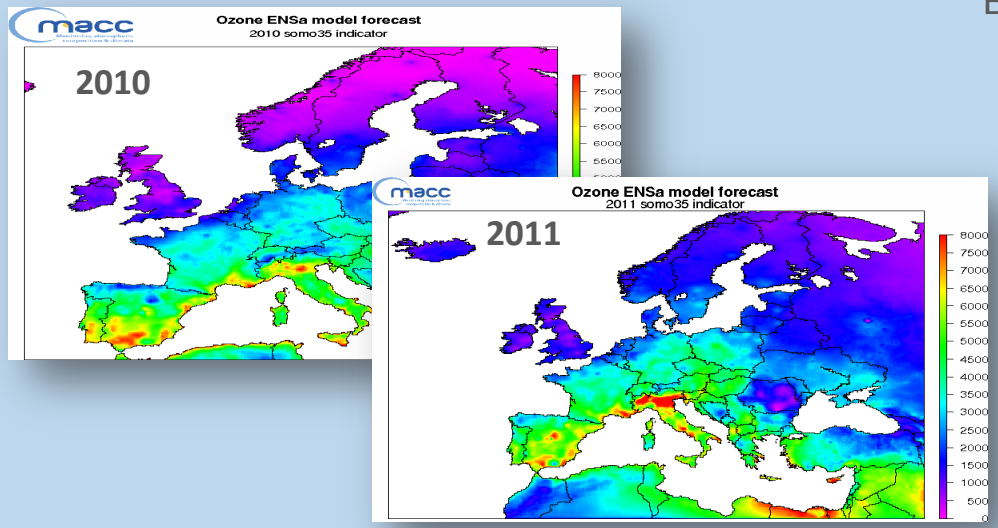
Over 70 EO instruments are assimilated in the global system

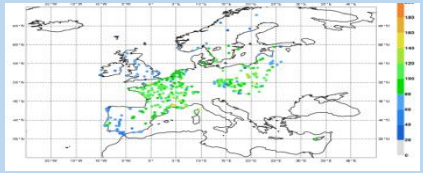


Boundary conditions feed an ensemble of high-resolution European AQ systems (in order to assess uncertainties)



More data are assimilated (in particular hourly surface AQ concentrated by EEA/EIONET)





Policy-relevant (here health indicator for ozone) products are delivered. They are “maps with no gaps”, which observations alone don’t provide and are essential to assess impacts.

CAMS Portfolio

AIR QUALITY AND ATMOSPHERIC COMPOSITION

European air quality analyses, forecasts and assessments in support of reporting and policy making, pollen forecasts, global transport of constituents/pollutants...

CLIMATE FORCING

Distributions of aerosol components and their radiative impacts, *other radiative forcings...*

OZONE LAYER AND UV

Monitoring and forecasting of the ozone layer / hole, UV index*, UV radiation (crops, ecosystems)...*

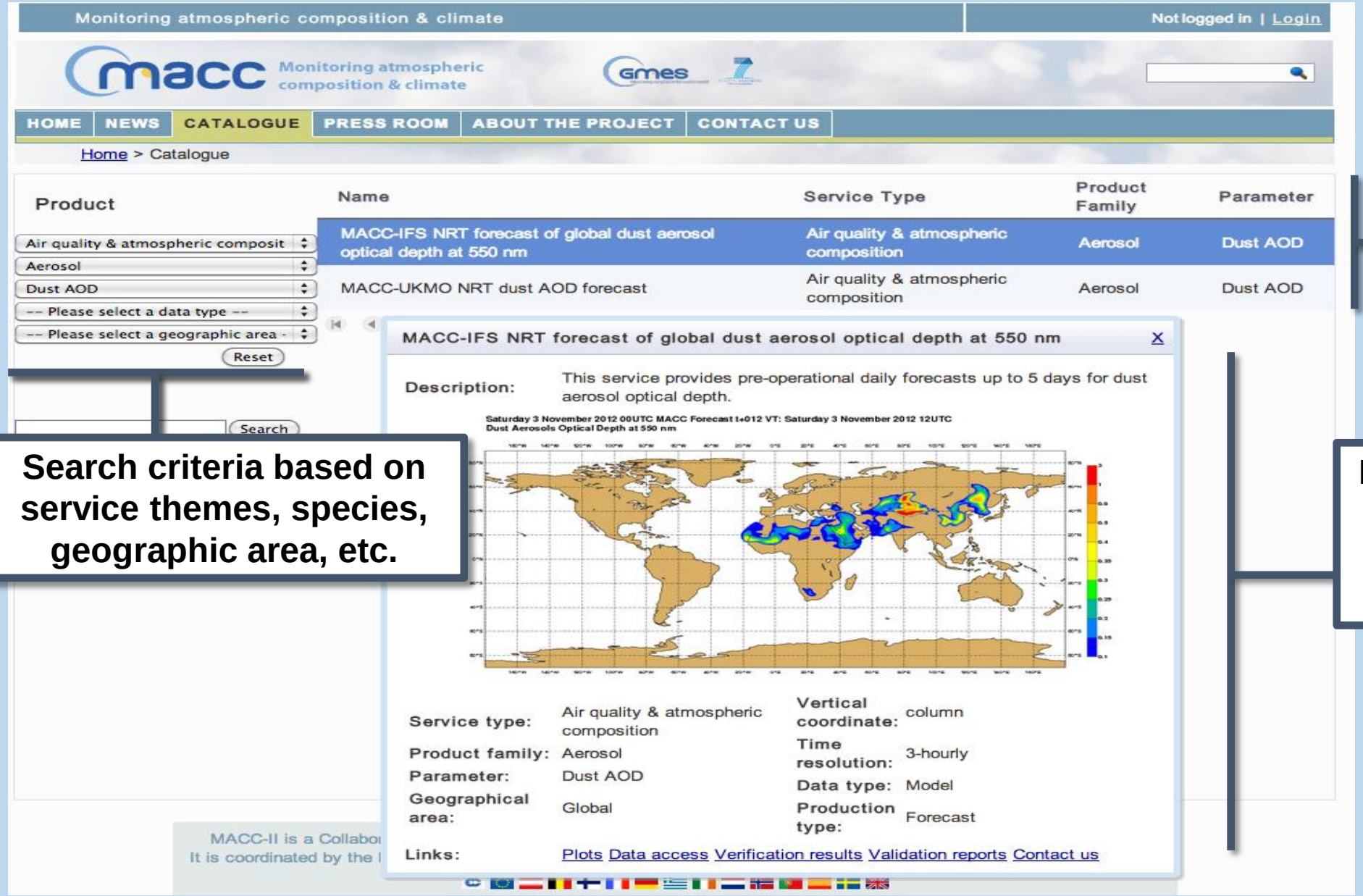
SOLAR RADIATION

Estimates of solar irradiance at surface, improved potential yield assessments for solar plants...

EMISSIONS AND SURFACE FLUXES

Estimates of human emissions globally and in Europe (high-resolution), emissions by wildfires, surface fluxes of CO_2, CH_4 and N_2O...

http://www.copernicus-atmosphere.eu

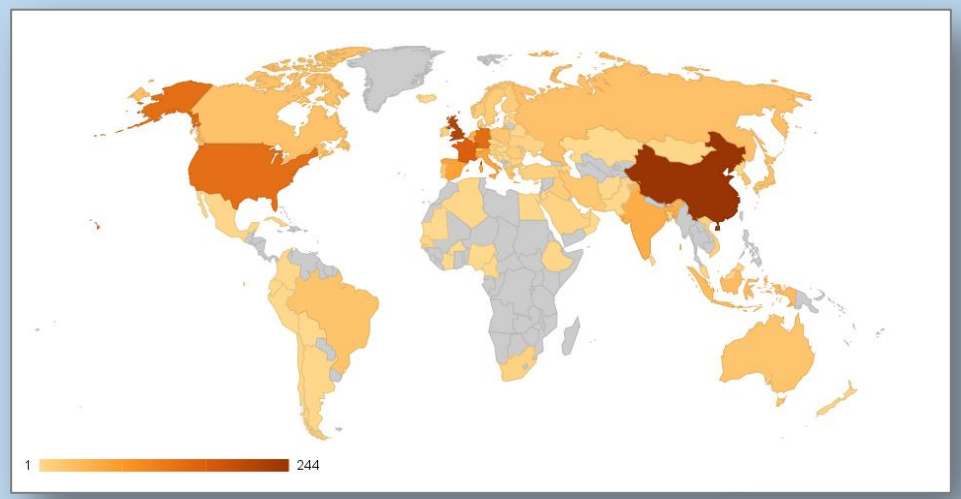


Products found

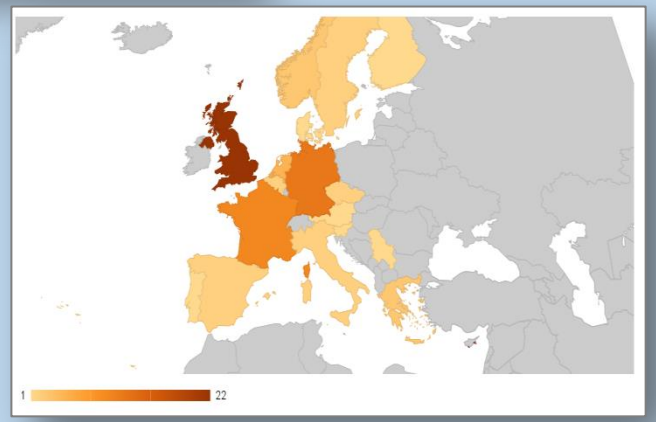
Search criteria based on service themes, species, geographic area, etc.

Pop-up window with product description and links to plots, data, and validation

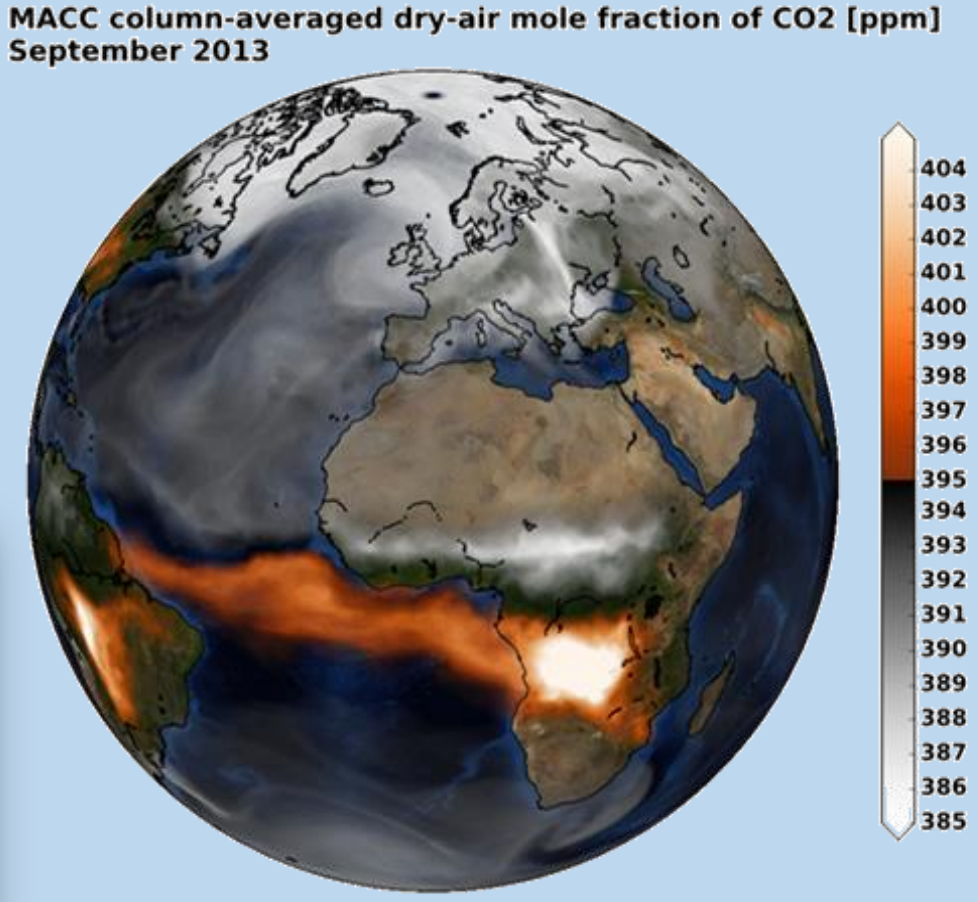
3000+ Users of MACC/CAMS



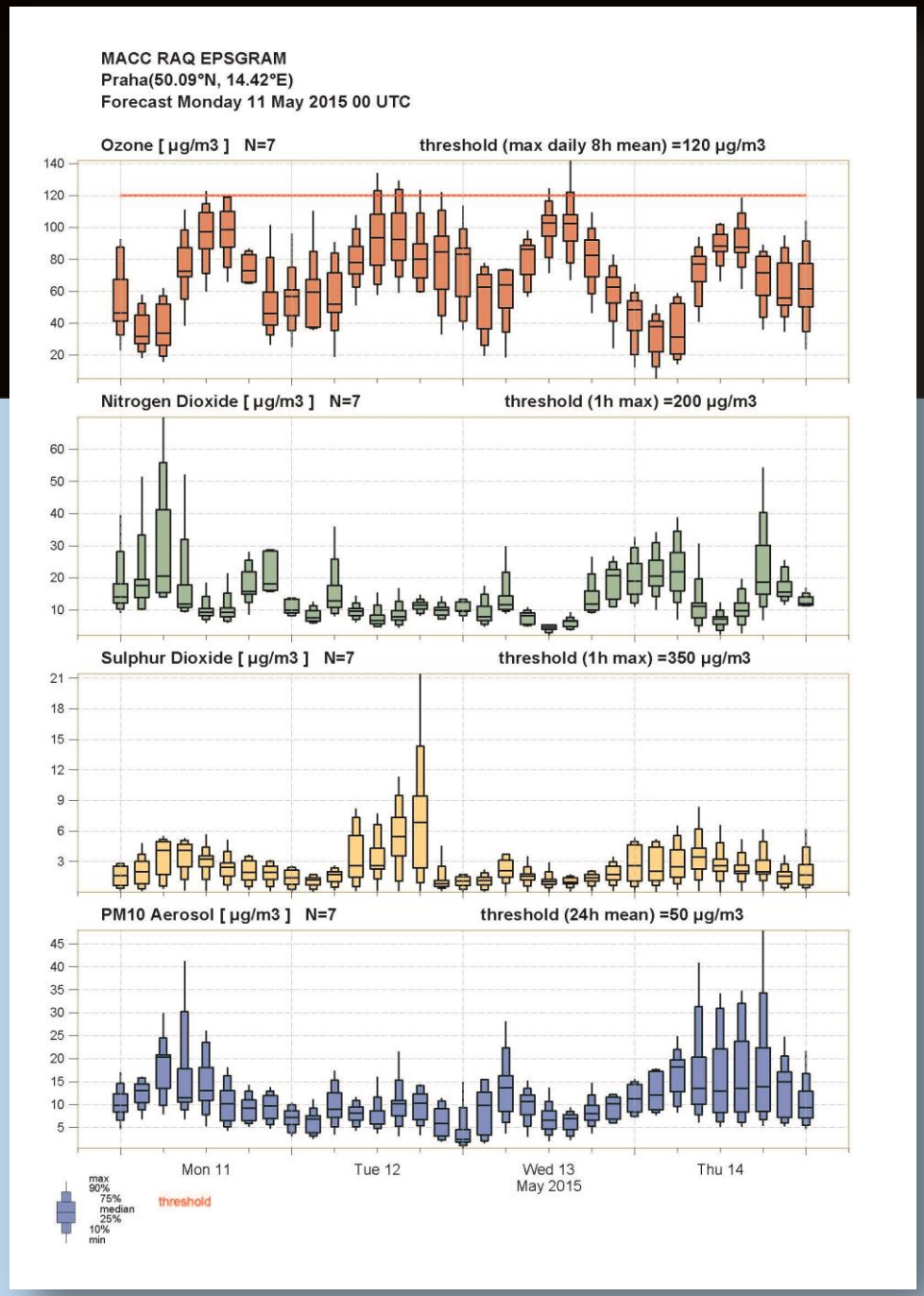
Users of the global re-analysis product

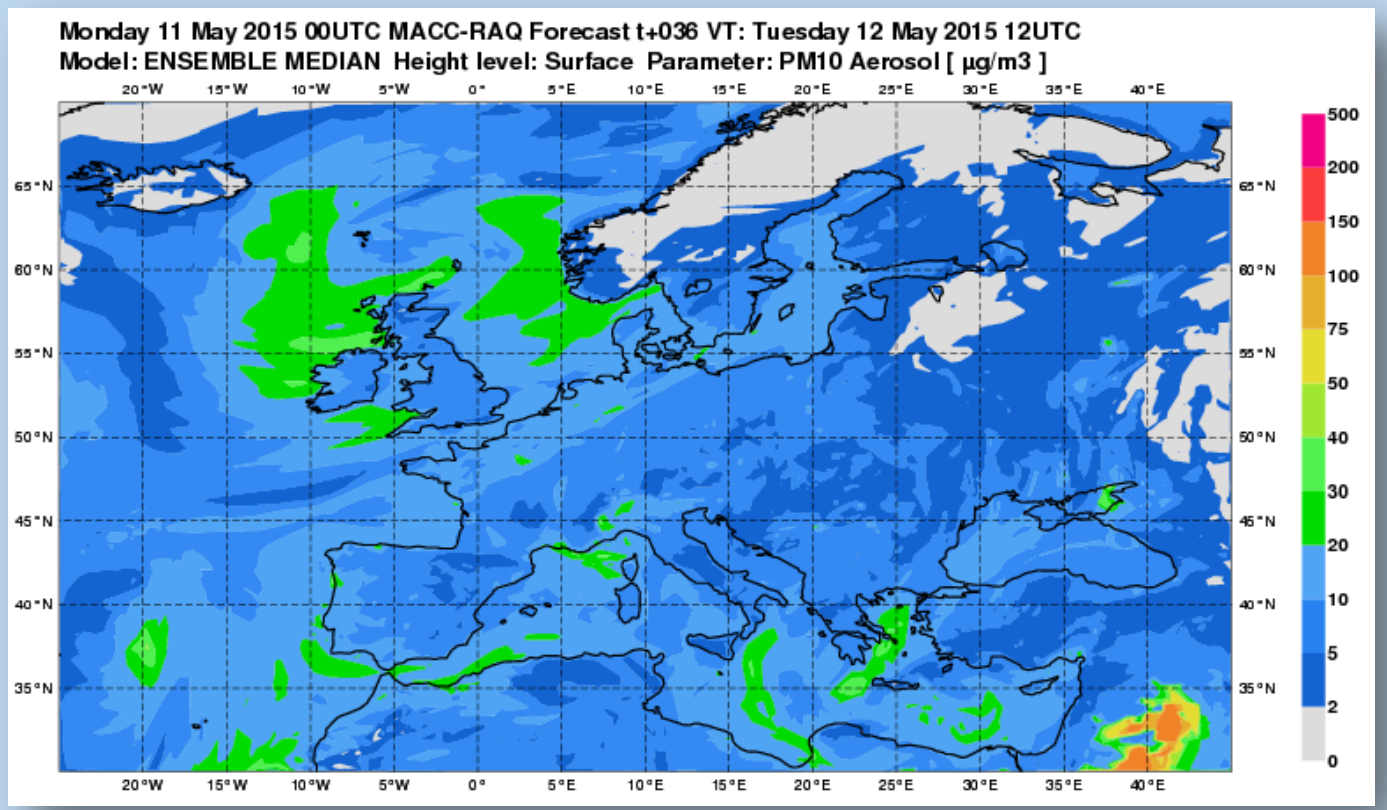


Users of the NRT European Air Quality forecasts



Air quality today





Copernicus
Atmosphere Monitoring Service

CAMS OPERATIONAL STRUCTURE

In-Situ Observations

Global Production

Regional Production

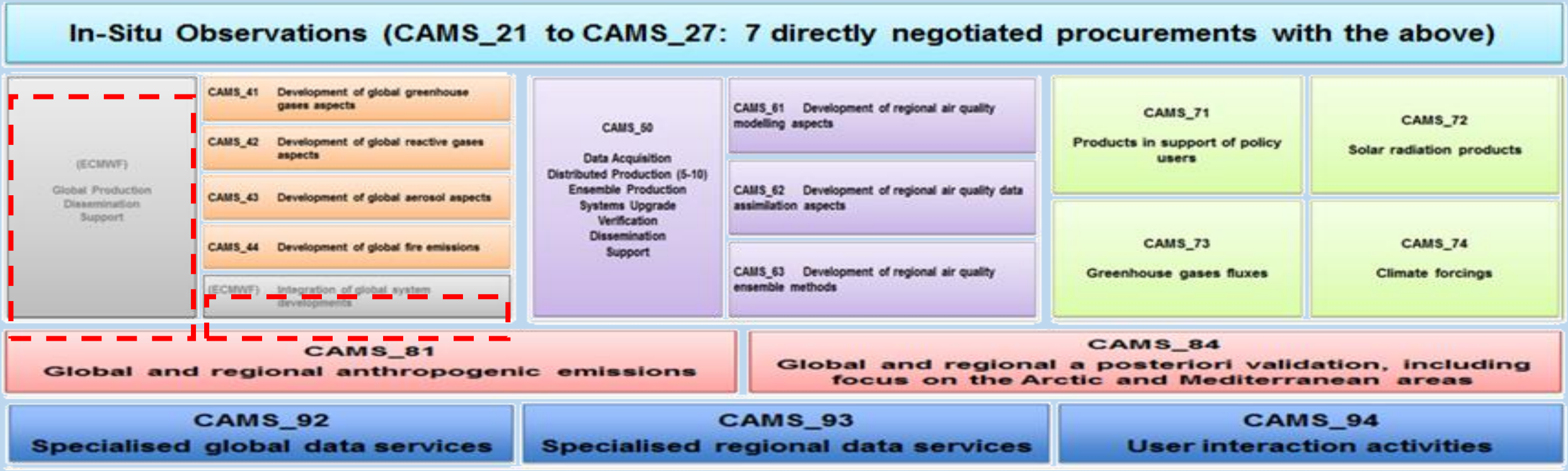
Supplementary Services

Activities in support of production: Validation, Emissions

Communications, Training, User Interaction, Use cases

Copernicus
Atmosphere Monitoring Service

CAMS PROCUREMENT OPPORTUNITIES



http://www.ecmwf.int/en/about/suppliers/copernicus-procurement

Copernicus
Climate Change Service

MISSION

- An authoritative source of climate information for Europe covering past climate and trends, current state of the climate and projections of possible scenarios of future climate.
- Building upon national and international existing efforts.
- Supporting the market for climate services in Europe.

Funded by the European Union

Implemented by ECMWF

Copernicus Climate Change Service

How is the climate changing?

- Earth observations
- Reanalyses

What are the societal impacts?

- Climate indicators
- Sectoral information

Will climate change continue, accelerate?

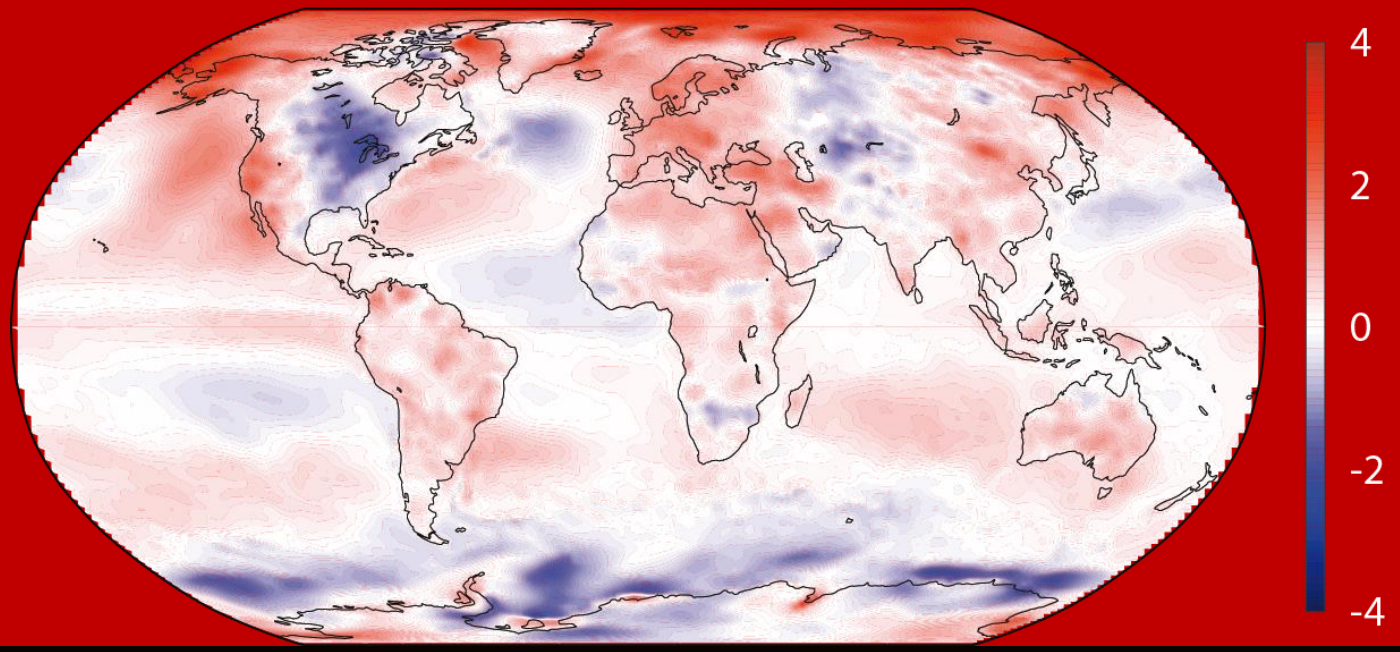
- Predictions
- Projections

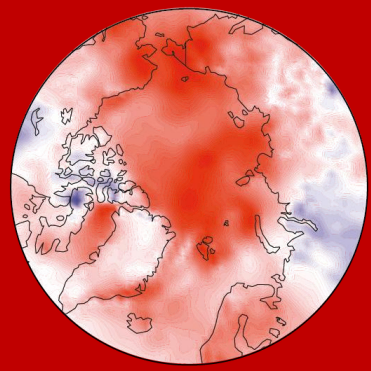
Funded by the European Union

Implemented by ECMWF

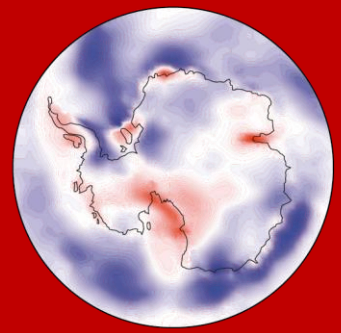
Copernicus
Climate Change Service

Two-metre temperature anomaly (K) for 2014 relative to 1981-2010





Arctic pattern of temperature anomalies

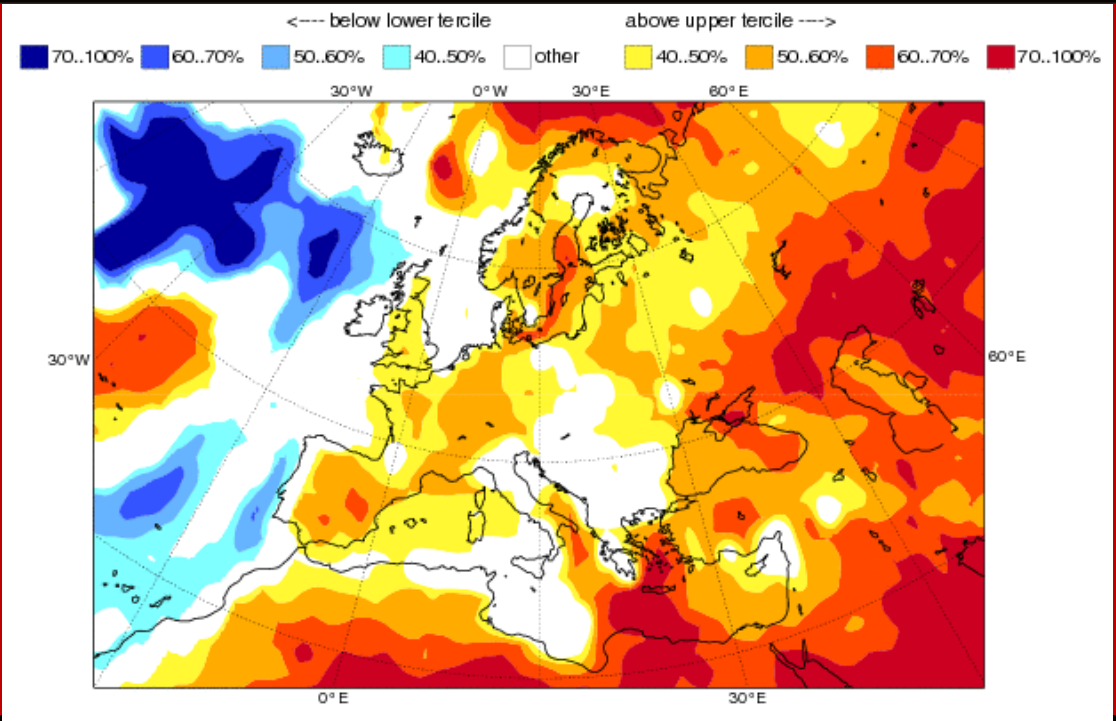


Antarctic pattern of temperature anomalies

Funded by the European Union

Implemented by ECMWF

Copernicus
Climate Change Service



Seasonal forecast

May-June-July

Surface temperature

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Implemented by ECMWF

Copernicus
Climate Change Service

ORGANISATION

Evaluation & QC

from European commission
e.g.,FP7 Space call

from other bodies e.g., MS,
ESA, Eumetsat, EEA, WMO..

Climate Data Store

Sectoral Information System

Stakeholders & users

Outreach & Dissemination

Funded by the European Union

Implemented by ECMWF

Copernicus
Climate Change Service

CLIMATE DATA STORE

Series of ECV datasets and climate indicators:

- **Observed, reanalysed and simulated**
- **Supporting adaptation/mitigation policies for Europe**

Using: multi-model forecasts and projections; re-analyses; data rescue and reprocessing, ……

Funded by the European Union

Implemented by ECMWF

Copernicus
Climate Change Service

EVALUATION AND QUALITY CONTROL

- **Ensures C3S delivers state-of-the art climate information to end users**
- **Identifies gaps in the Service**
- **Bridges Copernicus with the EU Research Agenda (e.g. H2020)**
- **Monitors continually quality of C3S products and services**

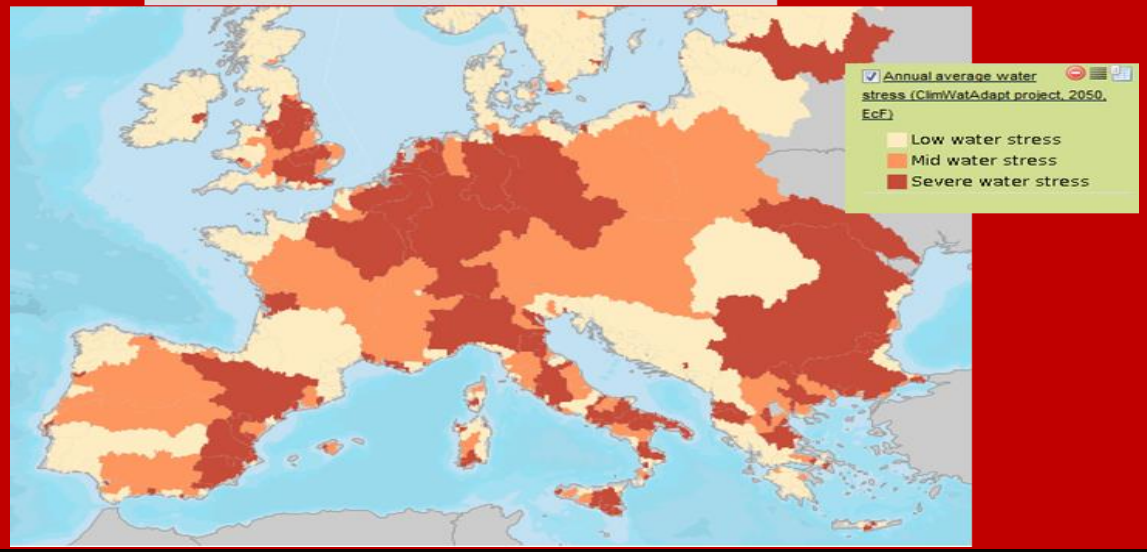
Funded by the European Union

Implemented by ECMWF

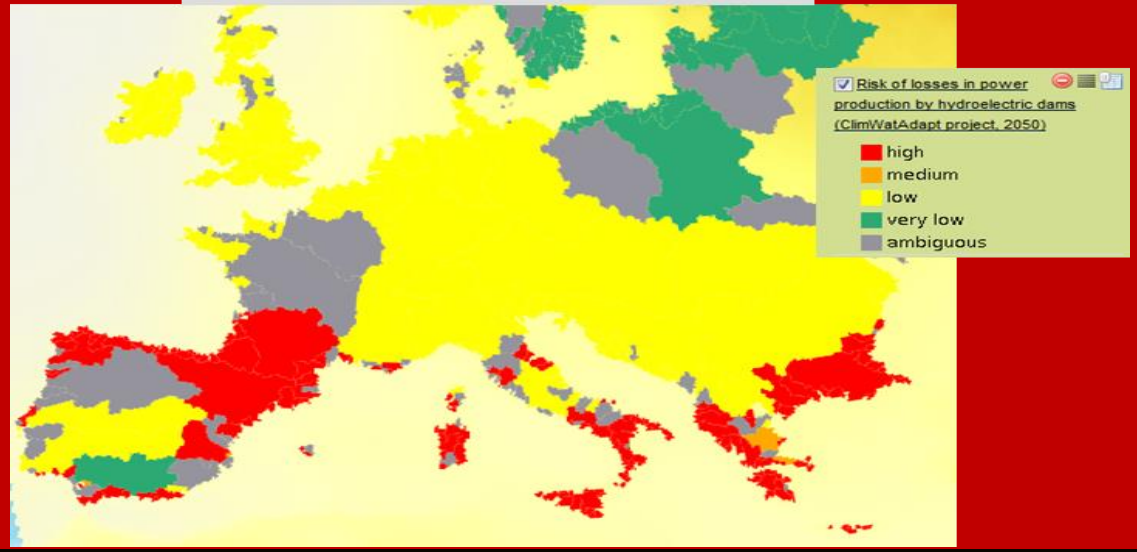
Copernicus
Climate Change Service

SECTORAL INFORMATION SYSTEM

Water management



Energy



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Copernicus
Climate Change Service

OUTREACH AND DISSEMINATION

- **Web content provision and management**
- **Public outreach**
- **Coordination with national outreach efforts**
- **Liaison with public authorities**
- **Events (conferences, seminars, summer schools, ..)**
- **Training and educational material, smartphone apps, etc.**

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Implemented by ECMWF

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Climate Change Service

RESEARCH TO ENHANCE C3S

Uncertainty in climate information is significant – this must be quantified (within C3S) and reduced (via allied research)

Research needed on:

- **Seasonal and decadal predictability**
- **Coupled data assimilation and Earth observations**
- **Earth-system modelling: regional and global**
- **Socio-economic impacts of climate change**

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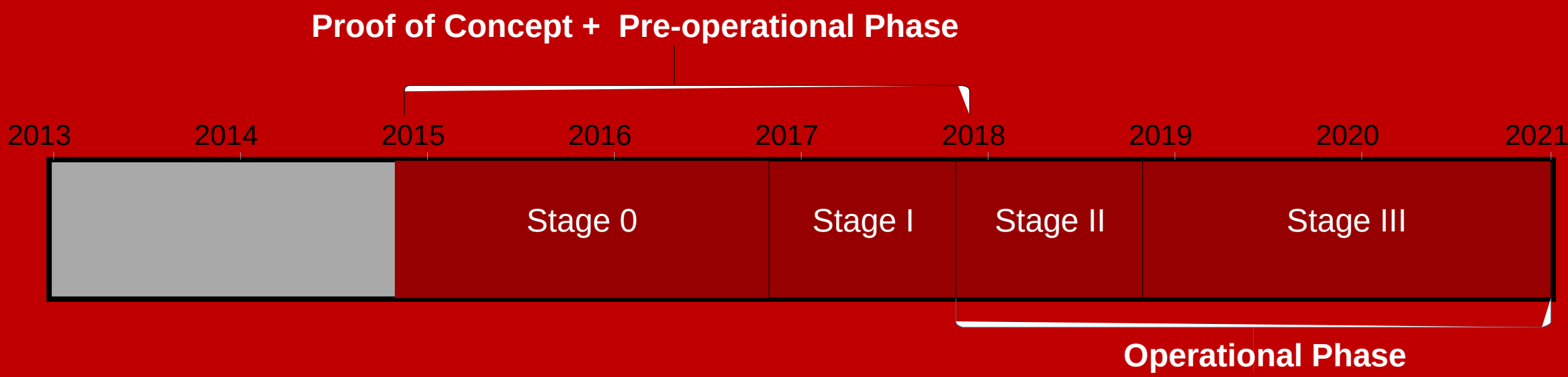
Climate Change Service

TIMELINE



Funded by the European Union

Implemented by ECMWF

Watch this: www.copernicus-climate.eu

The Copernicus Climate Change Service implemented by ECMWF is part of the Copernicus programme coordinated and managed by the European Commission.