

El programa Copernicus de la Unión Europea y sus servicios de Atmósfera y Cambio Climático.

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Service (C3S)

 @j_munoz_sabater

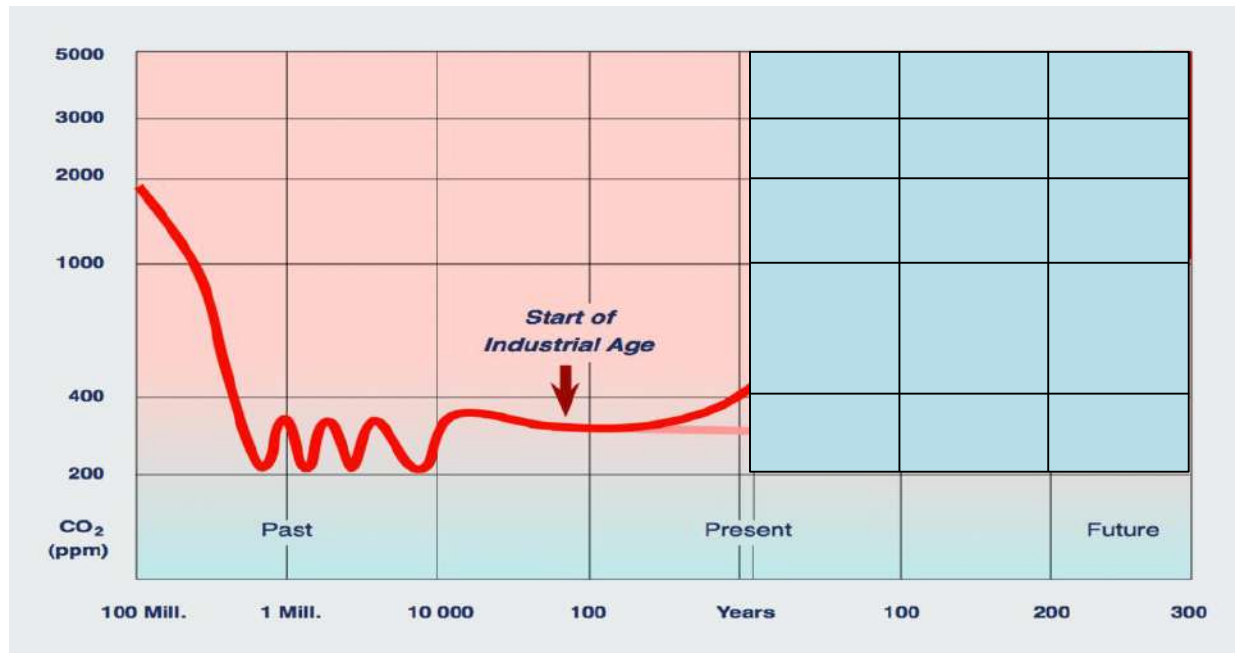
XVIII Congreso Nacional de Teledetección
24-27 Septiembre 2019, Valladolid, Spain





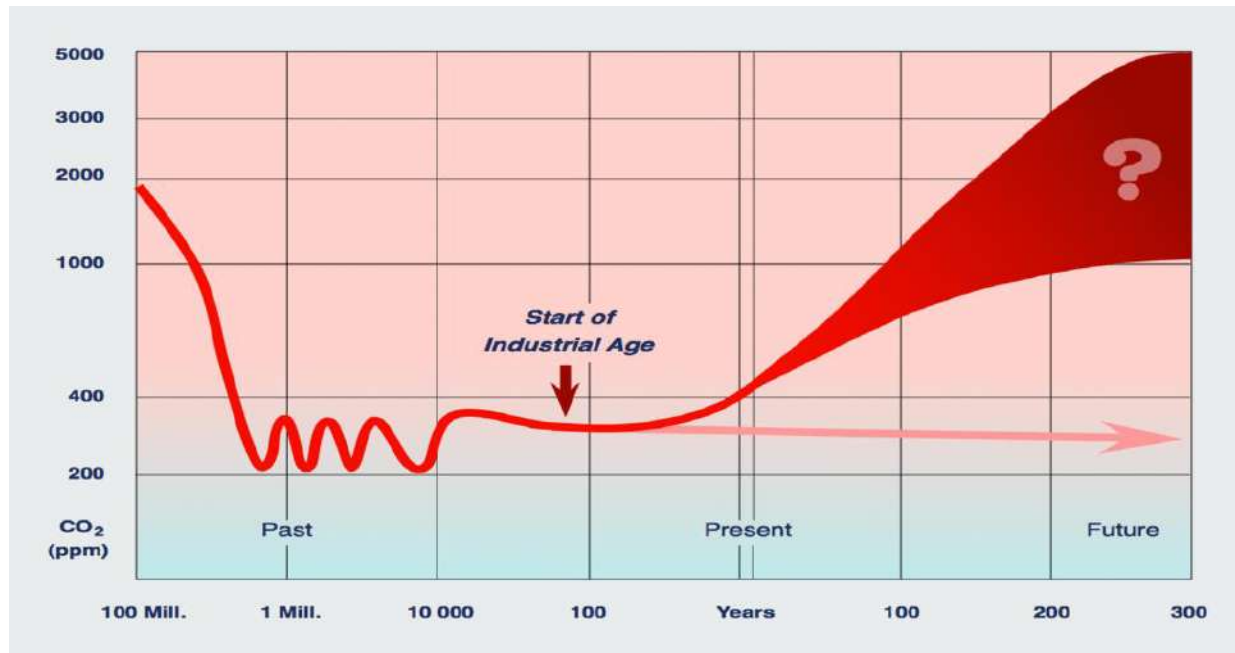


¿Por qué nos preocupa un *posible* cambio del clima?



Credits: Dr. Hannes Grobe

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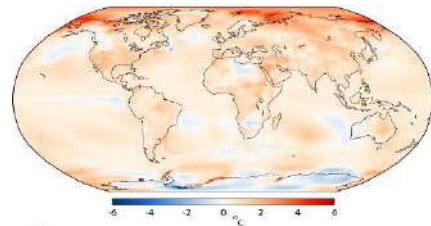
Outline

Introducción al programa Europeo Copernicus



El Servicio Europeo de Cambio Climático (C3S)

- Misión
- ¿Qué productos/servicios nos ofrece C3S?
- Uso de los productos de información climática de C3S
- Cómo acceder a sus productos



El Servicio Europeo de Composición Atmosférica (CAMS)

- ¿Por qué?
- ¿Qué productos/servicios nos ofrece CAMS?
- Uso de los productos de composición atmosférica de CAMS
- Como acceder a sus productos



C3S & CAMS; asistencia a los usuarios



Un poco de historia

1998: “Manifiesto Baveno” compromiso a largo plazo para el desarrollo de servicios espaciales de vigilancia medioambiental. (GMES)

2001: Cumbre de Gotemburgo. Establecer, para 2008, una capacidad europea de supervisión mundial del medio ambiente y la seguridad

2008-2010: Servicios pre-operacionales

2012: Cambio de nombre. Copernicus

2014: Empieza la fase operativa.
Marco financiero multianual 2014-2020. 4300 M€

Copernicus: Observaciones de la Tierra y servicios de información



→ Programa de observación de la Tierra de la Unión Europea;

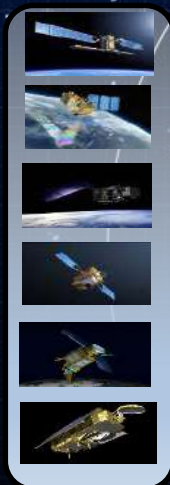
- Gestionado y coordinado por la Comisión Europea
- Implementado en colaboración con los Estados Miembro de la UE, la Agencia Espacial Europea (ESA), EUMETSAT, Mercator Océan, ECMWF y agencias de la UE como la EEA.
- ~4300 M€ en el actual marco multianual de financiación (2014-2020)

→ Sistema basado en datos de satélites de observación de la Tierra y observaciones “in-situ” (no espaciales)

→ **Acceso completo, abierto y gratuito** a los datos y servicios para cualquier ciudadano u organización:

- Mejorar la vida de los ciudadanos
- Ofrecer (administraciones e industria) herramientas para la toma de decisiones

Sentinels



CLIMATE CHANGE



MARINE MONITORING



ATMOSPHERE MONITORING



LAND MONITORING



SECURITY



EMERGENCY MANAGEMENT





Climate Change

Copernicus Climate Change Service (C3S)





Climate
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Misión de C3S

"The service will help to meet the needs and requirements for a wide variety of C3S services, ranging from the monitoring of climate change impact on different sectors of society to long-term planning and policy development."

Apoyar las políticas Europeas de adaptación y mitigación:

- ◆ Siendo una fuente de información climática consistente y fidedigna (authoritative)
- ◆ Construyendo el servicio en torno a capacidades e infraestructuras existentes
- ◆ Estimulando el mercado de los servicios climáticos en Europa



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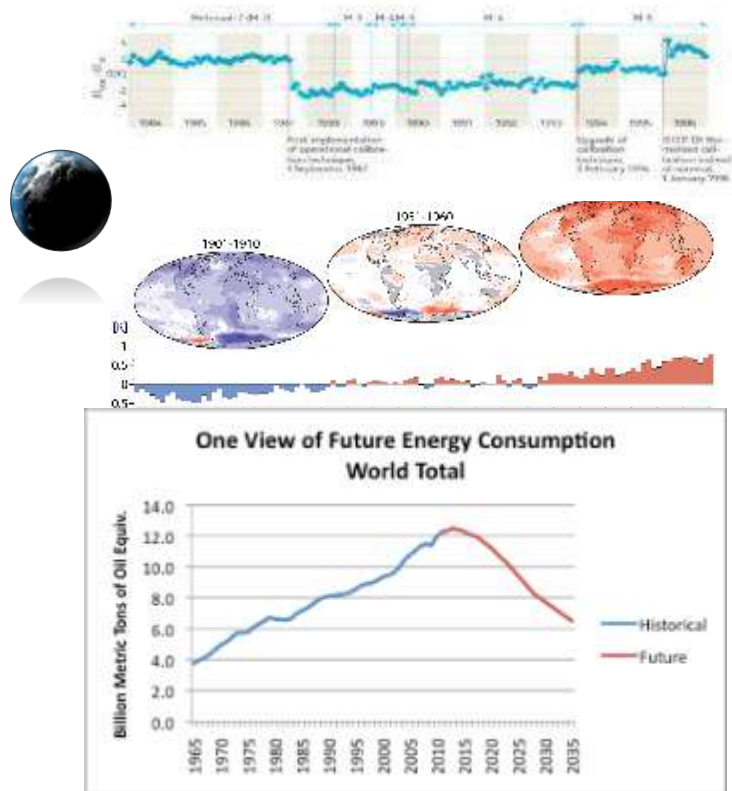


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El Servicio de Cambio Climático (C3S)

Temas tratados en el servicio:

- **Cómo está cambiando el clima?**
 - Observaciones de la Tierra
 - Reanálisis
- **Continuará/se acelerará el cambio climático?**
 - Predicciones
 - Proyecciones
- **Cuáles son los impactos en la sociedad?**
 - Indicadores del clima
 - Información sectorial





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Estructura de C3S

Evaluación & Control Calidad

Garantía de calidad
Integridad del Servicio
Necesidades de usuarios

European commission
e.g., FP7 Space call, H2020

EU estados miembros,
ESA, EUMETSAT, EEA,
WMO..

Climate Data Store

Sistemas de Información Sectorial



ENERGY



WATER
MANAGEMENT



INSURANCE



AGRICULTURE
& FORESTRY



INFRASTRUCTURE

Usuarios & stakeholders



Divulgación & difusión



European
Commission





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Climate Data Store: Contenido



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

Observaciones

Global estimates
of ECVs from
satellite and in-
situ observations

Reprocessed
CDRs, reference
observations

Support for data
rescue, climate
data collections

Reanálisis climáticos

Global atmosphere,
ocean, land

Regional
reanalyses for
Europe and Arctic

Coupled climate
reanalysis for 100
years

Datos de modelos

Multi-model seasonal
forecast products

Access to CMIP
data and
products, global
and regional

Reference set of
climate projections
for Europe

Climate Indicators



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Variables Esenciales del Clima (ECV)

			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

Generación de registros de datos climáticos de ECVs

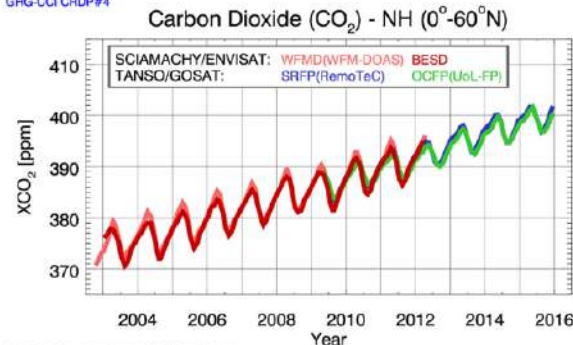
Fase I: C3S_312a:

- 12 ECVs en 9 Lots

Fase II: C3S_312b:

- 22 ECVs en 5 Lots
- Continuidad del servicio

GHG-CGI CRDP#4





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Climate Data Store: Reanálisis

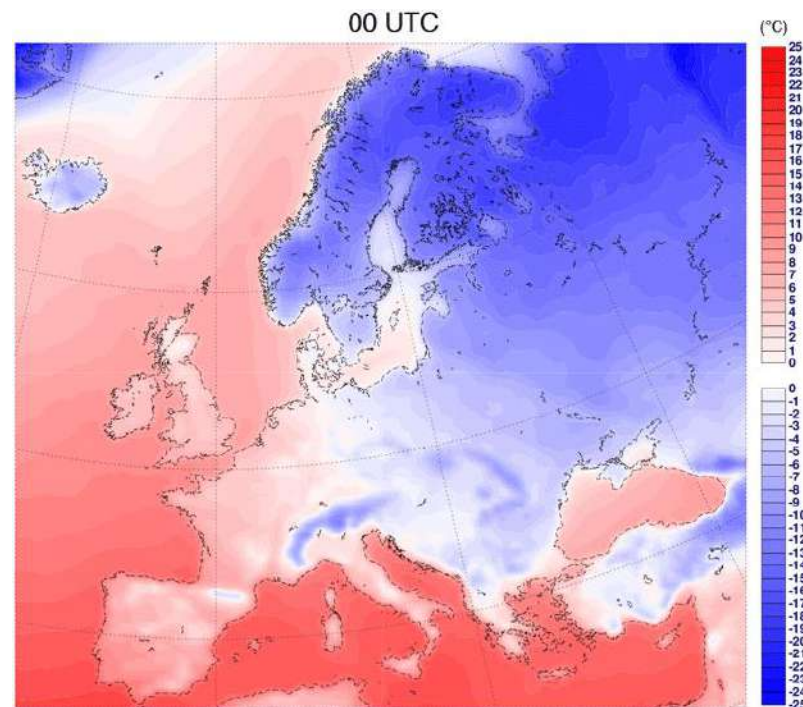
ERA5 reanálisis a escala global:

- Variables Atmósfera/Tierra/Olas
- Resolución global 31 km, 137 niveles
- Salida horaria desde 1979 en adelante
- Uso mejorado de las observaciones de entrada
- Estimaciones de incertidumbre
- 1979-NRT disponible

Los reanálisis son ahora un servicio operacional proporcionado por ECMWF

Y... reanálisis de:

- Zonas de Europa + Ártico
- ERA5-Land



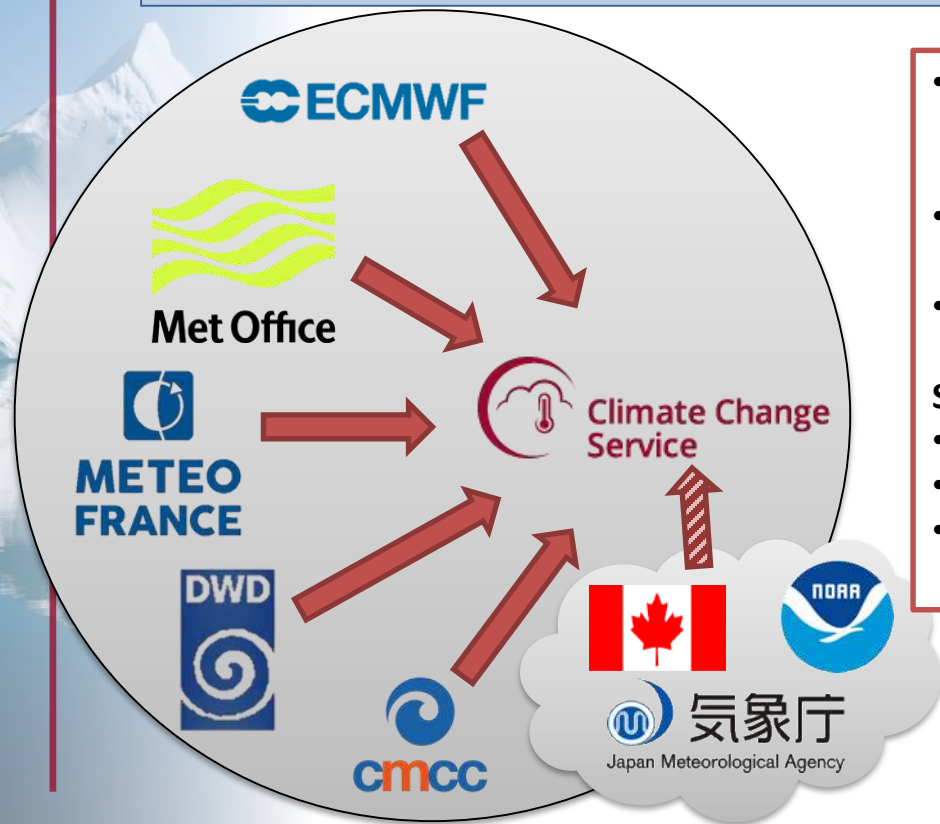
Temperaturas horarias de ERA5 para Enero 2018



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Predicción estacional en C3S

Objetivo: generar productos de **predicción estacional** basados en la **mejor información disponible**, y ponerlos **a disposición del público de forma operativa**.



- Publicados el 13 de cada mes (probablemente se cambiará al 10)
- Large ensembles (members: ~50 predicciones, ~25 hindcast)
- Período de referencia común (1993-2016)

Salidas de los modelos

- Resolución horizontal común ($1^\circ \times 1^\circ$)
- ~30 single-level variables (every 6h or 24h)
- 5 variables en niveles de presión (cada 12h) (11 niveles desde 925hPa a 10hPa)

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Copernicus

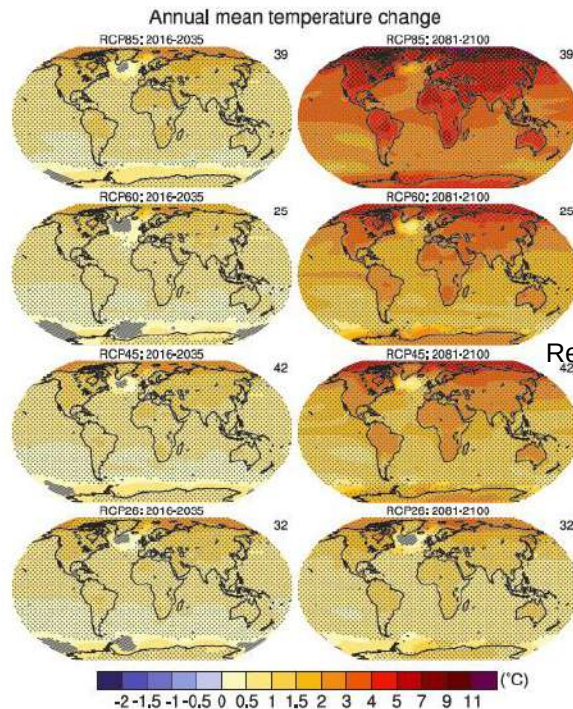
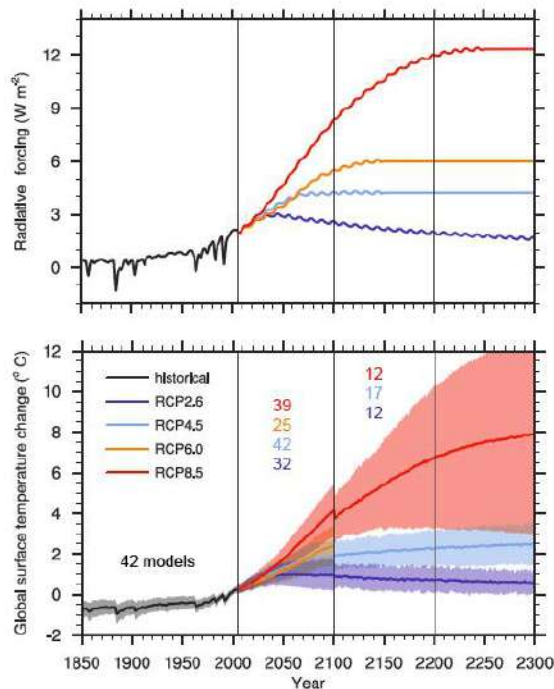




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Proyecciones climáticas; escenarios de concentración

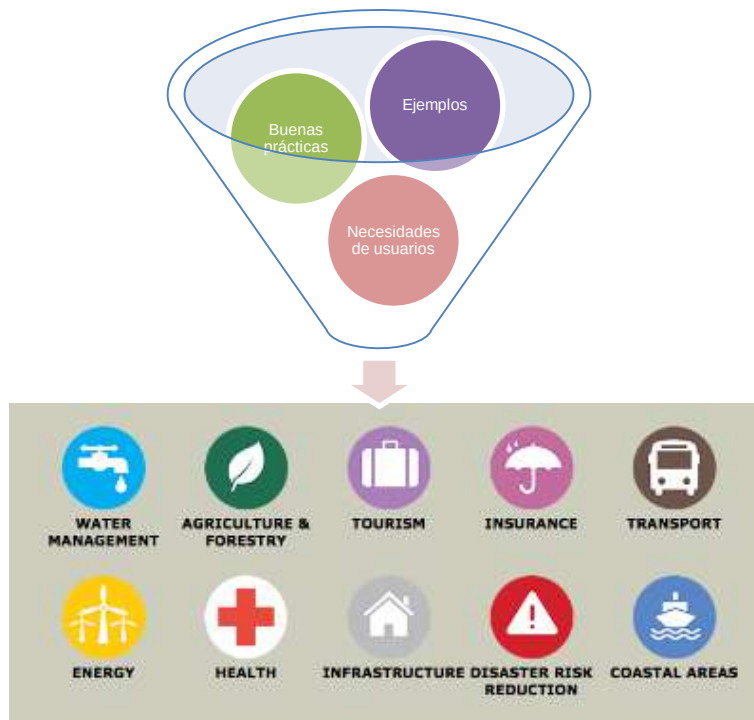
Projected surface temperature change (from IPCC AR5)





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Sistema de información sectorial (SIS)





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De los datos al 'decision making': AGUA

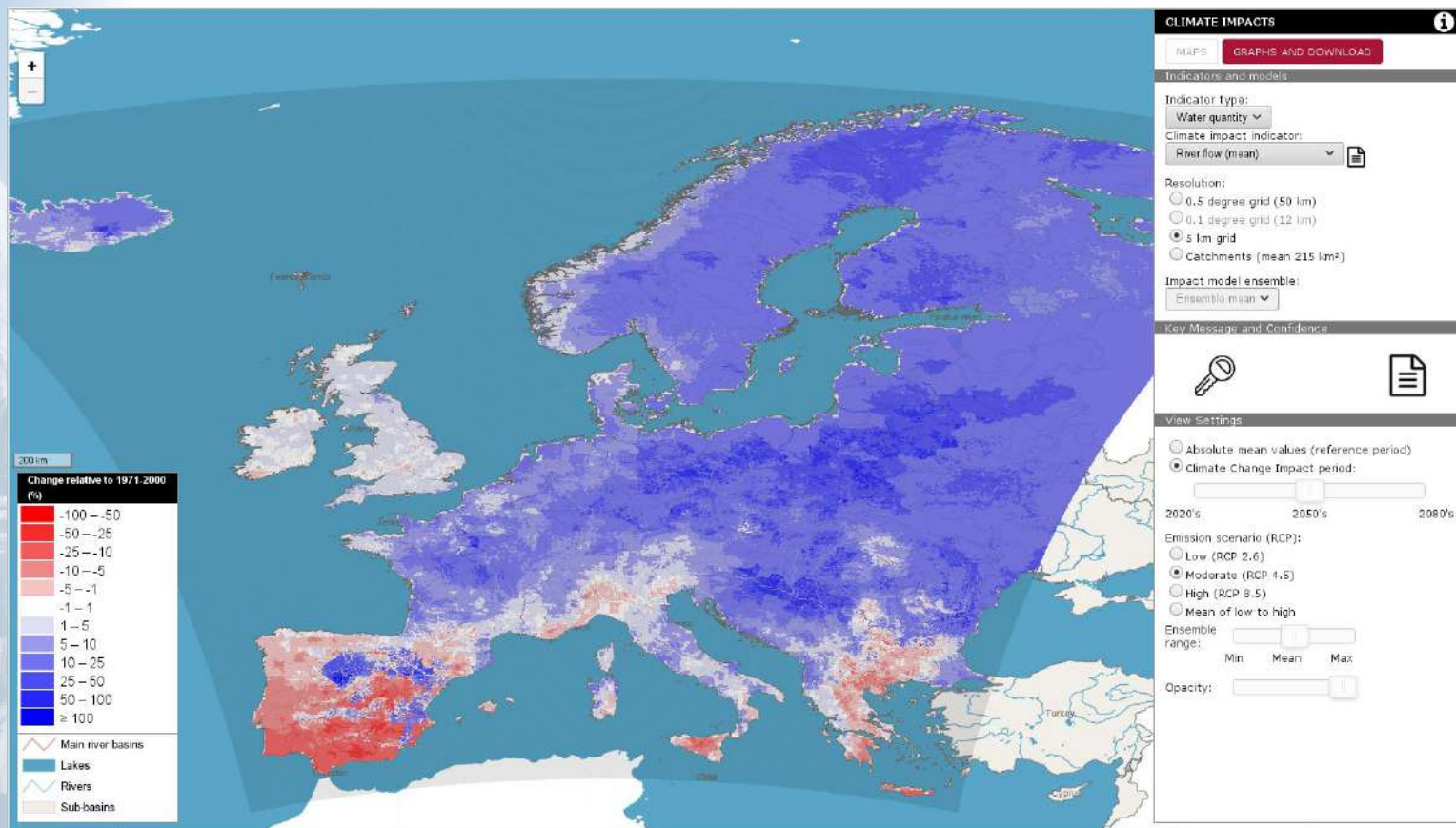


<http://swicca.climate.copernicus.eu/>



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De los datos al 'decision making': AGUA



<http://swicca.climate.copernicus.eu/>

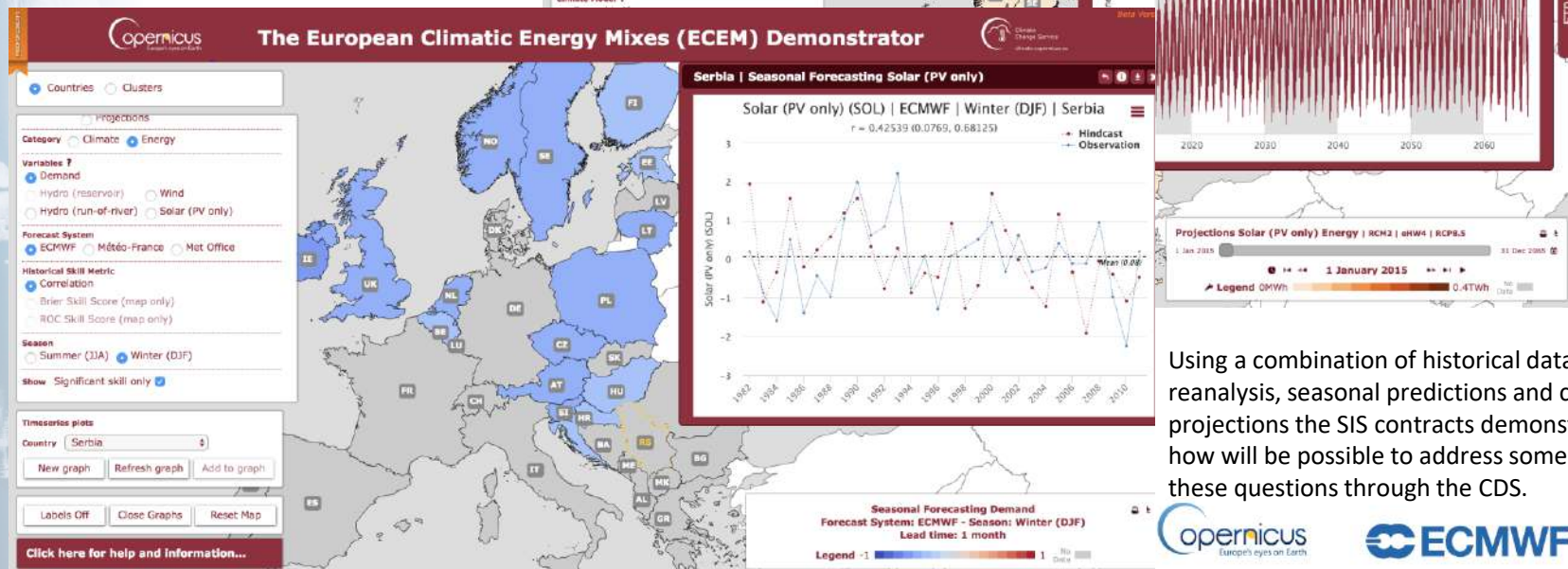




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De los datos al 'decision making': ENERGÍA

Integrating climate and energy scenarios to learn how well prepared our infrastructure is to cope with the climate of the future. Will the renewable dominated energy mix of the future able to cope with the expected change in the energy demand profile?



Using a combination of historical data, reanalysis, seasonal predictions and climate projections the SIS contracts demonstrated how will be possible to address some of these questions through the CDS.

Copernicus
Europe's eyes on Earth

ECMWF



Climate Change

Copernicus Climate Change Service (C3S) – Monitorio del clima





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Boletines climatológicos mensuales – 4th to 6th de cada mes

Implemented by EC/NW² as part of the Copernicus Programme

Climate Change Service

News Events Press Tenders Help & Support

ABOUT US WHAT WE DO DATA QSEARCH

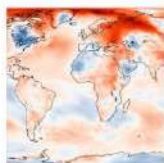
WHAT WE DO ► CLIMATE BULLETIN

Climate bulletins

Through our monthly maps, we present the current condition of the climate using key climate change indicators. We also provide analysis of the maps and guidance on how they are produced.

HIGHLIGHTS OF THE LATEST MONTHLY SUMMARIES MONTHLY CLIMATE UPDATE FEATURED STORY MONTHLY SUMMARIES

Monthly summaries



Surface air temperature

This series of monthly maps and charts, generated from ERA-interim data, covers



Sea ice

We produce sea ice maps every month. Based on ERA-interim reanalysis data, these provide near real-time



Hydrological variables

This series of monthly maps and charts, based on ERA-interim data, covers several



Surface in-situ monitoring for Europe

Monthly and yearly State-of-the-European-climate reports provided

Monthly climate update

15TH OCTOBER 2018

In Europe, it was the warmest September on record. Portugal and western Spain were particularly warm.

Iceland, Ireland and Scotland saw generally cooler than average temperatures.

Japan was hit by two devastating storms, Jebi and Trami following rains, landslides, floods and record-breaking heat this year.

Strong tropical cyclone Mangkhut caused at least 134 fatalities in the Philippines, Hong Kong and China.



Featured story

29TH OCTOBER 2018



A stormy September

One of the **warmest summers on record** has come to an end with September full of storms. Modelling of historic storms can help prepare for such events. We use two of the recent storms to demonstrate the improvements we have made with the release of our new dataset.

[Read more](#)

➤ climate.copernicus.eu/climate-bulletins

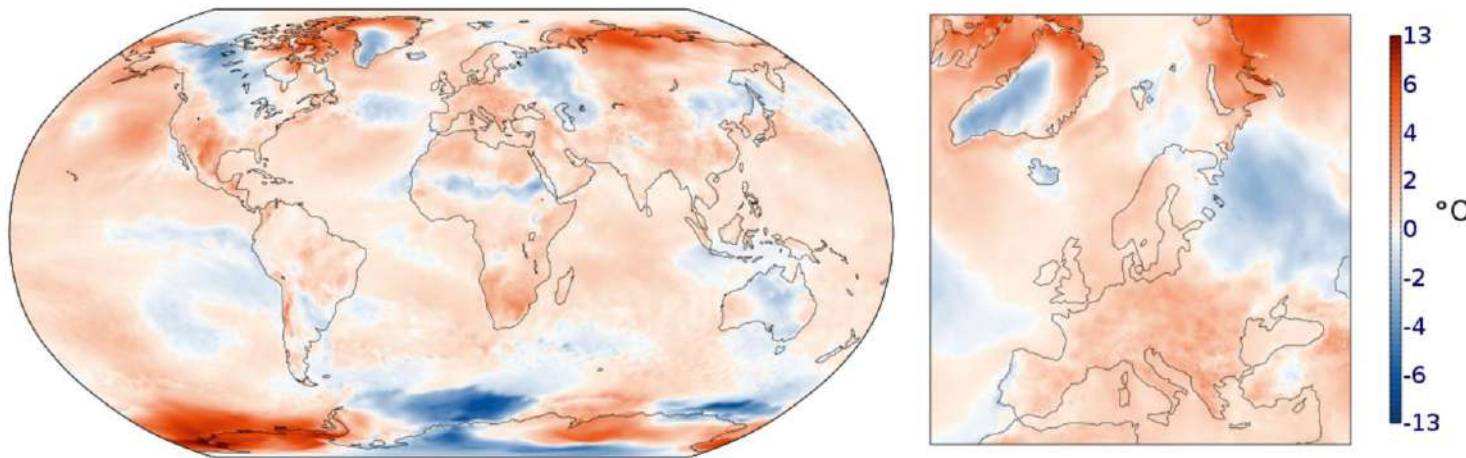




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C3S – Boletines mensuales del clima

Surface air temperature anomaly for August 2019 relative to 1981-2010



- The June-August average temperature for Europe was close to 1.1°C above the 1981-2010 norm, making it the fourth warmest summer since at least 1979.
- Globally, August 2019 was the second warmest August on record, being 0.53°C warmer than the 1981-2010 August average.

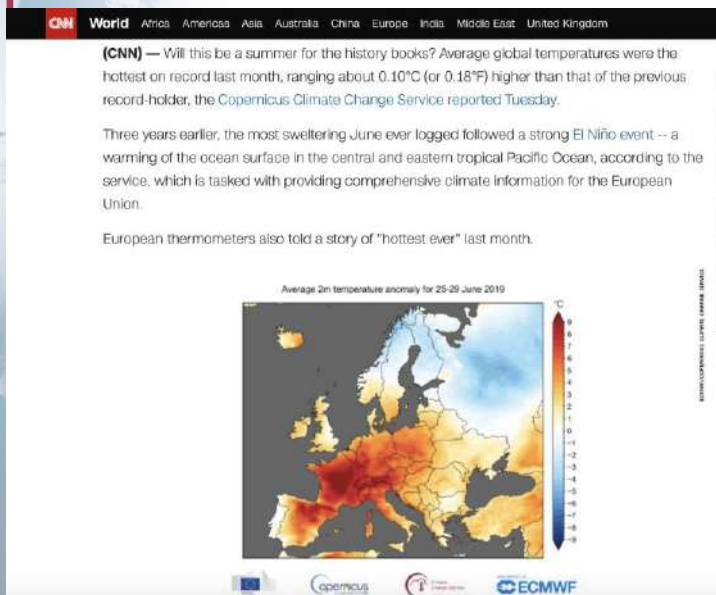


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Ejemplos de 'user uptake' por los *medias*



Credit: ZDF – German State TV, Özden Terli, C3S



CNN, July 2019

BBC, July 2018





Climate
Change

European State of climate



GENERAL

An overview of annual and seasonal conditions in Europe and the European Arctic, compared with the long-term average.

[European temperatures](#) ▶ [European wet and dry conditions](#) ▶ [European Arctic](#) ▶

EVENTS

Three major events in 2018 showed persistent weather conditions over several months, leaving a clear imprint on seasonal and annual averages.

[Cold start to the year](#) ▶ [Dry and warm spring and summer](#) ▶ [Heat conditions in southern Europe](#) ▶

SPOTLIGHT ON

The persistent warm and dry conditions of 2018 show a clear impact on key climate variables.

[Vegetation and land surface](#) ▶ [Wildfire activity](#) ▶ [Alpine glaciers](#) ▶

[Snowmelt duration](#) ▶ [Lake surface temperatures](#) ▶ [River discharge](#) ▶

[Sea ice retreating north of Greenland](#) ▶

Heading Climate indicators

The headline climate indicators show the long-term evolution of important climate variables. These can be used to assess the global and regional extent of a changing climate.

[Surface temperature](#) ▶ [Greenhouse gases](#) ▶ [Sea ice](#) ▶

[Glaciers](#) ▶ [Sea level](#) ▶

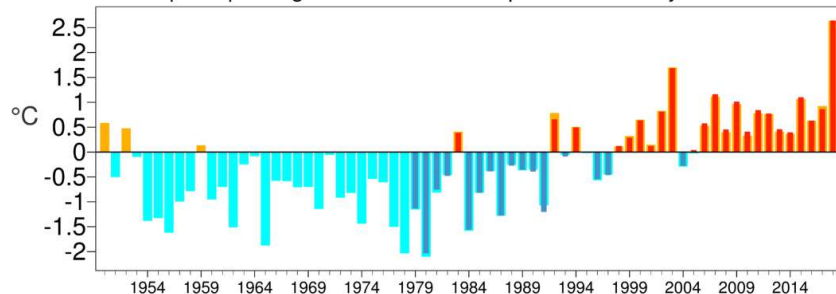
Footer: Copernicus Europe's eyes on Earth | European Commission | ECMWF



Climate
Change

European State of climate

Central Europe - April-August 2018 surface temperature anomaly relative to 1981-2010



1.2°C **2018 average**
temperature

summer
1.3°C

KEY MESSAGES

- The European average temperature in 2018 was one of the three highest on record.
- Summer was the warmest on record - more than 1.3°C than usual.
- All seasons were warmer than usual, with late spring, summer and autumn all seeing temperatures more than 1°C above average.
- There were high maximum temperatures from spring onwards, especially in the north.
- There were much above average minimum temperatures in the southeast.

GENERAL



EVENTS

Three major events in 2018 showed persistent weather conditions over several months, bearing a clear impact on natural and social systems.



SPOTLIGHT ON

The persistent warm and dry conditions of 2018 show a clear impact on key climate variables.



Headline Climate Indicators

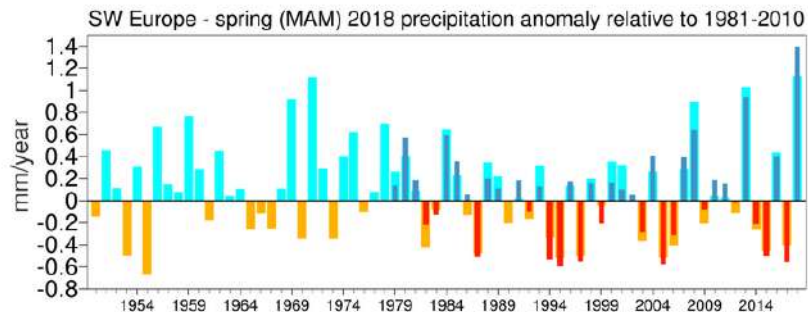
The headline climate indicators show the long-term evolution of essential climate variables. These can be used to assess the global and regional trends in a changing climate.





Climate
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European State of climate



European Climate Change Service
European State of the Climate | 2018



Cooperation
Copernicus

ECMWF



KEY MESSAGES

- Southern Europe experienced a wetter-than-average year.
- Southwestern Europe had one of the two wettest springs since at least 1950, mainly as a result of heavy rainfall events.
- Southeastern Europe saw one of the wettest summers of the last seventy years.
- Ex-hurricane Leslie was the strongest storm to hit the Iberian Peninsula since 1842. It led to heavy rainfall and flooding in several locations.

GENERAL

An overview of actual and seasonal conditions in Europe and the European Arctic, compared with the long-term average.



ACONTECIMIENTOS



SPOTLIGHT ON

The persistent warm and dry conditions of 2018 show a clear impact on key climate variables.



Headline Climate Indicators

The headline climate indicators show the long-term evolution of essential climate variables. These can be used to assess the global and regional trends in a changing climate.



Cooperation
Copernicus
Europe's eyes on Earth



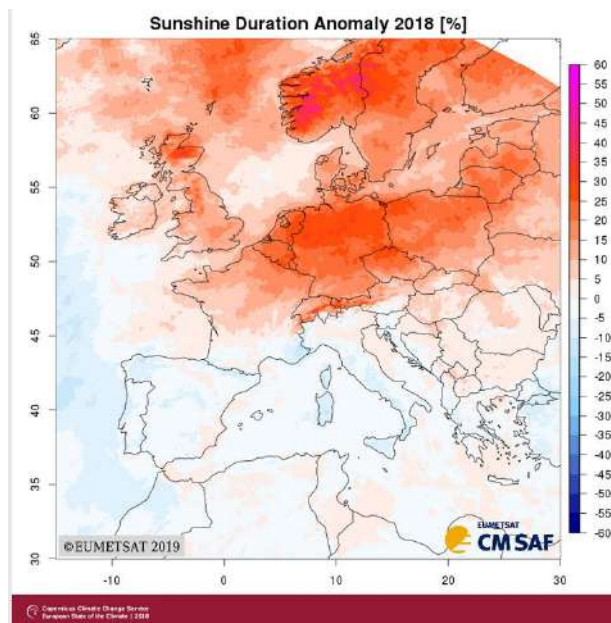
European
Commission

ECMWF



Climate
Change

European State of climate



KEY MESSAGES

- Record sunshine duration in parts of central and northern Europe.
- Widespread sunshine anomalies of more than 20%; regionally up to 40%.
- Only in southern Europe was sunshine duration below average.

GENERAL

An overview of actual and seasonal conditions in Europe and the European Arctic, compared with the long-term average.



EVENTS

Three major events in 2018 showed persistent weather conditions over several months, bearing a clear impact on natural and societal systems.



FOCO EN



Headline Climate Indicators

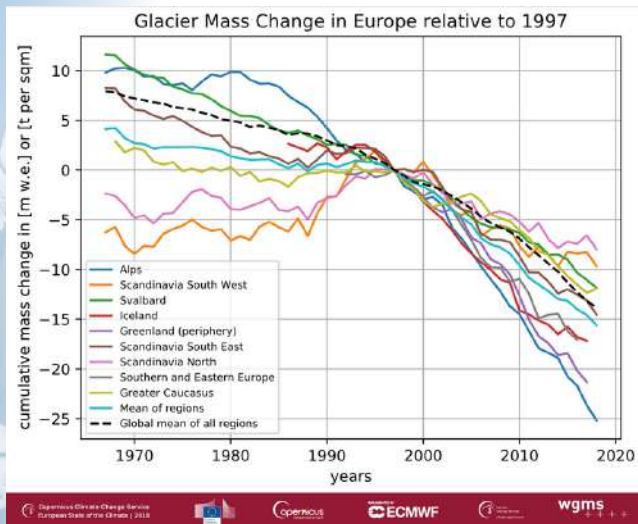
The headline climate indicators show the long-term evolution of essential climate variables. These can be used to assess the global and regional trends in a changing climate.





Climate
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European State of climate



▼ Globally: more than 20 m
of observed loss in ice thickness
since 1960s

▼ Europe: observed loss in ice
thickness since 1960s ranges
between 2 m in southwestern
Scandinavia and 34 m in the Alps



GENERAL

An overview of meteorological and seasonal conditions in Europe and the European Arctic, compared with the long-term average.



EVENTS

Three major events in 2018 showed persistent weather conditions over several months, bearing a clear impact on meteorological and seasonal averages.



SPOTLIGHT ON

The persistent warm and dry conditions of 2018 show a clear impact on key climate variables.



Principales indicadores climáticos



European
Commission





Climate Change

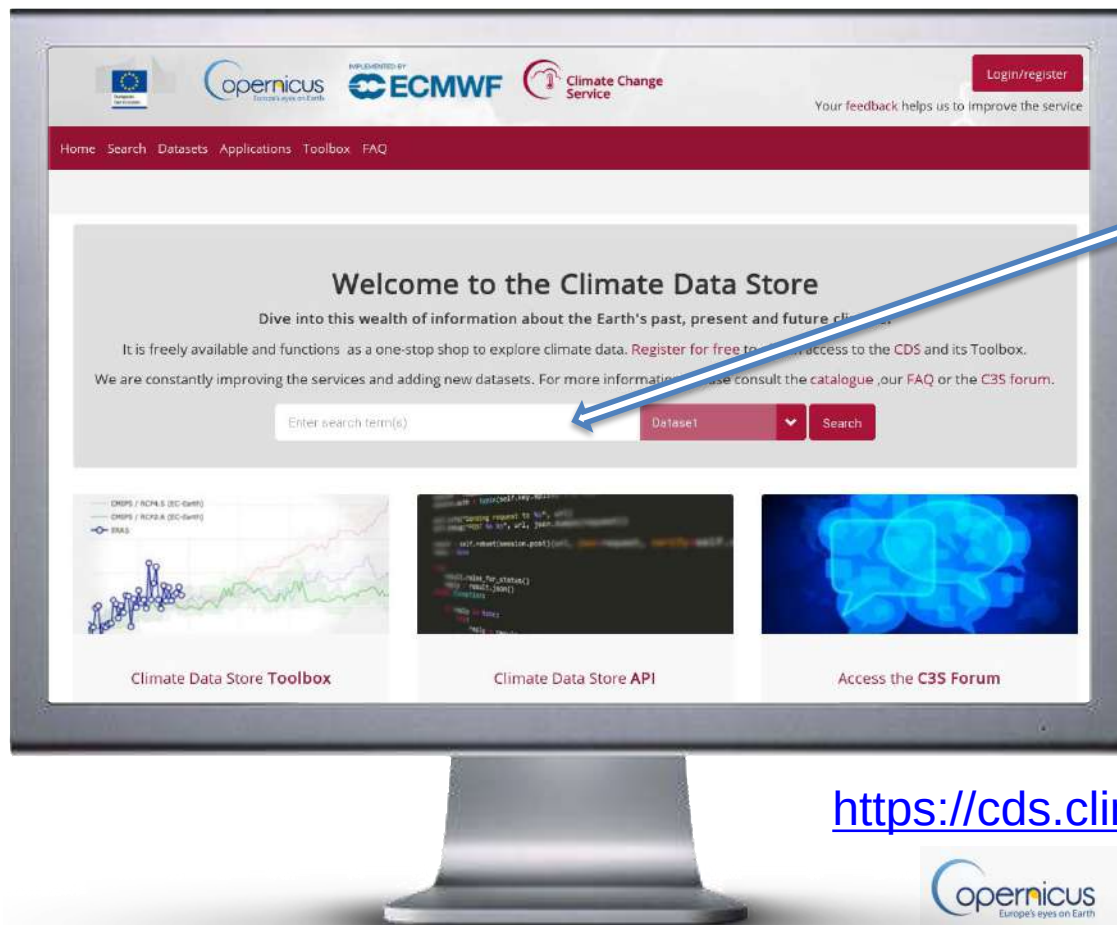
Copernicus Climate Change Service (C3S) – distribución de datos climáticos





Climate
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Distribución de datos climáticos



búsqueda

<https://cds.climate.copernicus.eu/>



Distribución de datos climáticos

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Overview Download data Documentation

Methane (CH₄) is the second most significant greenhouse gases that has increased in concentration in the atmosphere directly due to human activities. At the viewpoint of the radiative forcing of climate change, its mole fraction has increased from a pre-industrial level of about 700 ppb to current levels that are about 1 960 ppb at high northern latitudes and approach 1 800 ppb at the South Pole.

This dataset is a time extension of products generated in the framework of the **European Space Agency anthropogenic greenhouse gases Climate Change Initiative** (ESA GHG CCI) using data from the Scanning Imaging Absorption Spectrometer for Atmospheric Cartography sensor (SCIAMACHY) and the subunit Fourier Transform Spectrometer of the Thermal And Near-infrared Sensor for carbon Observation sensor (TANSO/FTS).

The column average methane values are computed from the SCIAMACHY original data using two different algorithms: the Bremen optimal Estimation Doas (BESD) algorithm and the Weighting Function Modified Doas (WFMDO) algorithm. For the TANSO/FTS sensor, the two algorithms that were applied are: the University of Leicester Full Physics Retrieval Algorithm (OCFPA) based on the original Orbiting Carbon Observatory (OCO) Full Physics Retrieval Algorithm and the SRON/AT RemoteC Full Physics Retrieval Algorithm (SRFP).

Typically different methods have different strengths and weaknesses and therefore which product to use for a given application typically depends on the application.

More details about the product are given in the Documentation section.

Methane SCIAMACHY/ENVISAT WFMDO

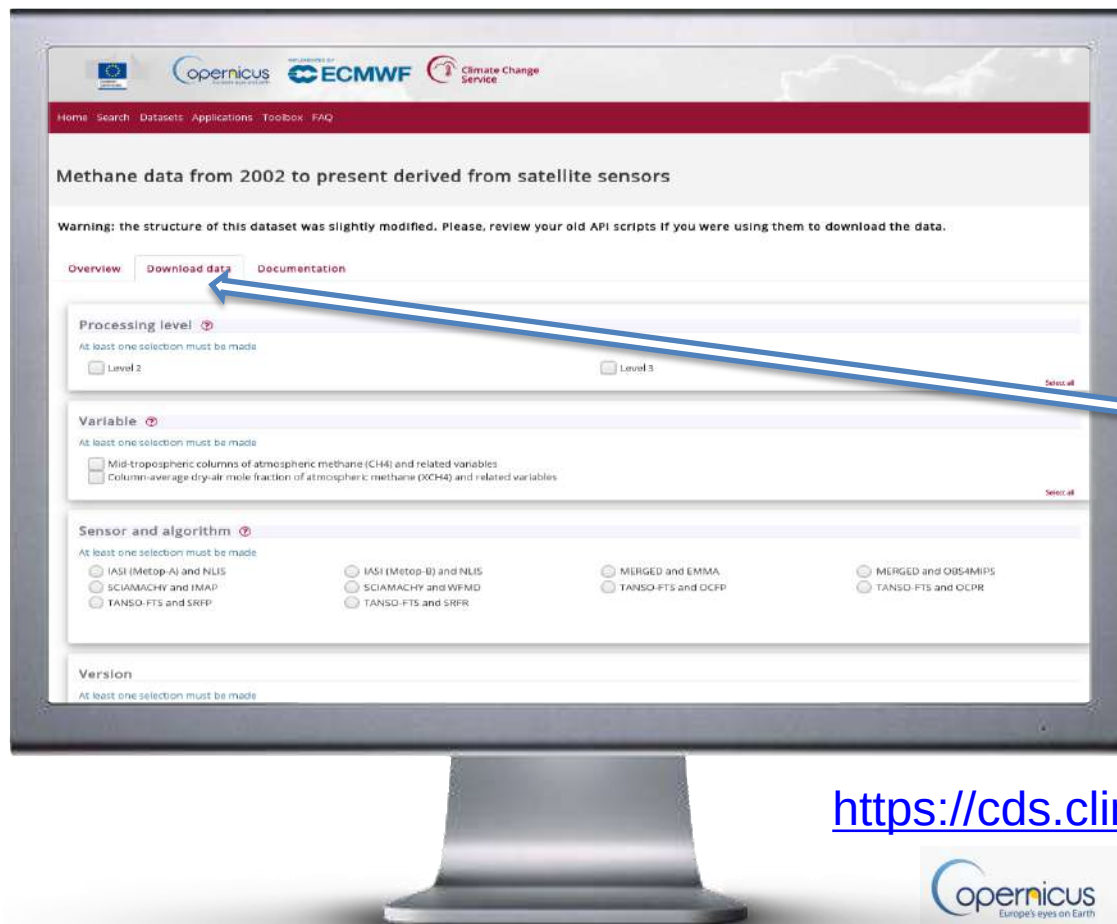
Temporal coverage	SCIAMACHY-WFMDO: October 2002 until April 2012 SCIAMACHY-BESD: August 2002 until March 2012 TANSO/FTS-OCFPA: April 2009 until December 2017 TANSO/FTS-SRFP: April 2009 until December 2017
Temporal resolution	SCIAMACHY: 1s. However, since the products are derived from Nadir (downlooking) mode observations, which are carried out only 50% of the time, the resolution has gaps along each orbit. TANSO/FTS: 4s. However, there are gaps of about 20s (about 200 km) between the 10 km footprints.

<https://cds.climate.copernicus.eu/>



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Distribución de datos climáticos



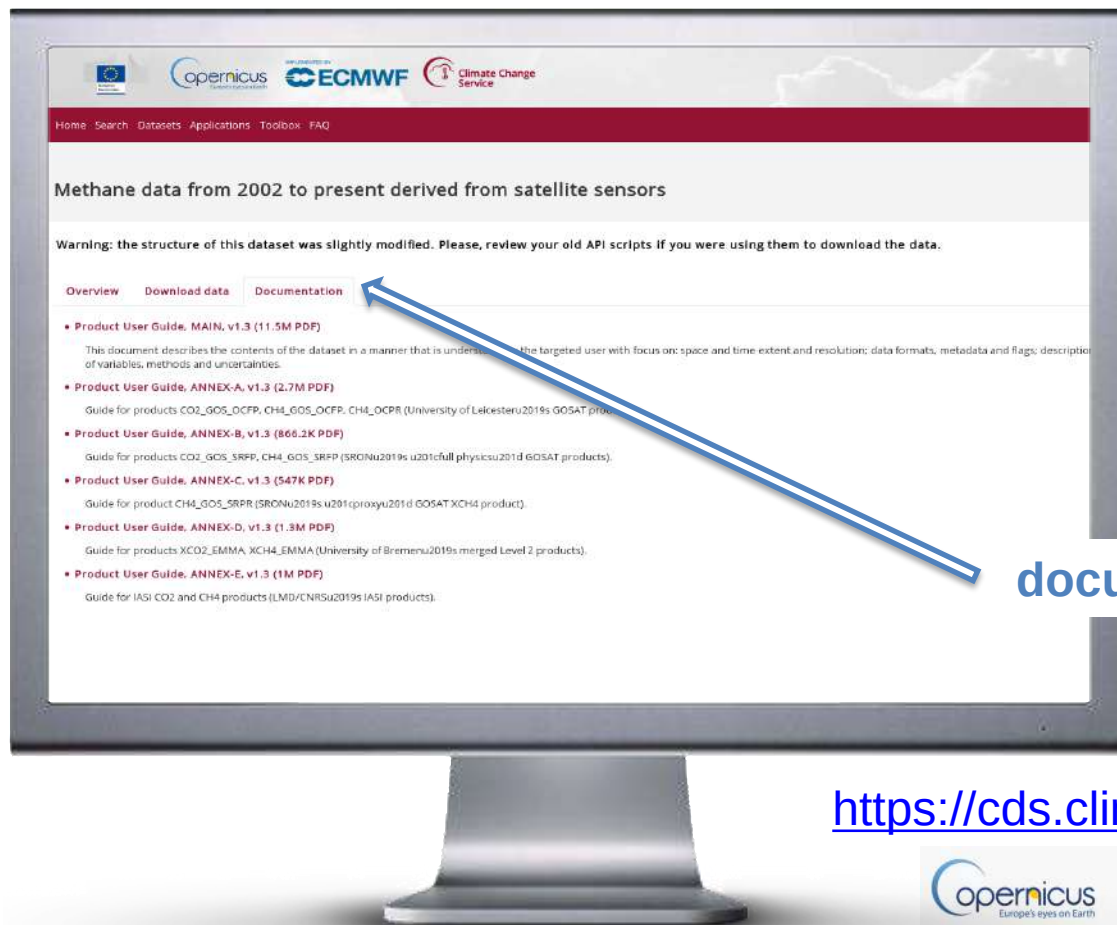
Recuperación de
datos

<https://cds.climate.copernicus.eu/>



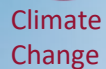
Climate
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Distribución de datos climáticos

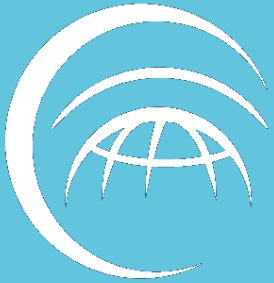


documentación

<https://cds.climate.copernicus.eu/>



Copernicus Atmosphere Monitoring Service (CAMS)



Atmosphere Monitoring





Atmosphere
Monitoring

Copernicus Atmospheric Monitoring Service



Información fiable sobre composición atmosférica para actores políticos, empresas, científicos y ciudadanos en general



Fortalecimiento del conocimiento e impulso a tomas de decisiones informadas en temas como calidad del aire, salud, energía solar, tiempo y clima



CAMS PORTFOLIO

- Previsiones, análisis y reanálisis de la composición de la atmósfera
- Previsión de la radiación ultravioleta
- Modelos de la atmósfera para estudios de efectos
- Forzamiento climático
- Catálogo de emisiones naturales y antropogénicas
- Emisiones de los fuegos



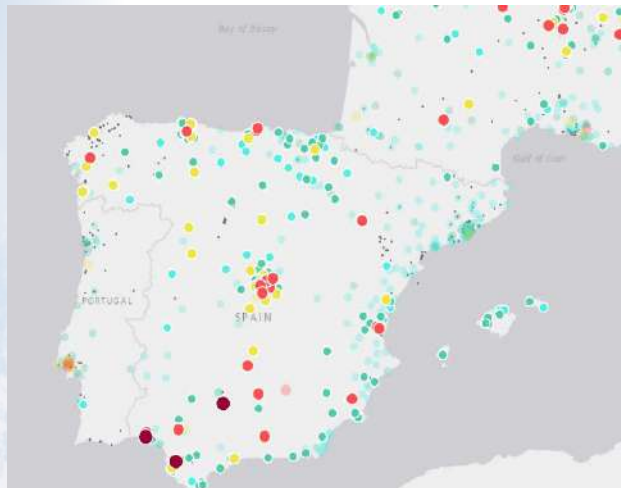
Portfolio	Product groups
A. Regional products	European AQ NRT analyses
	European AQ NRT forecasts
	European AQ interim reanalyses
	European AQ reanalyses
B. Global products (troposphere and stratosphere)	Global atmospheric composition NRT analyses
	Global atmospheric composition NRT forecasts
	Global atmospheric composition reanalyses
C. Supplementary products	Policy support products
	Solar radiation
	Greenhouse gas fluxes
D. Emissions products	Climate forcings
	Anthropogenic emissions
	Fire emissions



Atmosphere
Monitoring

¿Por qué se necesita CAMS?

European Environment Agency

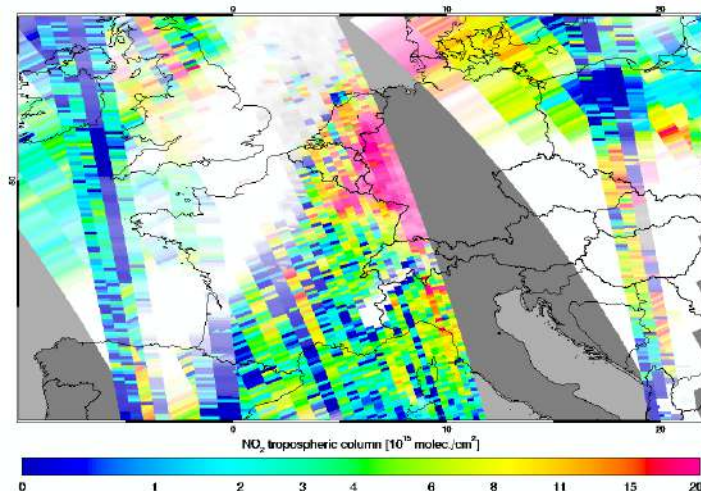


Numerosas observaciones in-situ en el suelo pero mucho espacio sin sensor, aun en Europa

Los productos de CAMS ofrecen un flujo continuo de datos, cubriendo el planeta entero sin huecos, y con una resolución de ~40 km (10 km en Europa)

OMI NRT tropospheric NO₂ 12 Nov 2016

KNMI/NASA



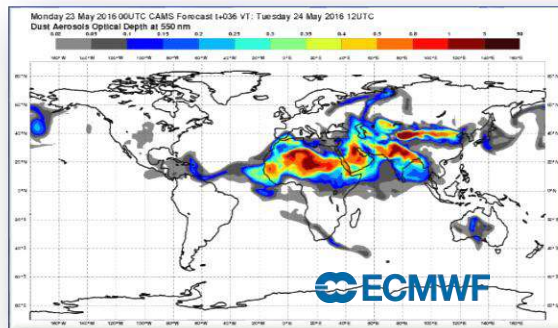
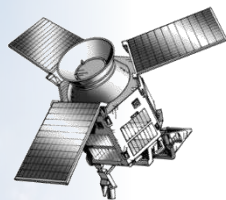
Uso directo de los datos satélites es difícil: hay espacio sin datos; hay mucho ruido; las nubes impiden las medidas



Atmosphere
Monitoring

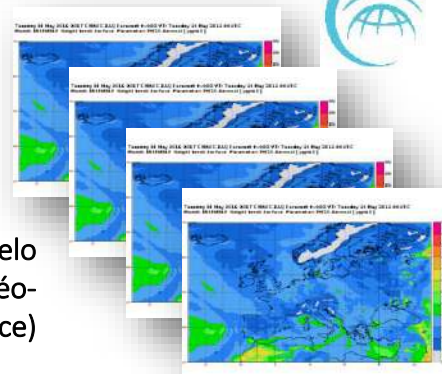
CAMS CADENA DE SERVICIO

Agencias espaciales

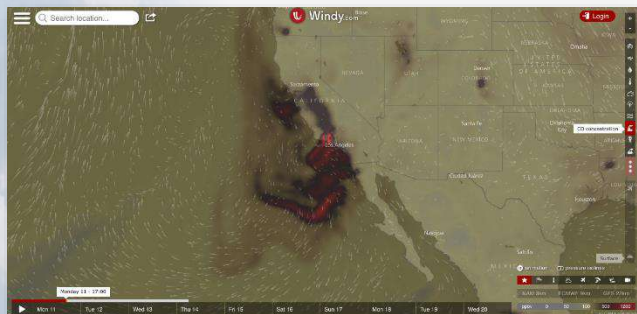


ECMWF Integrated Forecasting System (IFS)

Observaciones in-situ



Conjunto multimodelo
regional (lead: Météo-
France)



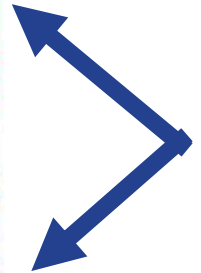
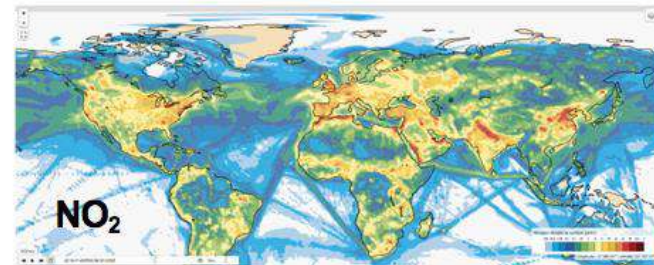
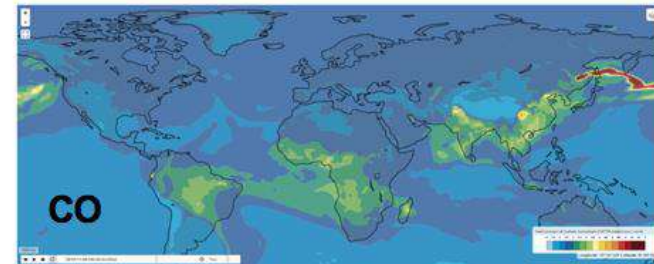
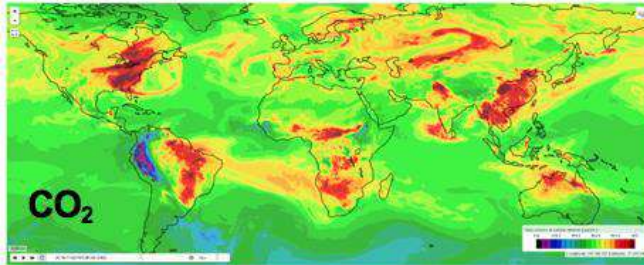
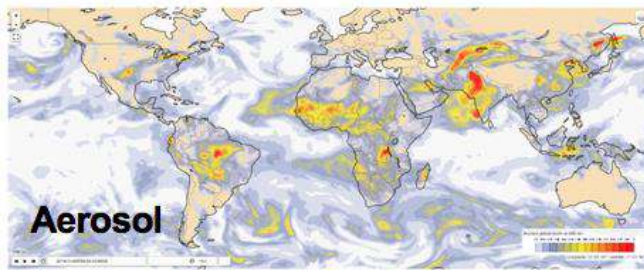
Usuarios



Atmosphere
Monitoring

Productos globales

<http://atmosphere.copernicus.eu/maps>



Principales aerosoles, gases de efecto invernadero, gases reactivos,
capa de ozono, radiación ultravioleta

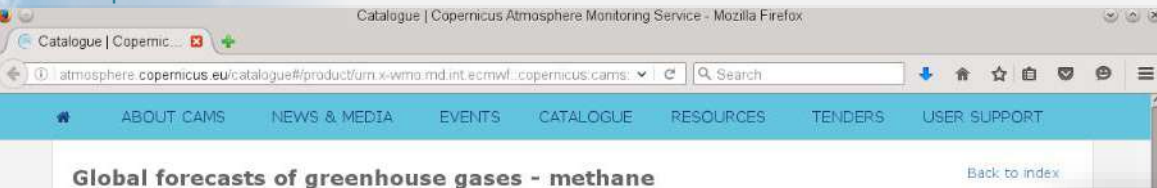
Análisis y previsiones a cinco días, dos veces por día
Reanálisis del 2003 hasta hoy



CAMS portfolio: catálogo online

Atmosphere

<http://atmosphere.copernicus.eu/catalogue>

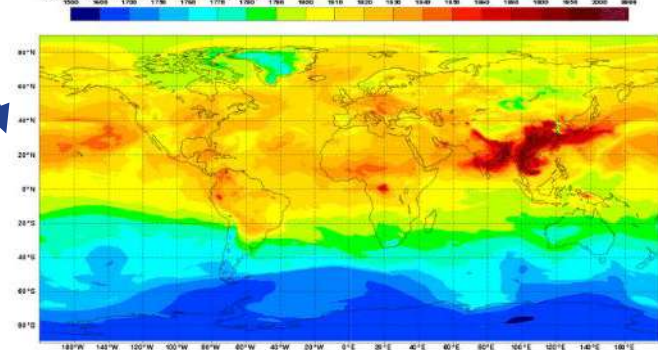


Global forecasts of greenhouse gases - methane

[Back to index](#)

Tuesday 11 October 2016 00UTC CAMS Forecast 1+036 VT: Wednesday 12 October 2016 12UTC

Mean Column Methane Mixing Ratio (ppbv)



This service provides near-real-time forecasts of CO₂ and CH₄ for the next 10 days using the CTESSEL model for the land surface fluxes and GFAS for wildfire and biomass burning emissions.

Theme: Climate forcing, Air quality and atmospheric composition

Product family: Global forecasts

Parameter: Methane

Geographical area: (-180, 180, -90, 90)

Time coverage:

Metadata: XML



Data download



Verification results



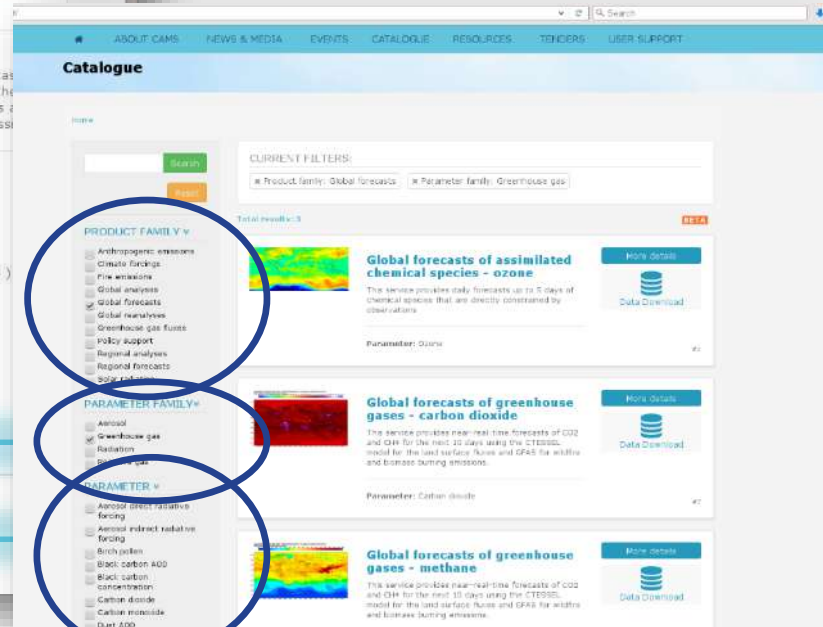
Plots



Documentation



Contact us



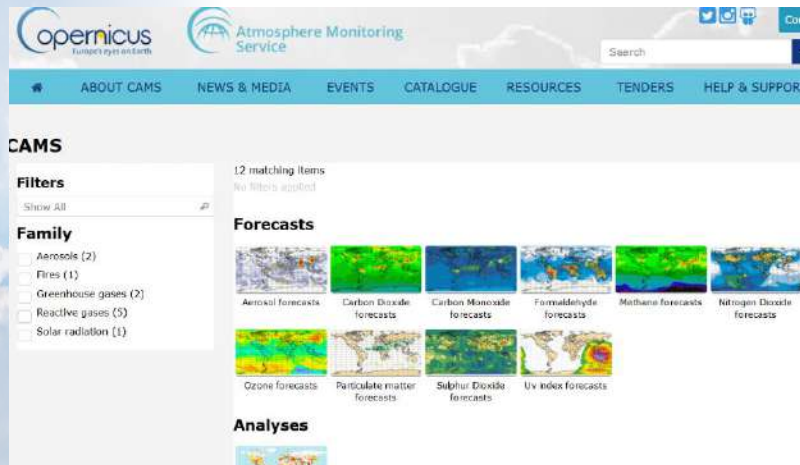
European Commission



Productos globales - Ozono

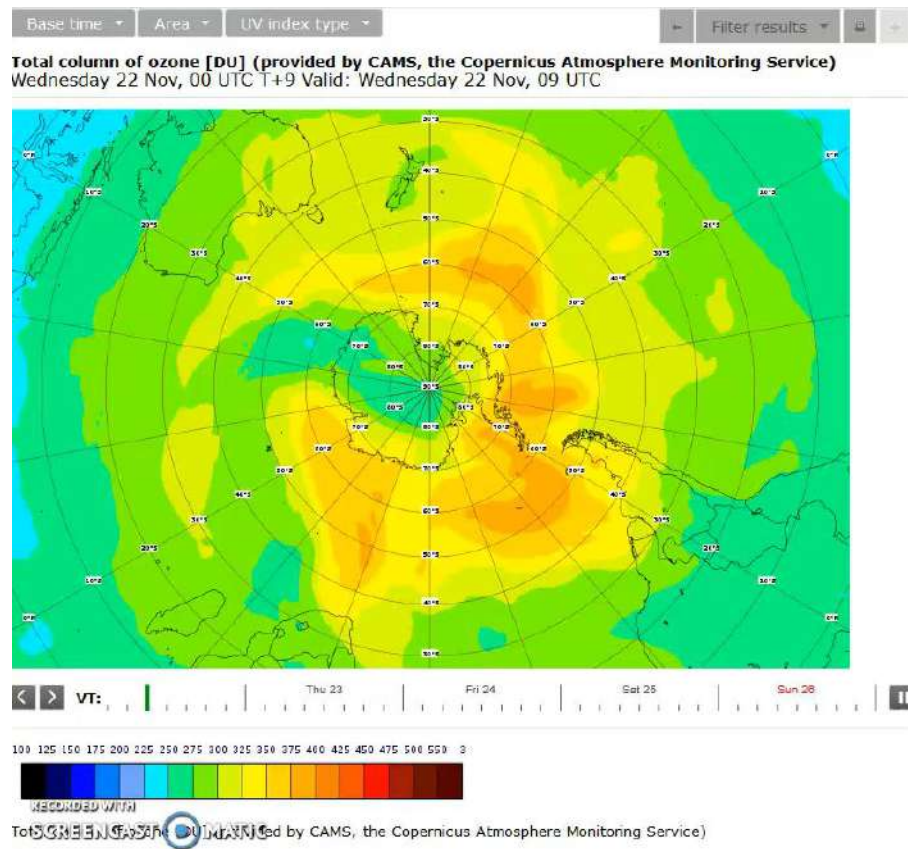
Atmosphere
Monitoring

<http://atmosphere.copernicus.eu/charts/cams>



Acceso directo para visualizar los
productos mas utilizados

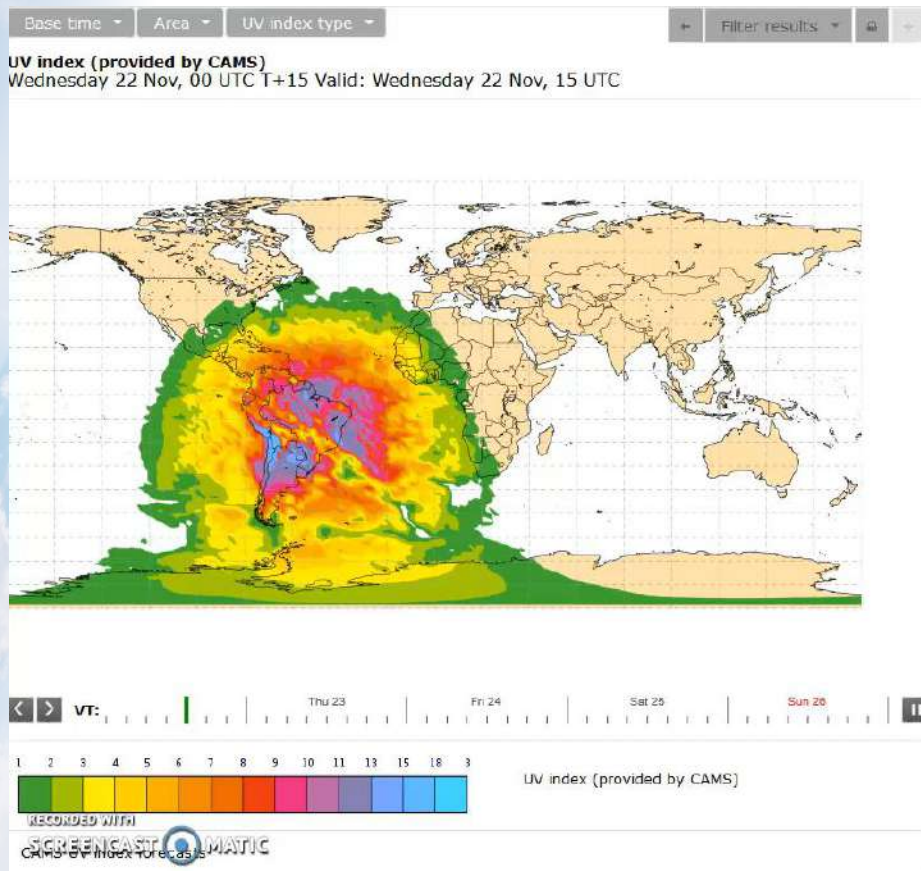
Nueva página web para monitoreo la capa de ozono:
<https://atmosphere.copernicus.eu/monitoring-ozone-layer>





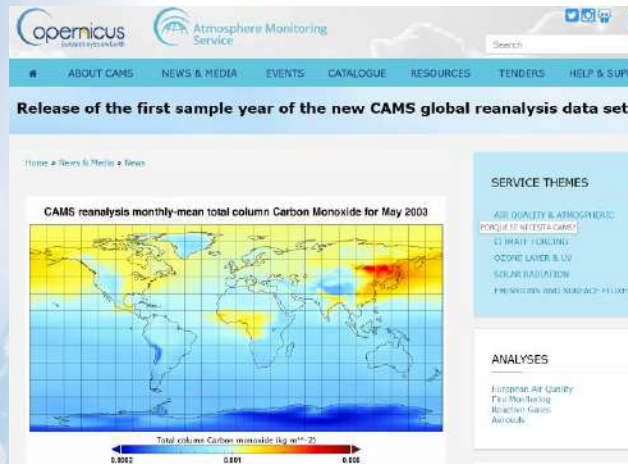
Atmosphere
Monitoring

Productos globales - UV



<http://atmosphere.copernicus.eu/charts/cams>

Previsiones del índice de radiación ultravioleta



Los reanálisis de CAMS han añadido en particular:

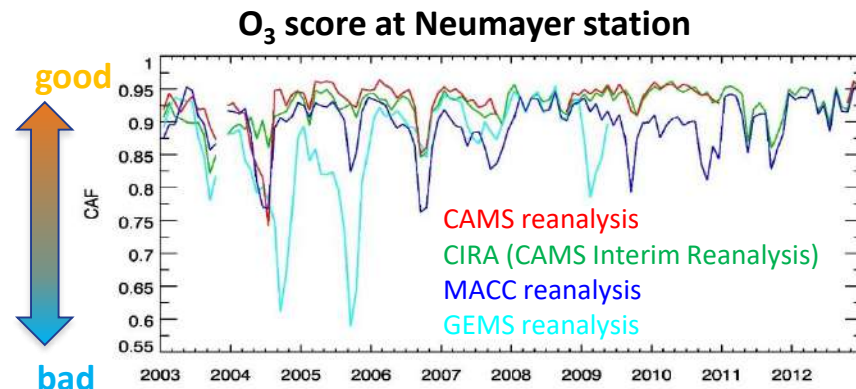
- los últimos desarrollos en el modelo
- nuevos conjuntos de datos
- prolongación hasta el presente

Ofrece una mejora en comparación con reanálisis anteriores MACC y GEMS

Incluyen todas las observaciones desde 2003

Ofrecen datos coherentes a largo plazo, para el planeta entero, y calculados con un mismo modelo fijo

Este producto no tiene muchos equivalentes en el mundo

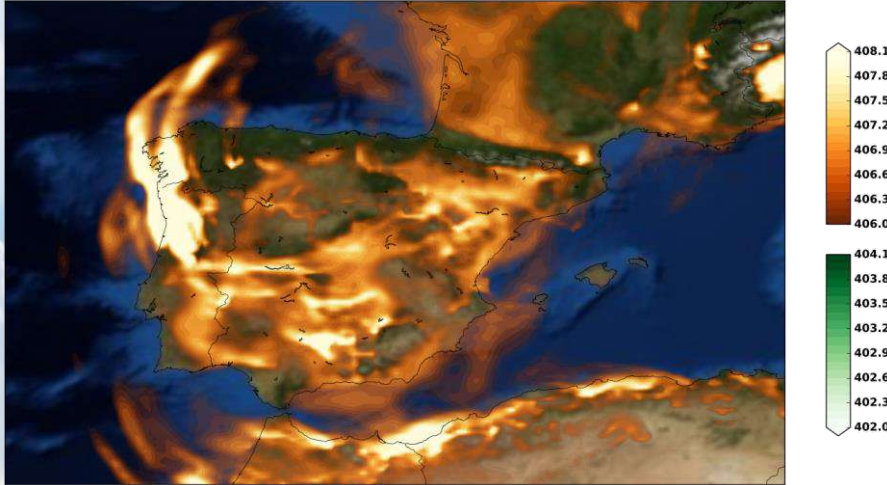




Atmosphere
Monitoring

Flujos de gases de efecto invernadero

20171015 15 UTC



Media de la columna atmosférica de CO₂ [ppm]
(15/10/2017) en la península ibérica

Resultado de todos los flujos en la atmósfera
basado en la previsión de CO₂ a alta resolución

- Anomalías positivas en comparación con la media global provocadas por las emisiones antropogénicas, la respiración de los ecosistemas y los fuegos
- Anomalías negativas escasas en este periodo del año



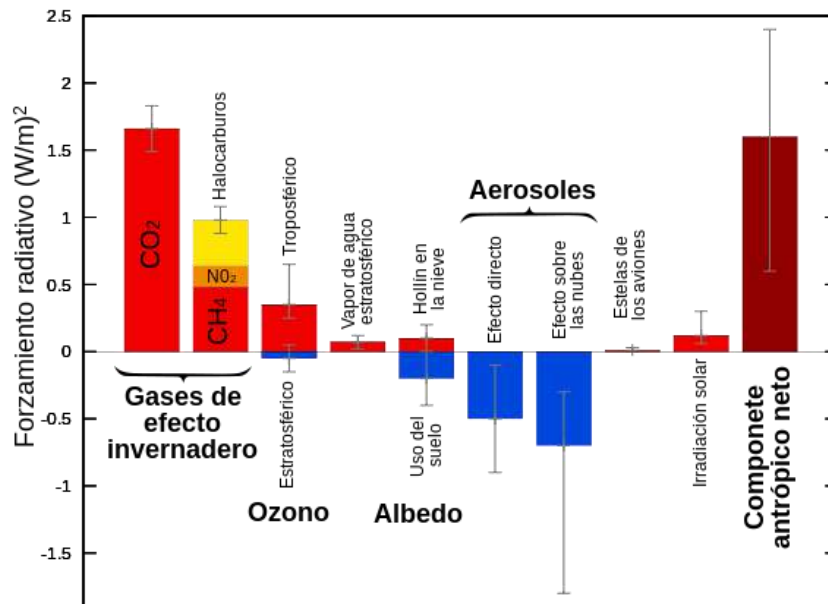
Forzamiento Radiativo del Clima

Cuantifica el desequilibrio en el balance de energía de la Tierra.

Utiliza:

- Para la era preindustrial, estimaciones de la composición de la atmósfera y de los flujos de superficie
- Para el presente, reanálisis de CAMS de la composición de la atmósfera para calcular los flujos radiativos

Calcula la diferencia entre hoy y la era preindustrial con un modelo de radiación, centrándose sobre todo en las incertidumbres



Cambio en el forzamiento radiativo entre 1750 y 2005 según las estimaciones del IPCC

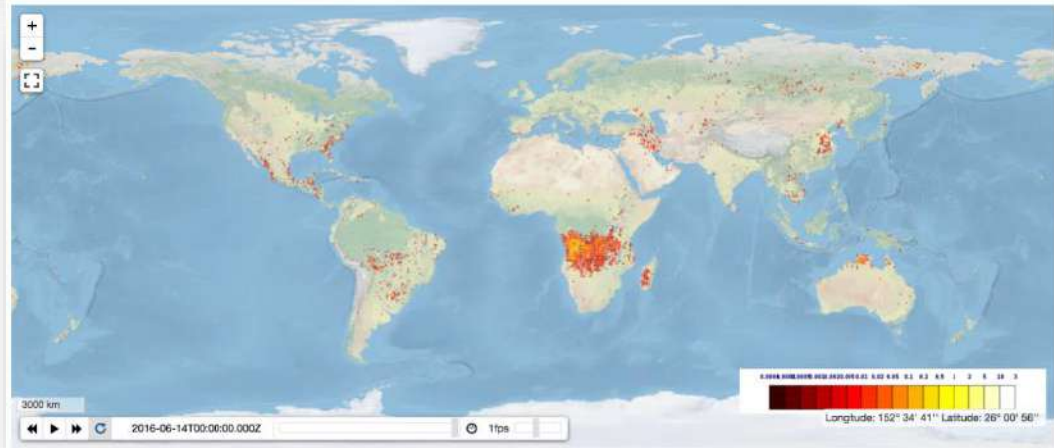


E m i s i o n e s

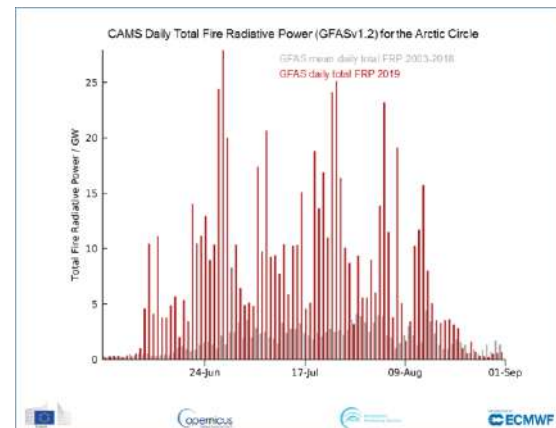


- **Emissiones diarias de fuegos** para ~40 constituyentes de la atmósfera

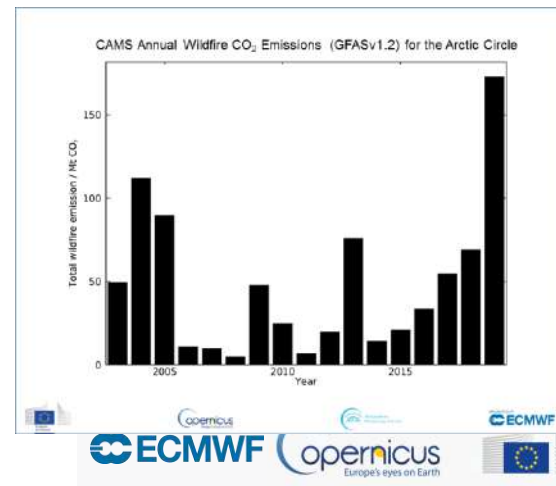
- **Emissiones antropogénicas:**
 - en Europa, con una resolución de 10km, del 2003 hasta hoy
 - para el planeta entero, con una resolución de ~50km, del 2003 hasta A-3
- **Emissiones naturales** para el planeta entero, con una resolución de ~50km, del 2003 hasta A-3

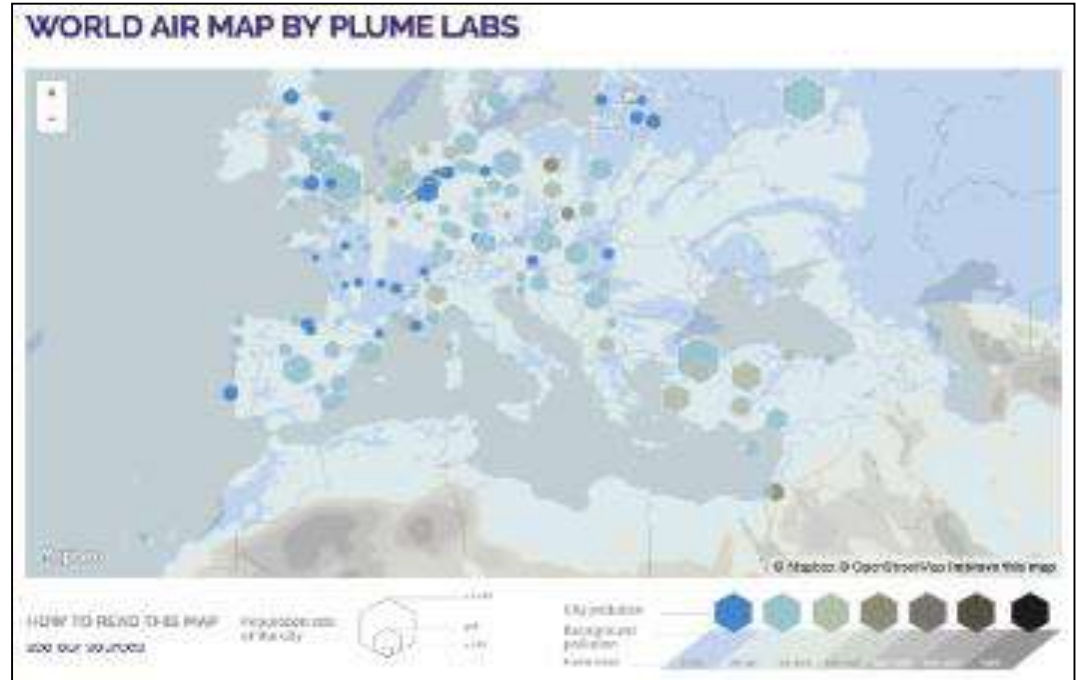
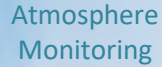


Atmosphere Monitoring



- Daily total wildfire emissions were well above the 2003-2018 average throughout the summer north of the Arctic Circle
- Many wildfires concentrated in the Sakha Republic, Russia with other fire activity in Alaska, Yukon Territory and Greenland
- Total estimated equivalent CO₂ of ~170 megatonnes







Atmosphere
Monitoring

Usuarios de productos globales - WINDY



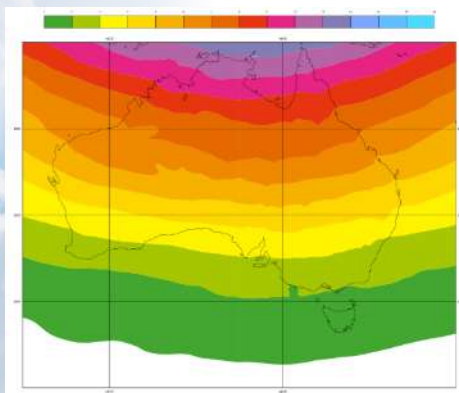
Windy ofrece una visualización de parámetros meteorológicos y de composición de la atmósfera (polvo, CO, SO₂)



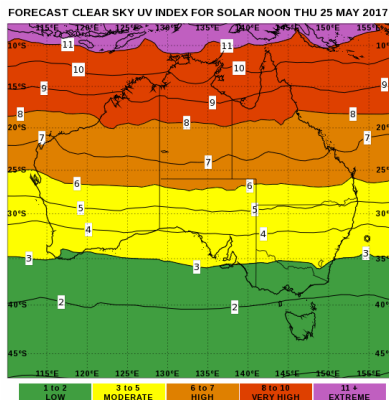
Atmosphere
Monitoring

Usuarios de productos globales - SUNSMART

En colaboración con el Bureau of Meteorology de Australia, SunSmart utiliza las previsiones de índice UV de CAMS cada día en sus aplicaciones para smartphones.



Previsiones de UV index
Copernicus



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Generated using Copernicus Atmosphere Monitoring Service Information 2017.

Previsiones del Bureau of
Meteorology de Australia



Previsiones SUNSMART
del Cancer Council Victoria
para smartphones

Atención al usuario – Ayuda y recursos



¿Qué tipo de ayuda (support) pueden recibir los usuarios?

Help and support

<https://climate.copernicus.eu/user-support>

We provide a dedicated user support service to aid Climate Change Service data discovery, dissemination, understanding and use by all users. The user support service currently includes a Knowledge Base accessible 24/7 and a friendly manned helpdesk.

24/7 Knowledge Base

The Knowledge Base provides documentation and answers to frequently asked questions.

Contact us

copernicus-support@ecmwf.int

or

login to the [C3S Enquiry Portal](#)

Forum

For users of the Climate Data Store

Become part of the community, work together and support each other.

Ayuda de nivel-0: Copernicus Knowledge Base (CKB)

Forum for discussion and solutions

Recursos de formación

garantía de recibir:

- respuesta en menos de 8 horas laborables
- solución para los problemas básicos (Nivel 1) en menos de 5 días laborables

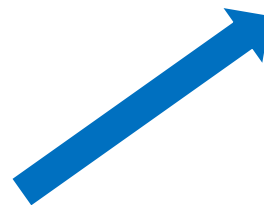
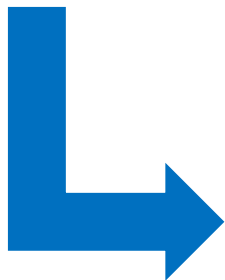
En resumen...



CAMS & C3S
del big data a las aplicaciones locales



Aplicaciones
'downstream'



¡Muchas gracias por vuestra atención!

Joaquín Muñoz Sabater
**ECMWF, Copernicus Climate Change
Service (C3S)**

 joaquin.munoz@ecmwf.int

 @j_munoz_sabater



XVIII Congreso Nacional de Teledetección
24-27 Septiembre 2019, Valladolid, Spain



Back up slides





Climate
Change

¿Qué datos ofrece CAMS?



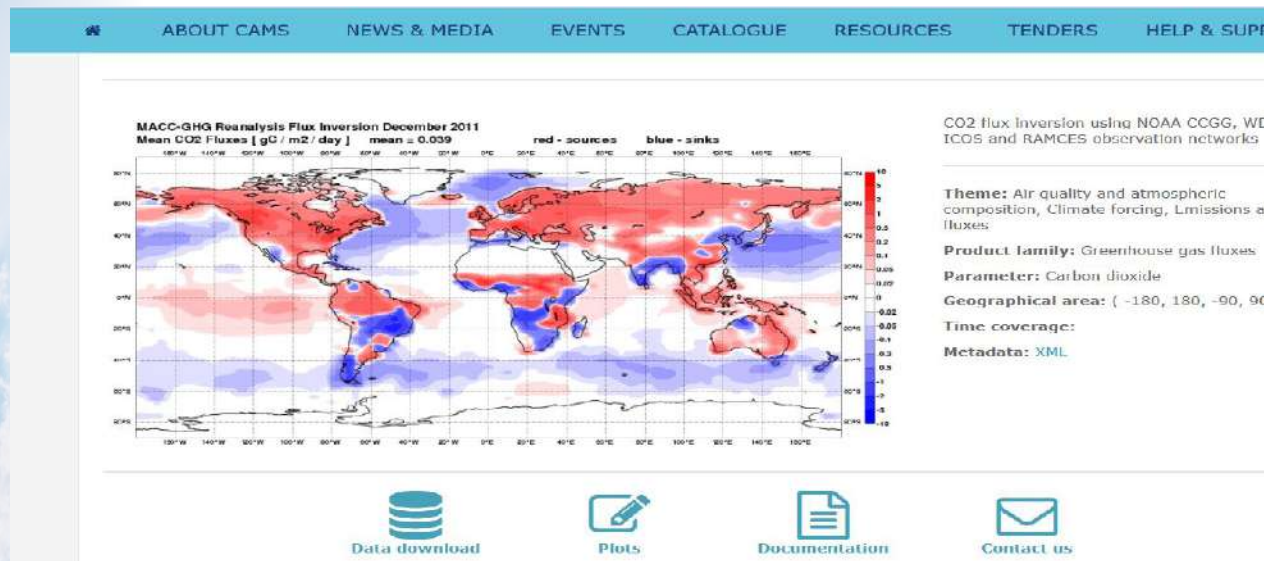
Portafolio de productos del servicio CAMS
Acuerdo de delegación con la Comisión Europea

Portfolio	Product groups
A. Regional products	European AQ NRT analyses
	European AQ NRT forecasts
	European AQ interim reanalyses
	European AQ reanalyses
B. Global products (troposphere and stratosphere)	Global atmospheric composition NRT analyses
	Global atmospheric composition NRT forecasts
	Global atmospheric composition reanalyses
C. Supplementary products	Policy support products
	Solar radiation
	Greenhouse gas fluxes
	Climate forcings
D. Emissions products	Anthropogenic emissions
	Fire emissions



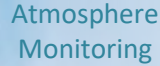
Atmosphere
Monitoring

FLUJOS DE GASES DE EFECTO INVERNADERO



CO₂ de 1979 a 2015
CH₄ de 2001 a 2016
N₂O de 1996 a 2015

La modelización inversa de la atmósfera permite estimar los flujos de superficie para gases de efecto invernadero, basándose en las observaciones de la atmósfera in situ y de satélite.



Cuantifica el desequilibrio en el balance de energía de la Tierra.

Calcula la diferencia de forzamiento radiativo entre hoy y la era preindustrial.

Estima cómo el cambio de la composición de la atmósfera influye en el calentamiento o el enfriamiento del clima.

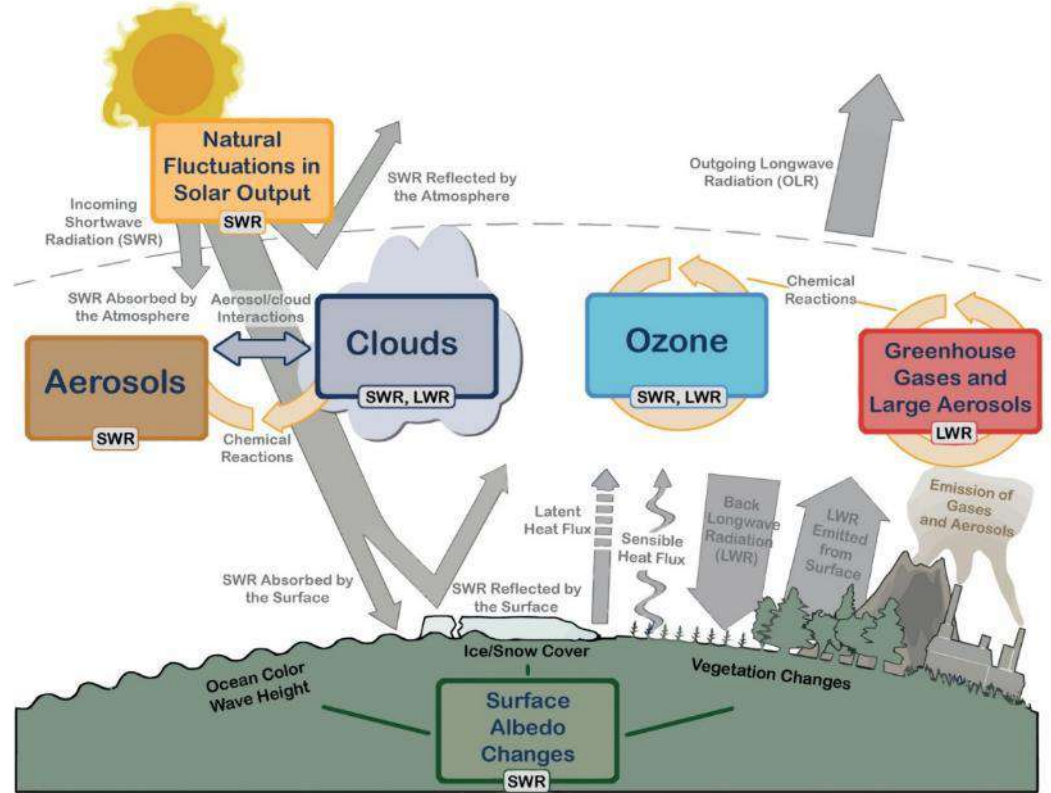
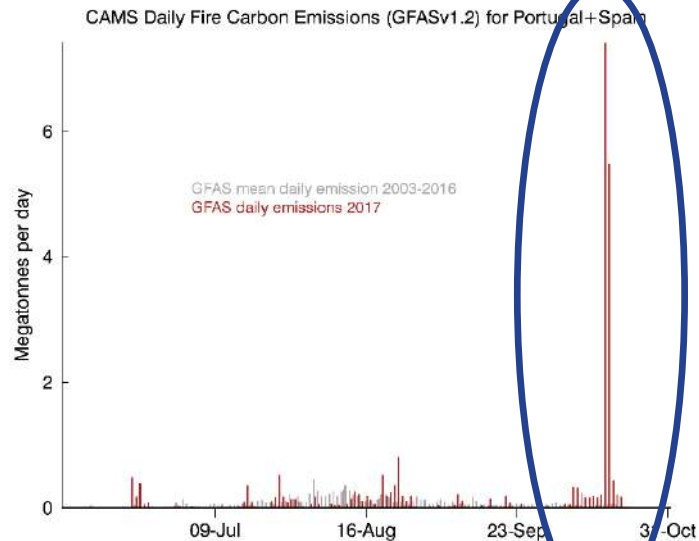


Figure 1.01 of IPCC AR5, 2013

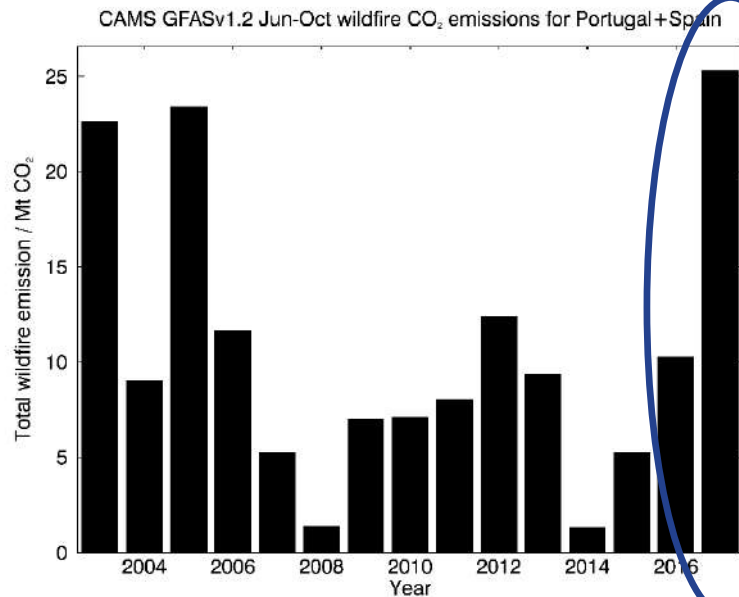


Atmosphere
Monitoring

EMISIONES DE LOS FUEGOS



Total de las emisiones diarias de los fuegos en la península ibérica entre junio y octubre 2017



Total de las emisiones entre junio y octubre desde 2003 en la península ibérica