Recent successes with Copernicus Services at ECMWF

Vincent-Henri.Peuch@ecmwf, @VHPeuch

Prague, 25 June 2019

Thanks to F. Di Giuseppe, C. Prudhomme, C. Buontempo & J.-N. Thépaut

Atmosphere Monitoring Service
atmosphere.copernicus.eu

Climate Change Service
climate.copernicus.eu

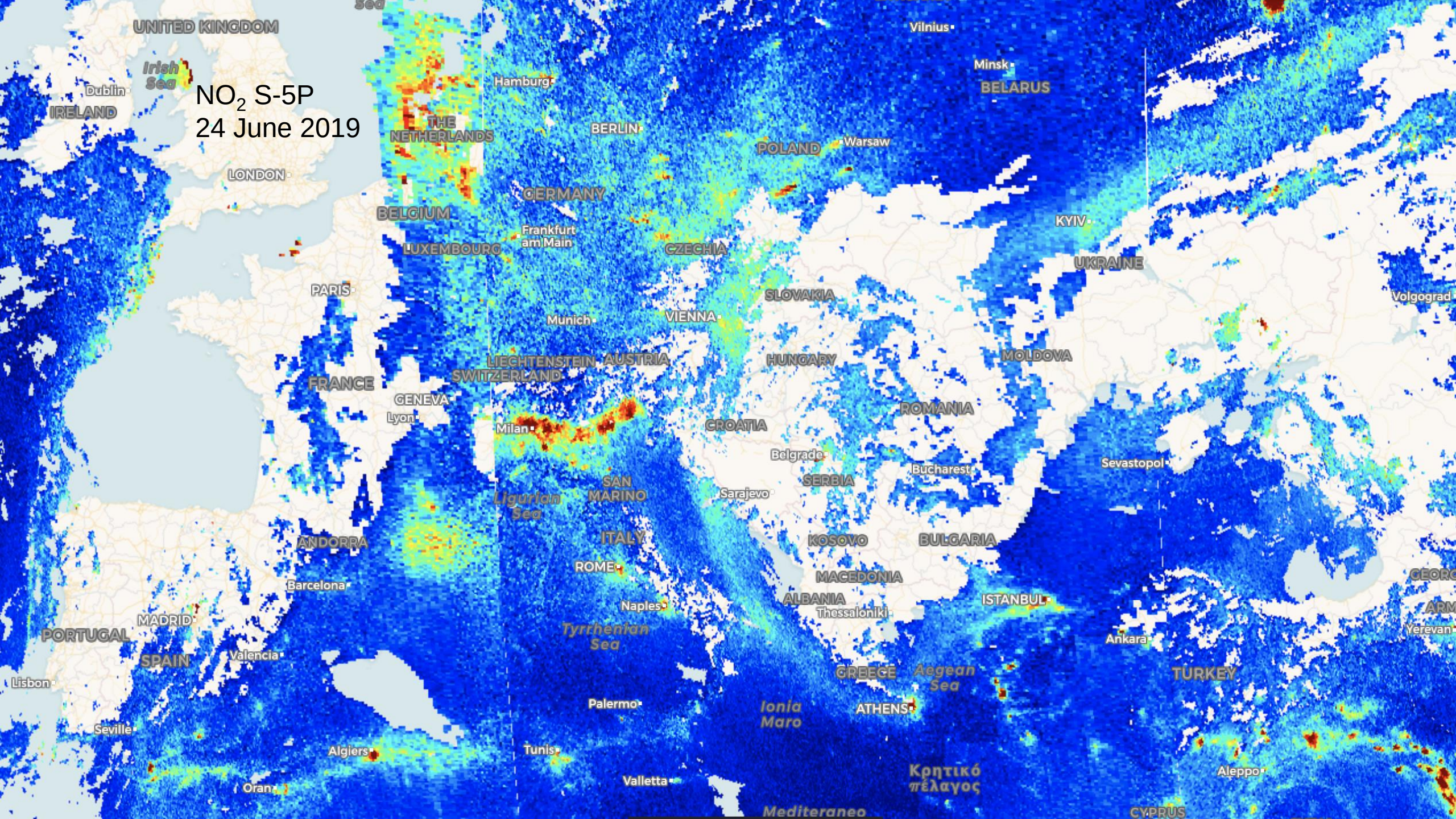
Emergency Management
emergency.copernicus.eu

ECMWF

Copernicus
Europe's eyes on Earth

European Commission

Sentinel-5P
13 October 2017


NO_2 S-5P
24 June 2019
UNITED KINGDOM
Irish Sea
Dublin
IRELAND
Hamburg
THE NETHERLANDS
BERLIN
LONDON
GERMANY
BELGIUM
LUXEMBOURG
Frankfurt am Main
PARIS
FRANCE
GENEVA
Lyon
Milan
LIECHTENSTEIN
SWITZERLAND
AUSTRIA
Munich
VIENNA
CZECHIA
POLAND
Warsaw
Vilnius
Minsk
BELARUS
KYIV
UKRAINE
SLOVAKIA
HUNGARY
MOLDOVA
ROMANIA
CROATIA
Belgrade
Bucharest
SERBIA
Sarajevo
Ligurian Sea
SAN MARINO
ITALY
ROME
Naples
Tyrrhenian Sea
ANDORRA
Barcelona
MADRID
PORTUGAL
SPAIN
Valencia
Lisbon
Seville
Palermo
Algiers
Tunis
Oran
Valletta
Ionia Maro
KOSOVO
BULGARIA
MACEDONIA
ALBANIA
Thessaloniki
GREECE
Aegean Sea
ATHENS
Κρητικό πέλαγος
Mediterraneo
ISTANBUL
Ankara
TURKEY
Sevastopol
Volgograd
Aleppo
CYPRUS

Atmosphere Monitoring

ESTABLISHING COPERNICUS REPUTATION

COMMENT

DESCRIPTION Three lines of text go in heere go in heere until its time for p.xxx

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PICTURE CREDIT

Smog envelopes Santiago in Chile.

nature
International journal of science

Five steps to improve air-quality forecasts

A worldwide network for monitoring and modelling air pollution would reduce its dramatic toll on health and food production, urge **Rajesh Kumar** and colleagues.

Seven million people die every year from the effects of air pollution. More than 90% of such deaths are in developing countries[1]. Across southern Asia, levels of fine particulate matter ($PM_{2.5}$) and surface ozone exceed the World Health Organization (WHO) limits for much of the year[2]. Ozone damage to crops and plants — especially to soya beans, wheat and maize (corn) — results in 79 million to 121 million tonnes of lost produce globally, at a cost of US $11 billion to $18 billion3. India's crop losses alone would feed 94 million people[4]. All this costs the world's economy US$5 trillion per year[5].

But air pollution often goes unmonitored. Some of the fastest growing cities in Africa, including Lagos, Kinshasa, Abidjan and Dakar, have no air-quality alert systems. Governments can be reluctant to acknowledge the problem or lack the tools to address it. There is no international strategy for dealing with the issue. And few people are trained in how to collect and interpret air-quality data.

Improvements can take decades. It took the US city of Atlanta 15 years to reduce emissions from power plants by around 80% and from traffic by up to 90%, saving more than 50,000 hospital visits for asthma and lung diseases (ref. 6). Los Angeles took 50 years to reduce ozone levels by two-thirds[7].

Forecasts of hazardous air pollution are crucial to help reduce exposure. Vulnerable people can avoid strenuous outdoor ▶

6 SEPTEMBER 2018 | VOL 561 | NATURE | 27

"Many parts of North America and Europe provide daily broadcasts of air-quality forecasts. But across much of Asia, Africa and South America, smog still arrives unannounced. Predictions require advanced computer models and regional weather forecasts; both are lacking across the developing world."

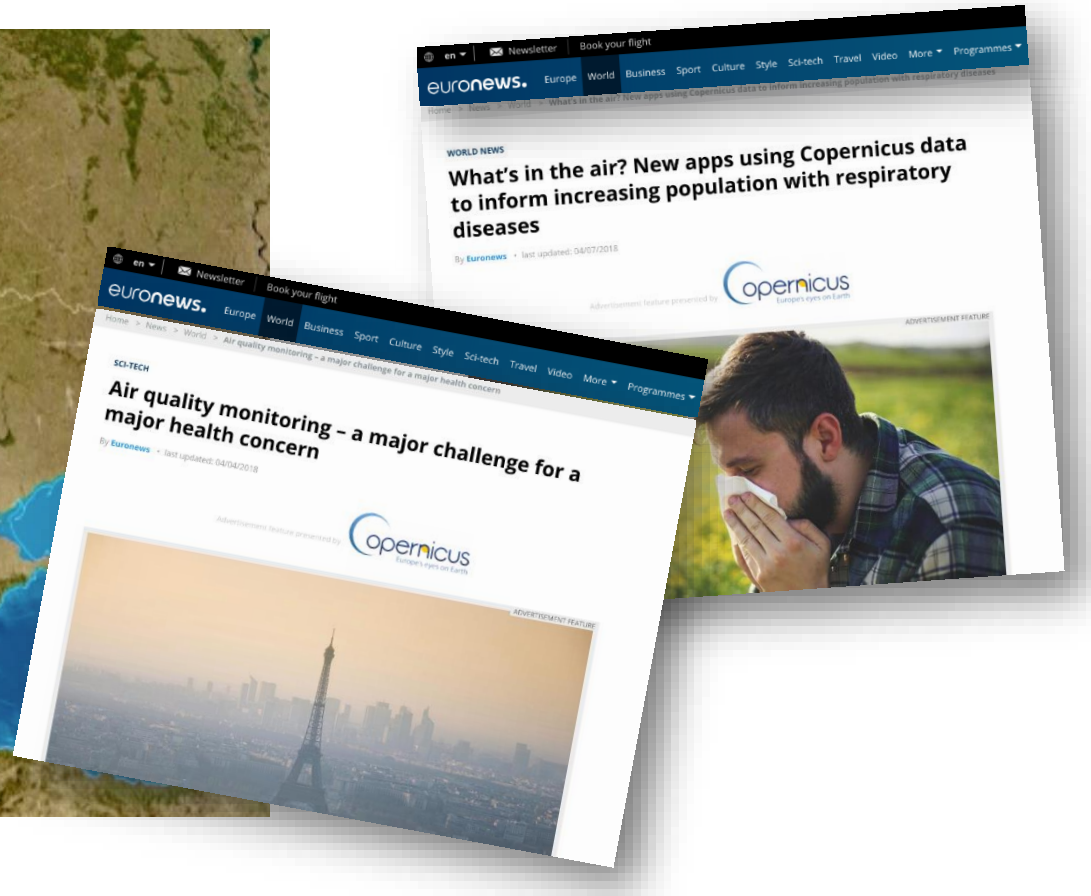
6 September 2018

ECMWF Copernicus Europe's eyes on Earth European Commission

BROADENING COPERNICUS AUDIENCE

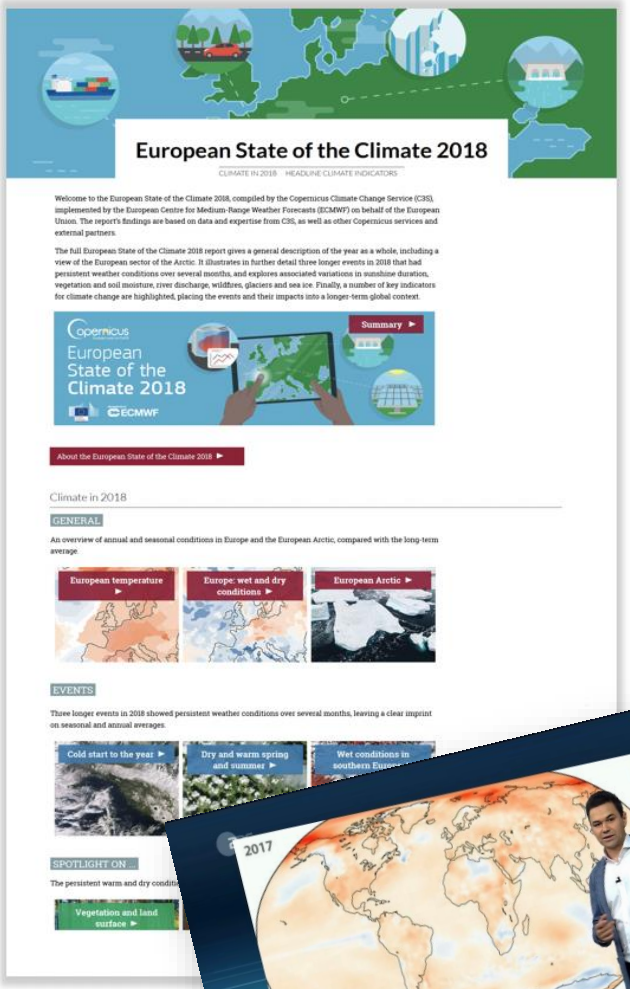
Atmosphere Monitoring

There is an estimated audience of 18.8 million people for the daily Euronews CAMS air quality bulletins and the C3S monthly climate updates.



Climate Change

EUROPEAN STATE OF THE CLIMATE – MARCH EACH YEAR



The complete report is available online:

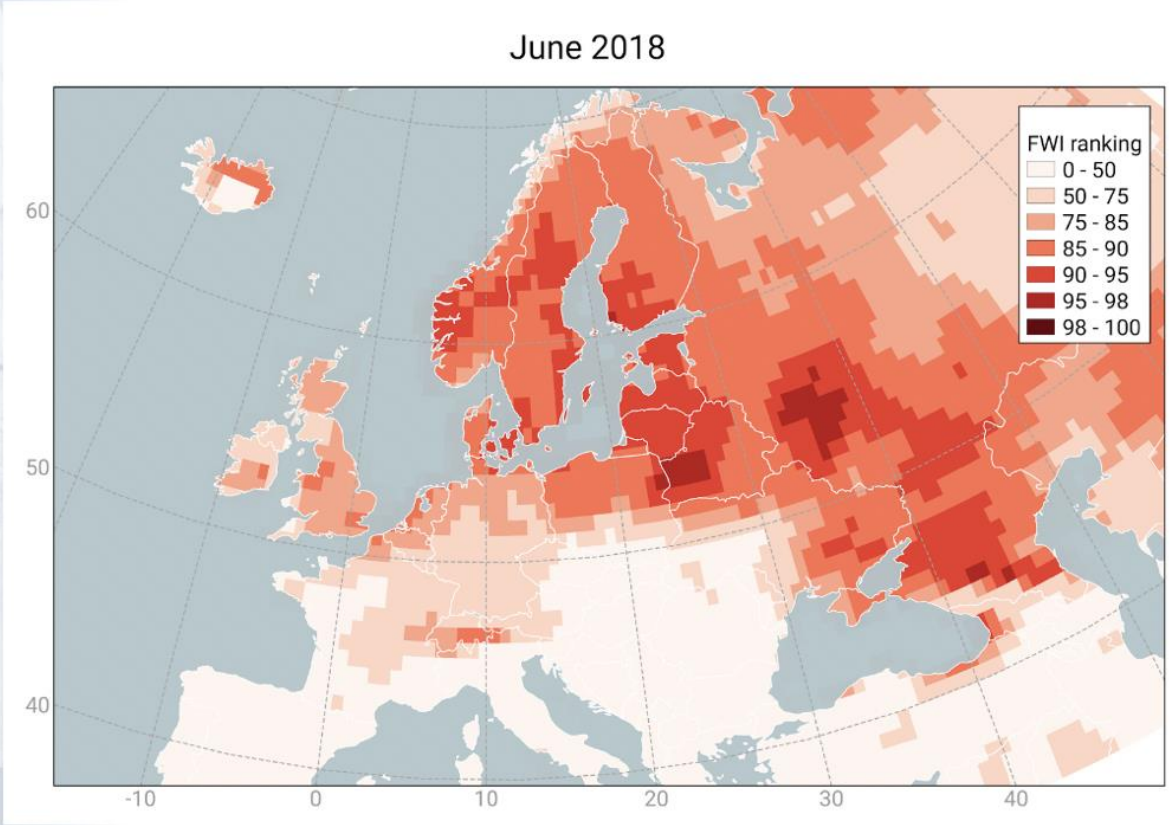
climate.copernicus.eu/ESOTC

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

2018 WILDFIRE ACTIVITY

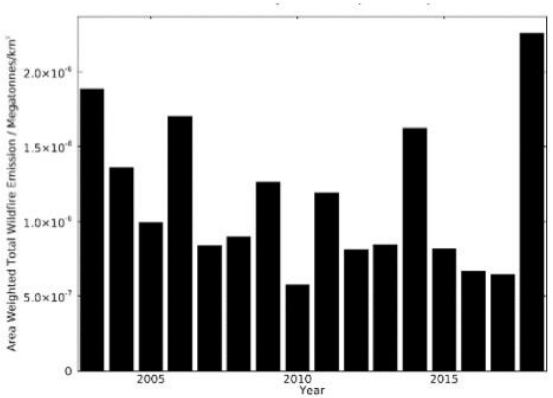
Climate Change

Much above average fire danger across northern, central and eastern Europe

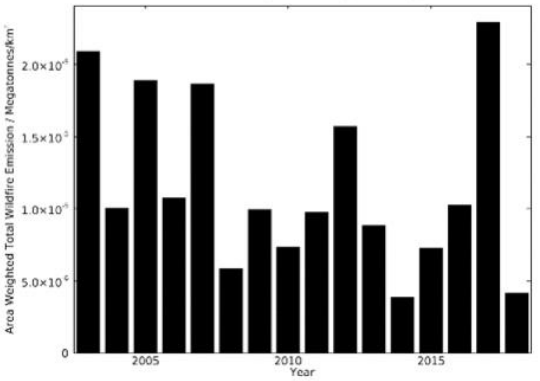


CEMS Fire danger classes

North EU



South EU



CAMS area weighted fire emissions

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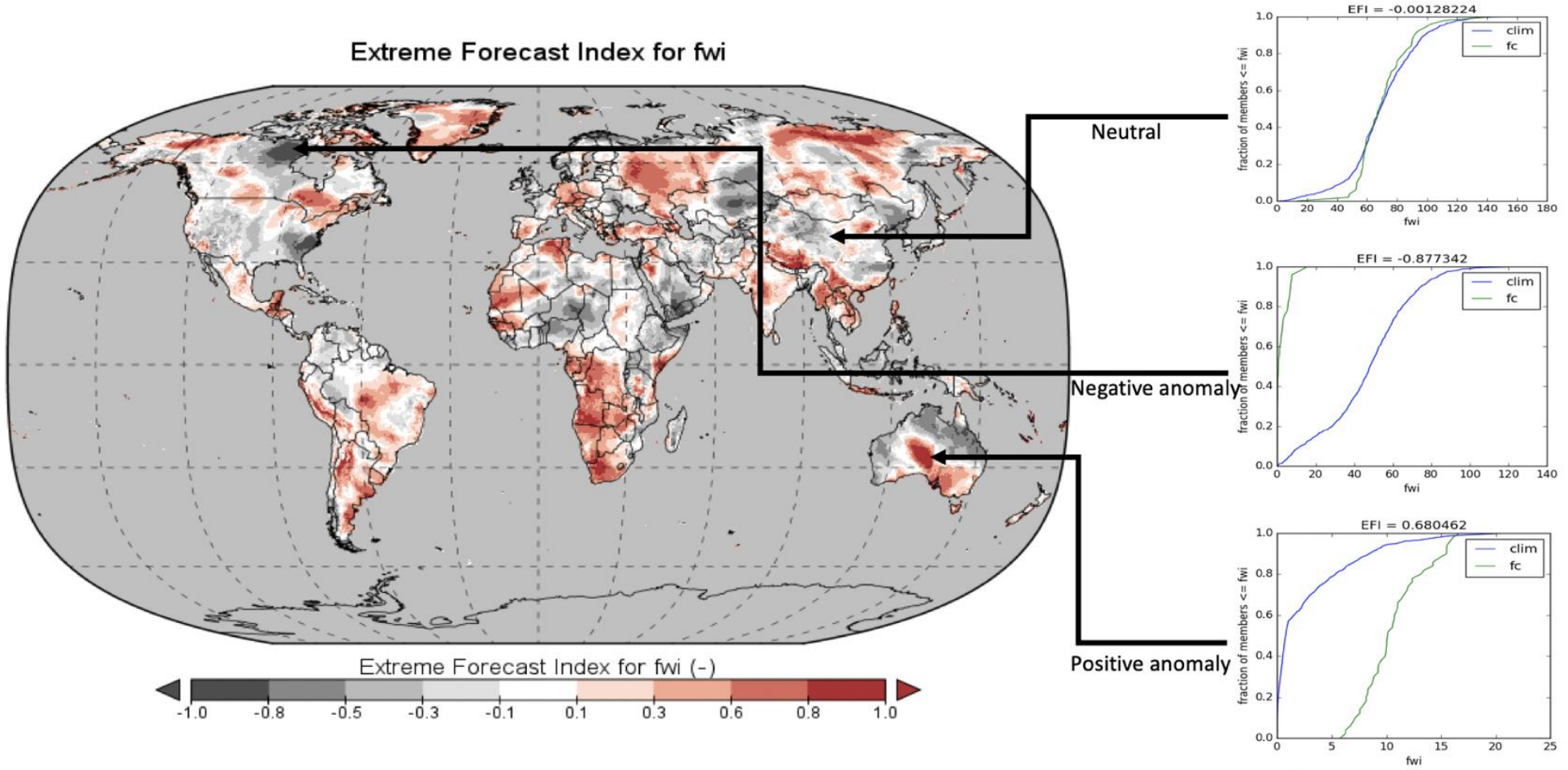
Emergency Management

PROTOTYPE PROBABILISTIC FIRE FORECAST PRODUCT



The extreme forecast Index for the FWI compares the model climate distribution with the ensemble prediction providing an indication of anomalous conditions.

ECMWF Copernicus Europe's eyes on Earth European Commission

Emergency Response Coordination Centre (ERCC) – DG ECHO Daily Map | 11/03/2019

Mozambique, Malawi, Madagascar | Tropical Cyclone IDAI and Floods

European Commission

Fatalities
Injuries
Affected people
Displaced people
Source: Government of Malawi, UN Resident Coordinator for Mozambique, DG ECHO

28
124
226 560

860

6
18 910
3 110

4
43 205
6 542

11 Mar 12.00 UTC
194 km/h sust. winds

16 Mar 12.00 UTC
83 km/h sust. winds

12 Mar 12.00 UTC
231 km/h sust. winds

15 Mar 12.00 UTC
139 km/h sust. winds

14 Mar 12.00 UTC
194 km/h sust. winds

13 Mar 12.00 UTC
222 km/h sust. winds

TC IDAI

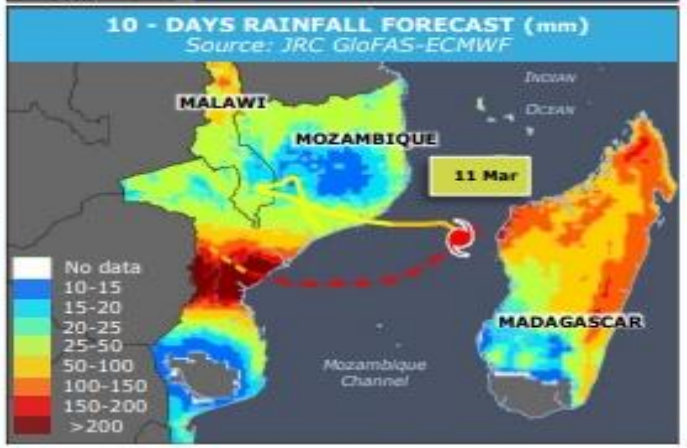
ZAMBIA
MALAWI
TANZANIA
MOZAMBIQUE
ZIMBABWE
SOUTH AFRICA
SWAZILAND
COMOROS
Mayotte (FRANCE)
MADAGASCAR
French Southern Territories
INDIAN OCEAN
Mozambique Channel

Karonga
Mocimboa
Niassa
Nkhotakota
Marupa
Montepuez
Salima
Lilongwe
Mangochi
Tete
Southern Region
Zambézia
Ligonha
Nampula
Mocambique
Luangwa
Moatize
Blantyre
Chiramba
Nicuadala
Manica
Chimoio
Beira
Espungabera
Massangena
Vilanculos
Mapai
Panda
Maxixe
Macia
Quissico
Matola
Maputo
Ambanja
Sambava
Antalaha
Maroantsetra
Mahajanga
Marovoay
Ambatondrazaka
Toamasina
Antananarivo
Antsirabe
Morondava
Mananjary

© European Union, 2019. Map produced by JRC. The boundaries and the names shown on this map do not imply official endorsement or acceptance by the European Union.
0 200 400 Km

POPULATION DENSITY
Source: JRC GHSL

10 - DAYS RAINFALL FORECAST (mm)
Source: JRC GloFAS-ECMWF



TROPICAL CYCLONE (TC)
Observed position
Forecast position

INTENSITY
< 63 Km/h
63-118 Km/h
> 118 Km/h

WIND BUFFER
93-118 km/h
> 118 km/h

STORM SURGE
Source: JRC, GDACS
0.2 – 1 m
1 – 2 m
2 – 2.1 m

PAST 7-DAYS RAINFALL ACCUMULATION
Source: NASA-GPM
250-500 mm
100-250 mm
50-100 mm
25-50 mm

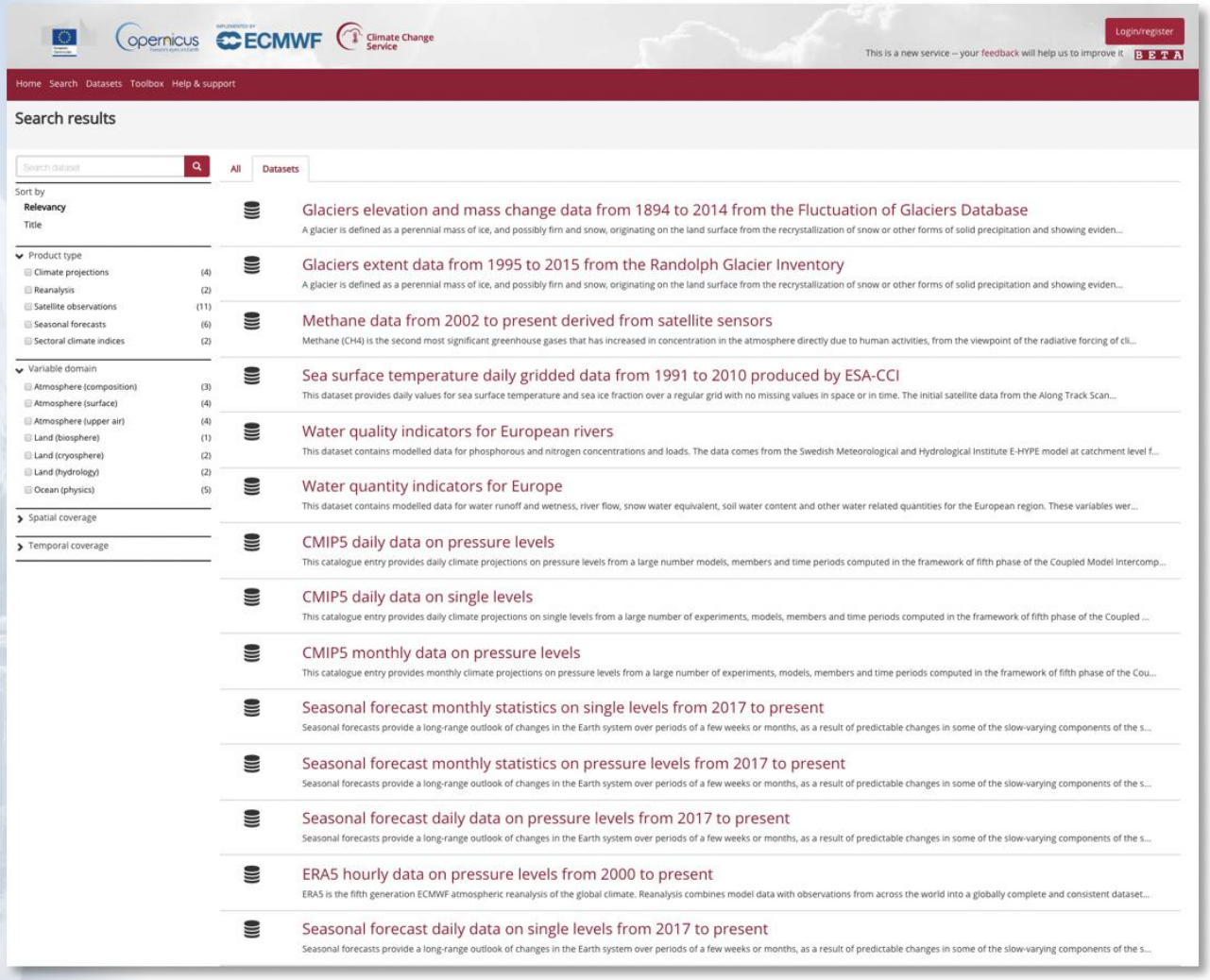
FLOOD DETECTION
As of 10 March
Source: NASA-MODIS
Flooded area

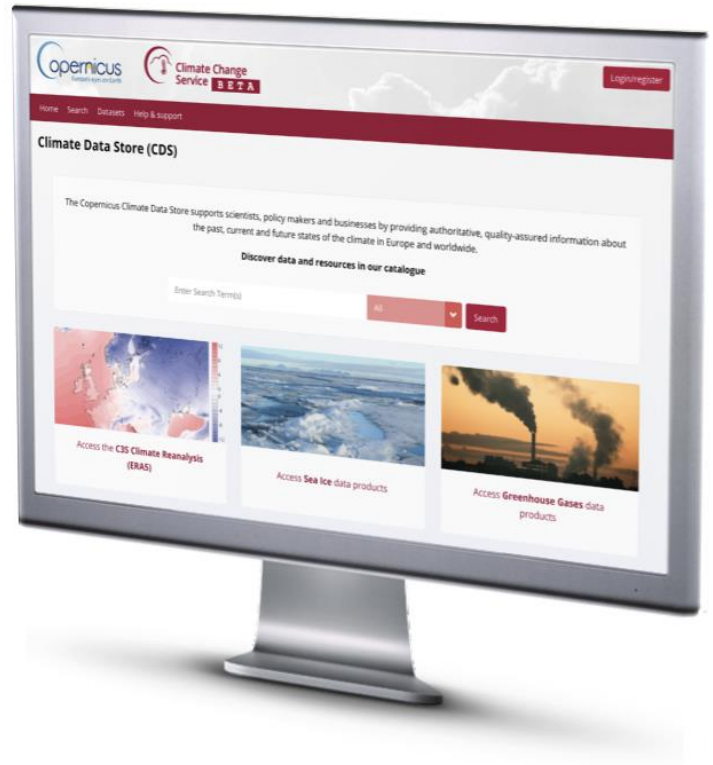
COPERNICUS ACTIVATION
EMSR346 Mozambique (completed)
EMSR347 Malawi (planned)

Main Airport
Main Port
Administrative division boundary

Climate Change

JUNE 2018: THE CLIMATE DATA STORE OPENS





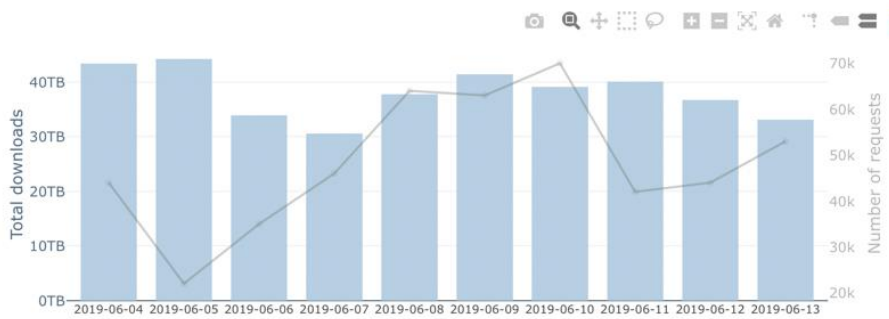
European Commission | Copernicus Europe's eyes on Earth | ECMWF

Climate Change

JUNE 2019: >15000 USERS AND ~40 TB/DAY

Registered users	Queued users	Running users	Queued requests	Running requests	At
15,427	218	50	922	101	07:16
From 14/06/2018					*UTC	14/06/2019*

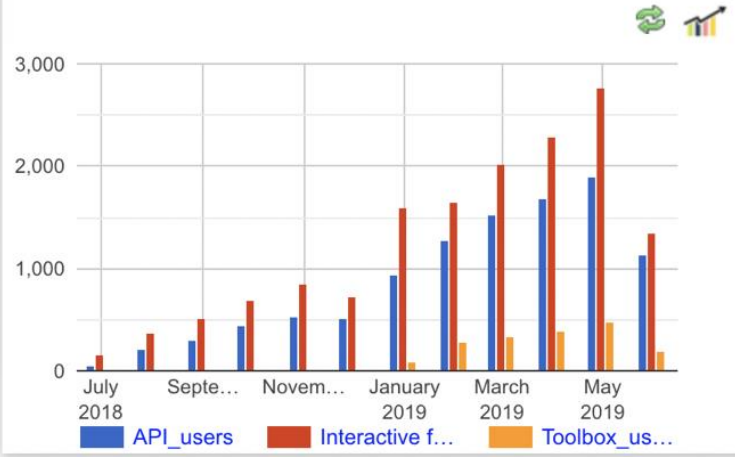
Daily downloads in Terabytes



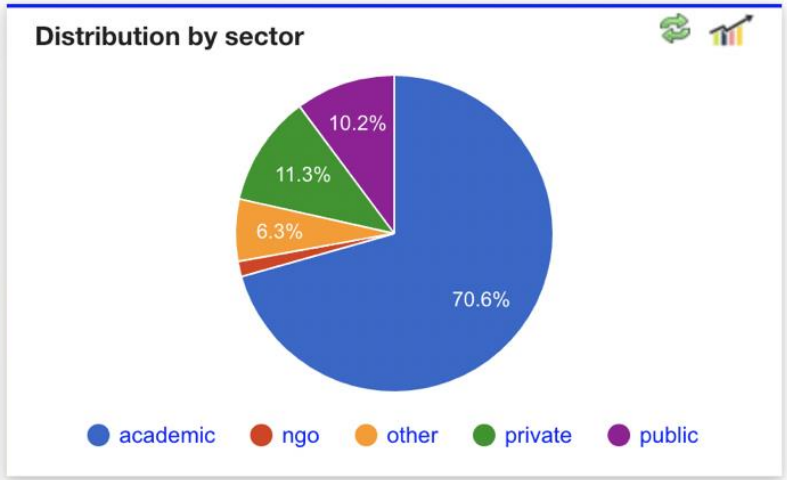
Requests completed

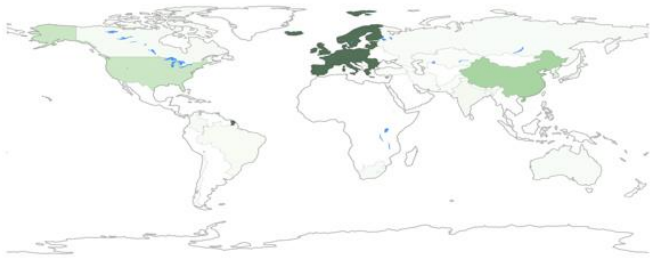
Last 1h	795	1.2TB
Last 2h	1,846	2.2TB
Last 3h	3,556	4.2TB
Last 6h	7,372	9.5TB
Last 12h	10,796	18.6TB
Last 24h	27,829	31.7TB

Monthly distribution of users accessisng the CDS by component



Distribution by sector





Top 5 (Running or queued)

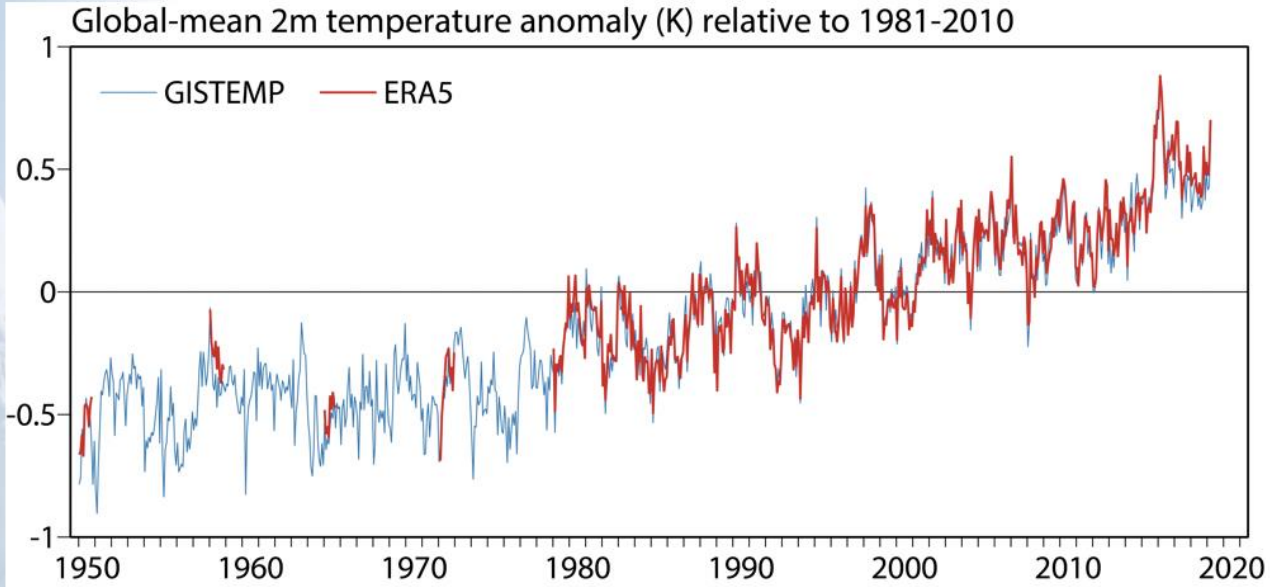
European Union/EFTA	95
China	46
United States of America (the)	31
Korea (the Republic of)	21
Japan	11

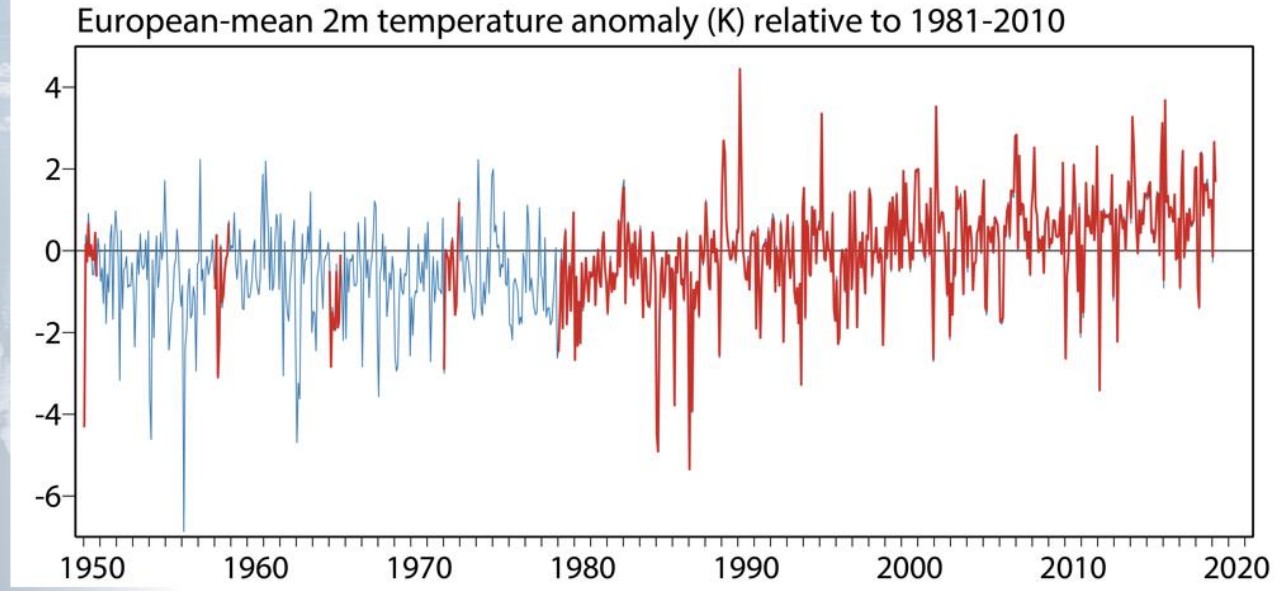
Datasets Top 15 (Running or queued)

1. ERA5 complete
2. ERA5 hourly data on single levels from 1979 t...
3. ERA5 hourly data on pressure levels from 19...
4. Seasonal forecast daily data on single levels fr...
5. ERA5 monthly averaged data on single levels f...
6. Seasonal forecast monthly statistics on press...
7. Seasonal forecast monthly statistics on single ...
8. UERRA regional reanalysis for Europe on sing...

Climate Change

ERA5 BEING EXTENDED BACK TO 1950





Datasets Top 8 (Running or queued)

1. ERA5 hourly data on pressure levels from 19…
2. ERA5 complete
3. ERA5 hourly data on single levels from 1979 …
4. Seasonal forecast daily data on single levels f…
5. UERRA regional reanalysis for Europe on sin…
6. Seasonal forecast daily data on pressure leve…
7. Seasonal forecast monthly statistics on singl…
8. Seasonal forecast monthly statistics on press…

Snapshot:
ERA5 is the most popular dataset of the CDS

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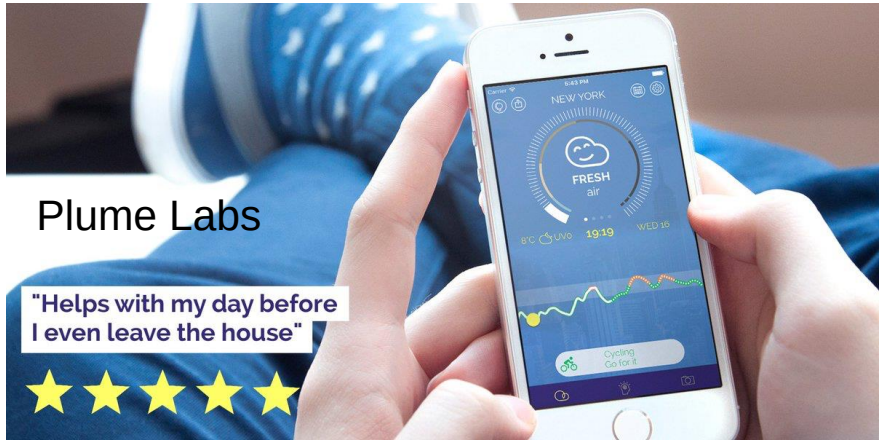
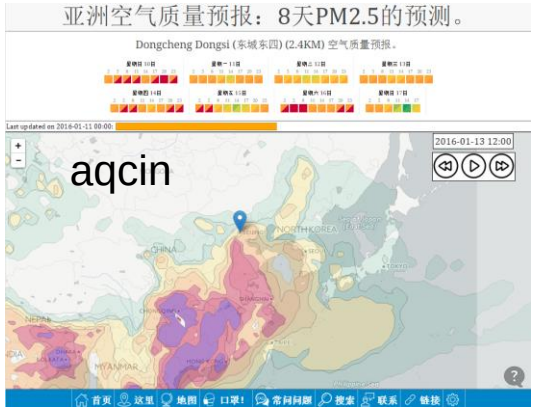
CAMS HEAVYWEIGHT USERS

Atmosphere Monitoring

Copernicus products are now reaching millions of people worldwide





Discussions in progress

Google

TESLA

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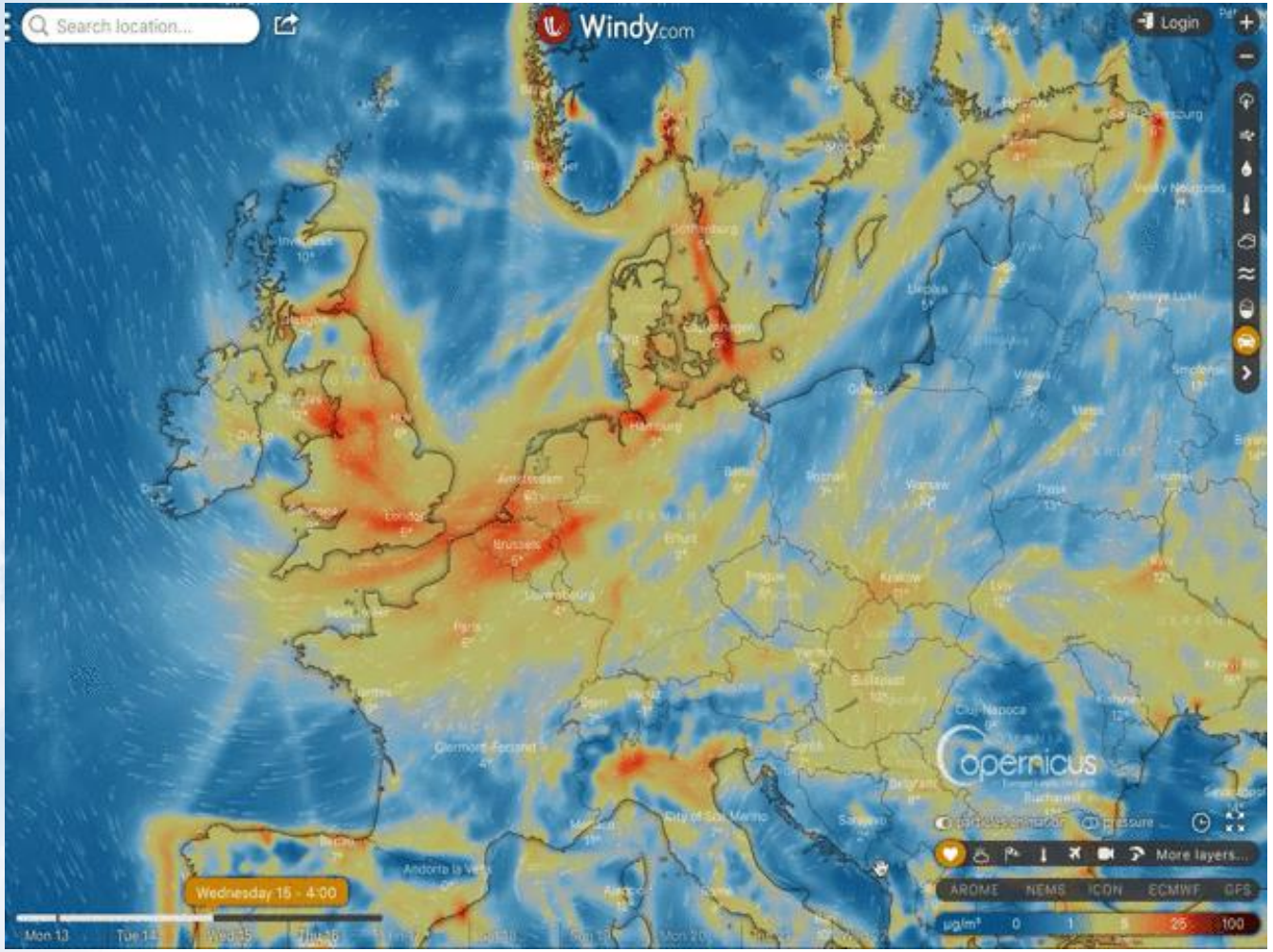
European Commission

KEEPING THE BEST FOR THE END

Atmosphere Monitoring



CAMS is available in Windy since the beginning of the month

- twice daily (based 00, 12) NRT global analyses and forecasts up to +120h, 40km resolution
- daily (based 00) NRT European analyses and forecasts up to +96h, 10 km resolution
- 4 layers, more to come likely

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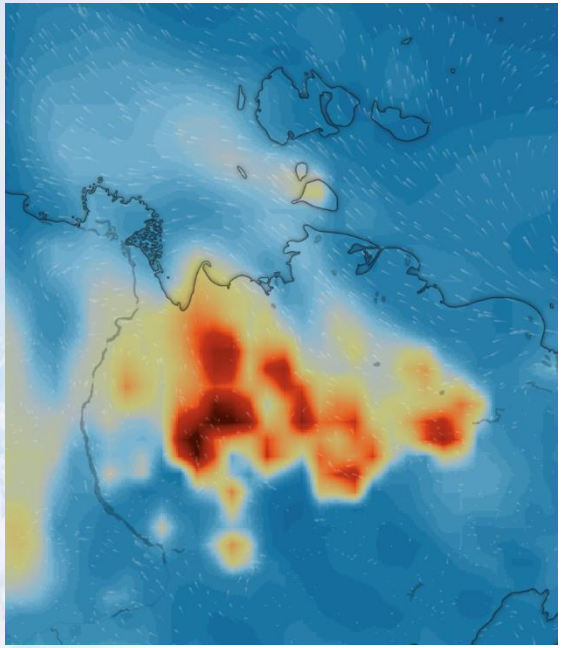
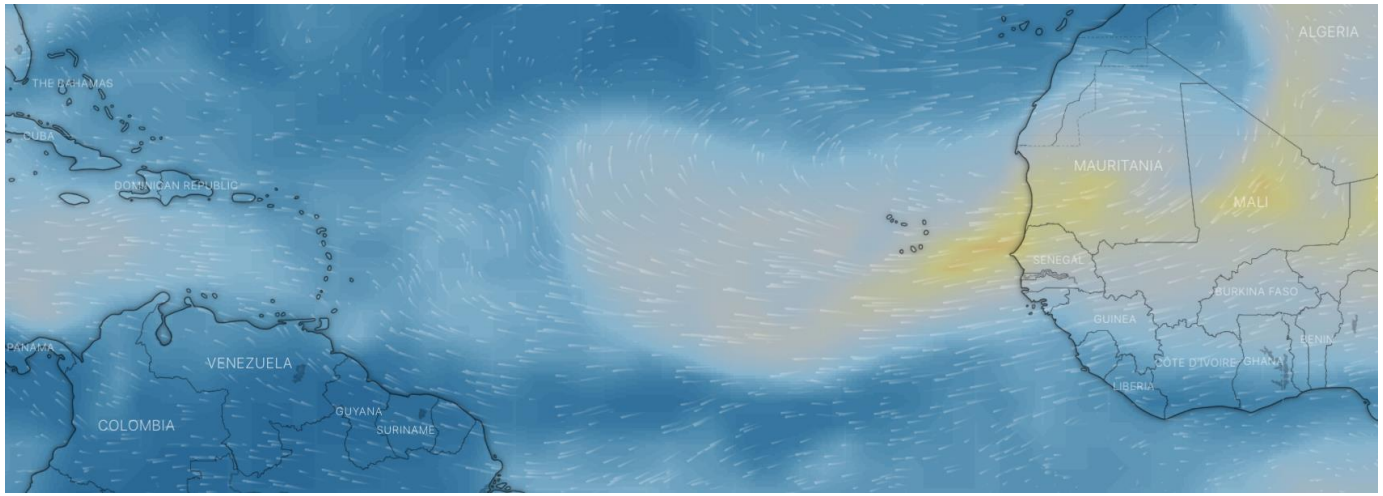
CAMS-WINDY: EUROPE'S EYES ON EARTH

Atmosphere Monitoring

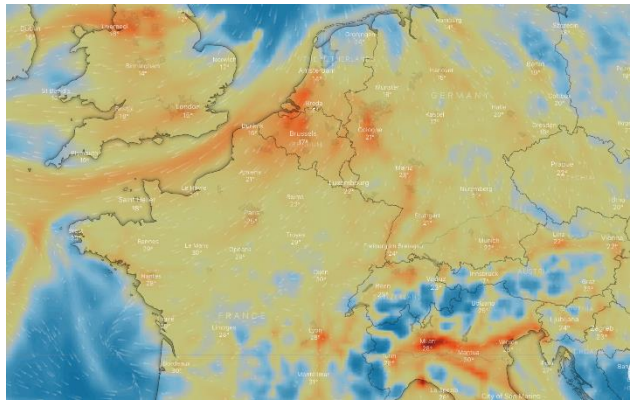
PM2.5 from fires
Sakha Republic, Russia



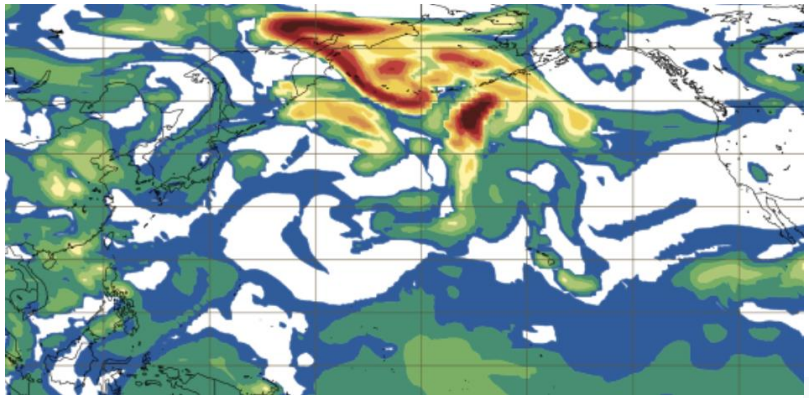
Transatlantic transport of dust (AOD)



NO_2 pollution building up (Thursday night)



SO_2 from Raikoke eruption
Kuril islands, Russia
(not yet in Windy)



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Europe's eyes on Earth

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