

# A snapshot from our CAMS 'Weather Room': events that marked 2020



Atmosphere Monitoring

Using ECMWF's Forecasts (UEF2021), 3 June 2021

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Acknowledgements: CAMS research and development team, Copernicus production team, CAMS developers



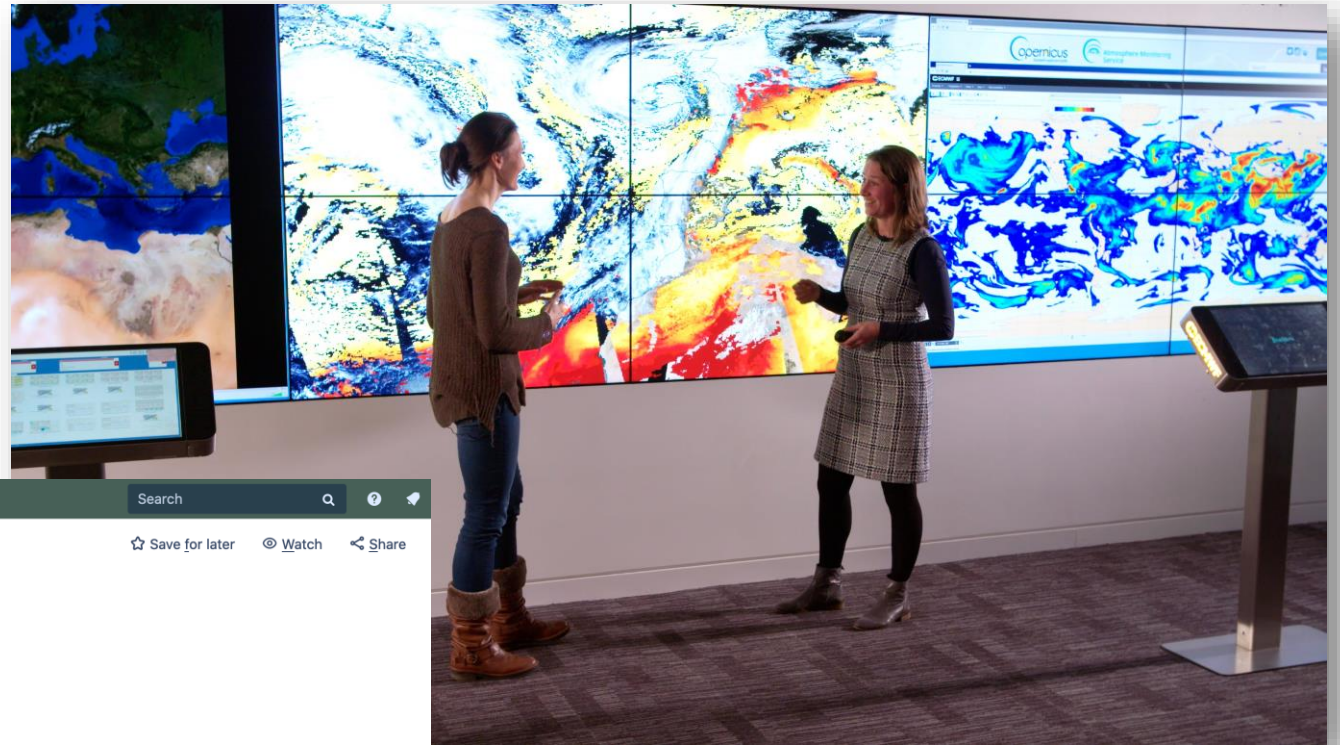
- The CAMS Weather Room
  - Concept
  - What it does
- Significant events monitored in 2020
  - ‘Godzilla’ Saharan dust transport
  - Arctic wildfires
  - California & western US wildfires
- Summary and future development



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# ECMWF Weather Room

NRT monitoring of NWP at ECMWF performed (pre-COVID) in physical Weather Room displaying charts.



ECMWF Spaces Calendars Create

Forecast Daily Report

Pages Blog Calendars

SPACE SHORTCUTS Forecast User eccharts www charts Data Events

PAGE TREE

- "Case" listing for Daily Report
- > 2016
- > 2017
- > 2018
- > 2019
- > 2020
  - Apr 2020
  - Aug 2020
  - Dec 2020
  - > Feb 2020
    - 2020-02-03

Space tools

Pages / ... / Feb 2020

2020-02-03

Created by Met Ops, last modified yesterday at 7:29 PM

- Few satellites missing: KOMPSAT-5 RO, Jason-3 and SARAL AltiKa
- Recovery of some BUFR SYNOPs stations from Italy.
- Few examples of stations with 2m temperature issues
- B787 wind problem still present.
- Expected genesis of a tropical storm over the North West coasts of Australia

Analyst:

Ivan  Fernando  Linus  Tim  Mohamed  Ervin  David  Esti  Jonny

2. Observations

2A. Satellite

- KOMPSAT-5 RO missing for two days due to technical issues on the data provider side. They resolved the problem shortly after we contacted them.
- Jason-3 is currently on safe-mode due to gyro anomaly. The outage is affecting wave height data and sea-level anomaly (ocean5). According to @Saleh Abdalla the satellite is being restarted and the data delivery should resume this week.
- No data being received from SARAL AltiKa. The outage is affecting sea-level anomaly (ocean5) and wave height (currently in the blacklist)

2B. Other  Synop  Ship/drifter  Sonde  Other

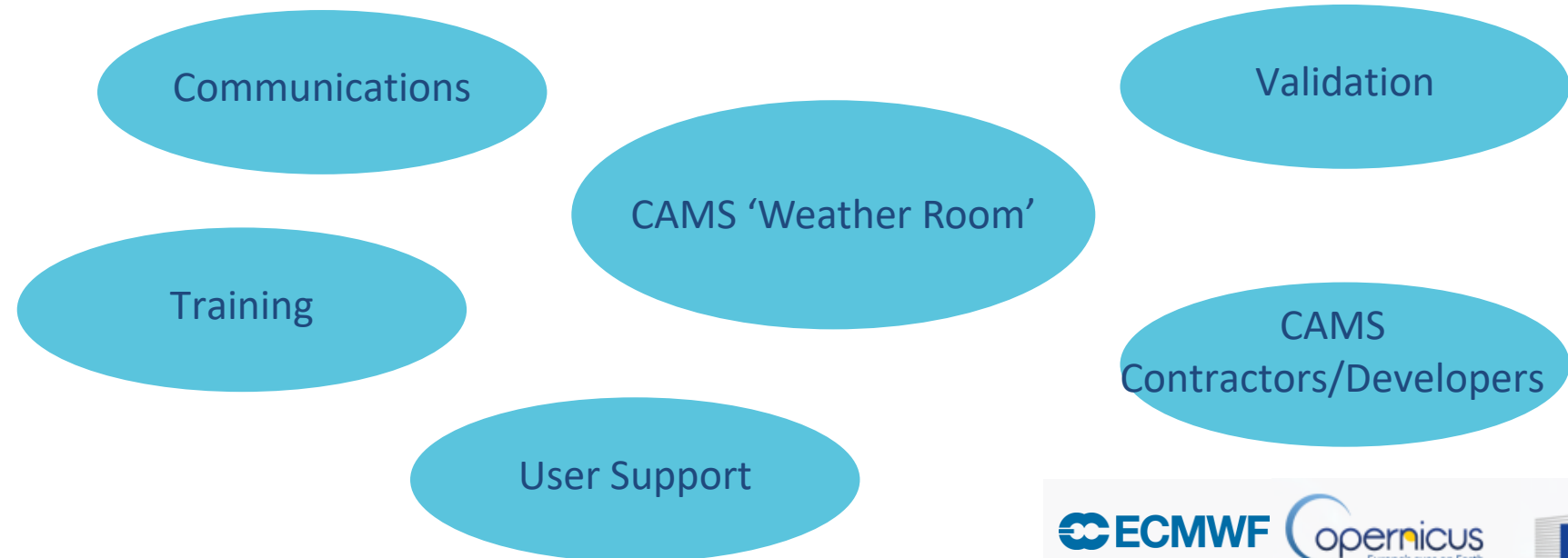
- Increased number of BUFR SYNOP data from Italy. Apparently we are recovering data that went missing since February 2019. During this period the system was using the available TAC version of the missing BUFR stations.

- Duty meteorologist with weekly rotation writes daily report available institution-wide for comments/analysis.
- Weekly weather discussion for staff and visitors reviews key issues in more detail.



## The 'Weather Room' concept

- Wider exposure to CAMS in the media and downstream applications brings more scrutiny to the products
- Example of Florida AQ issues in October 2018 highlighted issues in CAMS global surface PM forecasts
- Routine monitoring of CAMS operational global/regional forecasts:
  - Identify and resolve potential issues
  - Investigate significant issues reported by users







## Developing the CAMS 'Weather Room' Concept

- The CAMS Weather Room has been established to perform:
  - Routine monitoring of CAMS RT/NRT (global/regional forecasts, fire emissions) products to identify potential issues and communication-related activities
  - Regular evaluation and reporting on notable episodes in CAMS products
  - Maintain a database of notable events accessible to CAMS contractors
- It provides complementary information for continuing validation and evaluation activities in CAMS by:
  - Identifying case studies
  - Diagnosing potential causes of significant differences between CAMS NRT products and independent observations



# CAMS Weather Room

ECMWF Spaces Calendars Create

Copernicus Services

Pages / Copernicus Services Home / Copernicus Atmosphere Monitoring Service - CAMS

## CAMS Weather Room

Created by Richard Engelen, last modified by Mark Parrington on May 24, 2021

**Overview**

Welcome to the pages of the CAMS Weather Room. These pages are intended to provide regular reports on the routine monitoring of CAMS NRT products, and case studies.

**Reporting on current/recent notable events**

May	<ul style="list-style-type: none"> <li>Global atmospheric composition anomalies: April 2021</li> <li>Fagradalsfjall volcanic activity in May 2021</li> <li>Siberia early seasonal wildfire activity and outlook: May 2021               <ul style="list-style-type: none"> <li>Smoke transport from western Siberia fires: May 2021</li> </ul> </li> <li>Saharan dust transport across the Atlantic: May 2021</li> <li>Dust transport from Central Asia to Scandinavia in May 2021</li> <li>Industrial SO2 plume over the Arctic</li> <li>Canada wildfires: May 2021</li> <li>Eruption of Mt Nyiragongo, DR Congo in May 2021</li> </ul>
April	<ul style="list-style-type: none"> <li>Global atmospheric composition anomalies: March 2021</li> <li>Saharan dust over the Mediterranean in April 2021</li> <li>Fires and air quality in Nepal and northern India in April 2021</li> <li>Eruption of La Soufriere volcano: April 2021 (updated 27 April)</li> </ul>
March	<ul style="list-style-type: none"> <li>Global atmospheric composition anomalies: February 2021</li> <li>Saharan dust transport in March 2021               <ul style="list-style-type: none"> <li>Eastern Mediterranean: March 2021</li> <li>North Atlantic and western Europe: March 2021</li> </ul> </li> <li>Asian dust storm</li> <li>Smoke pollution in Nepal: March 2021</li> </ul>

**Monthly archive of previous notable events**

2021	January	February										
2020	January	February	March	April	May	June	July	August	September	October	November	December
2019											November	December

**Resources**

Useful links for monitoring CAMS products will be added here.

CAMS	<a href="#">CAMS Web Charts</a> <a href="#">CAMS Observation Monitoring Plots</a> <a href="#">CAMS Aerosol Alerts</a>
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Space tools

← Most recent issues/case studies

← Archived issues/case studies

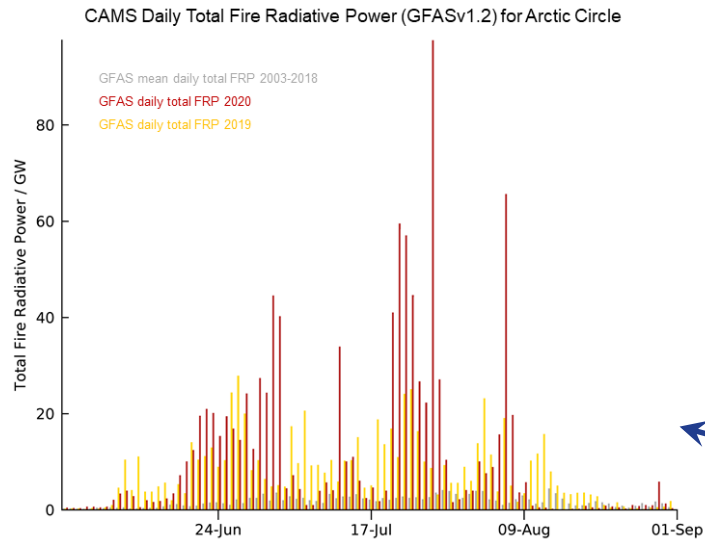
← Links to relevant resources

- Development based on quasi-“daily reporting” approach
- Currently only internally available but eventually some cases will be published externally via, e.g., Copernicus User Support Forum (<https://confluence.ecmwf.int/display/CUSF/forum>)



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# Monitoring Arctic wildfires in 2019 and 2020



Daily total fire radiative power (FRP) and June-August total estimated CO<sub>2</sub> emissions from the Copernicus Atmosphere Monitoring Service (CAMS) Global Fire Assimilation System (GFASv1.2), based on MODIS observations.

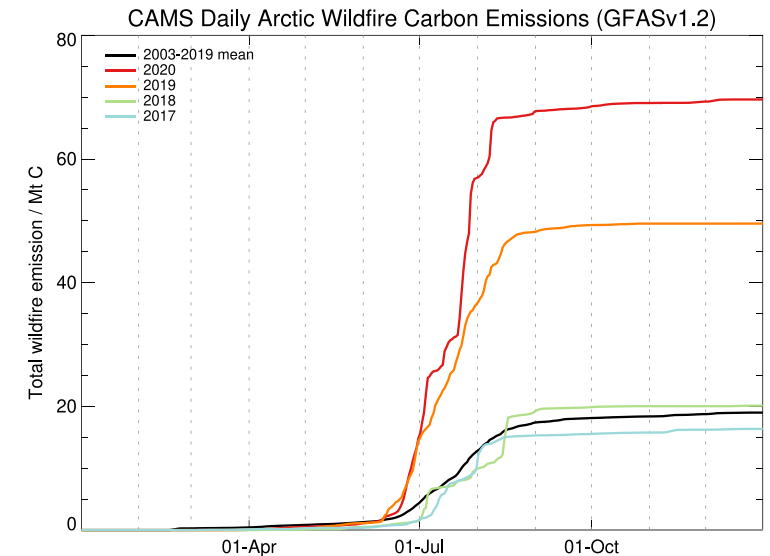
FRP for 2020 (red bars) and 2019 (gold bars) >> 2003-2018 mean (grey bars) for the Arctic Circle (latitudes > 66° N) from mid-June to mid-August.

- 2020 exceeded what was observed in 2019 in the Arctic.

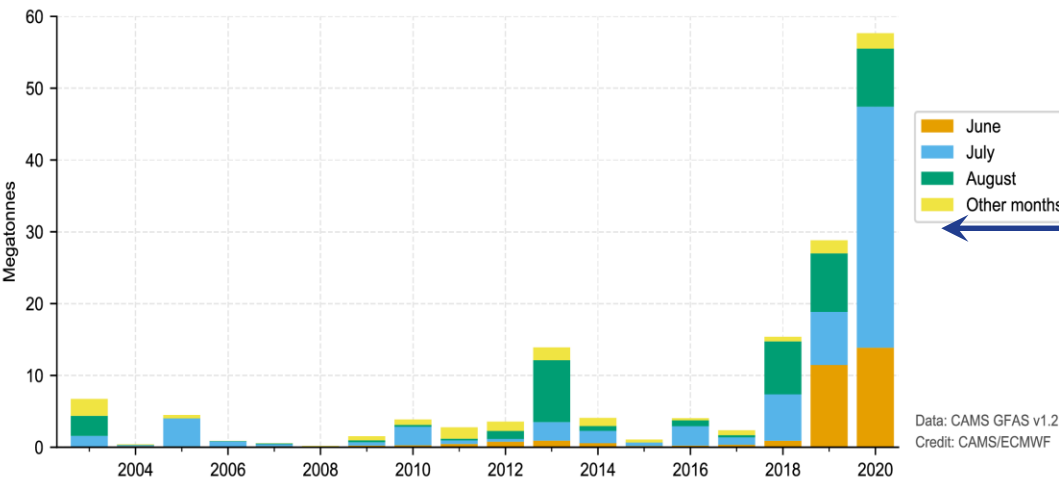
Annual total estimated carbon emissions for 2019 and 2020 in the Arctic Circle were the highest in the 18-year GFAS dataset.

- Largest contribution in July 2020.

Growth in 2020 Arctic wildfire activity comparable to 2019 through June but accelerated in July to early August.



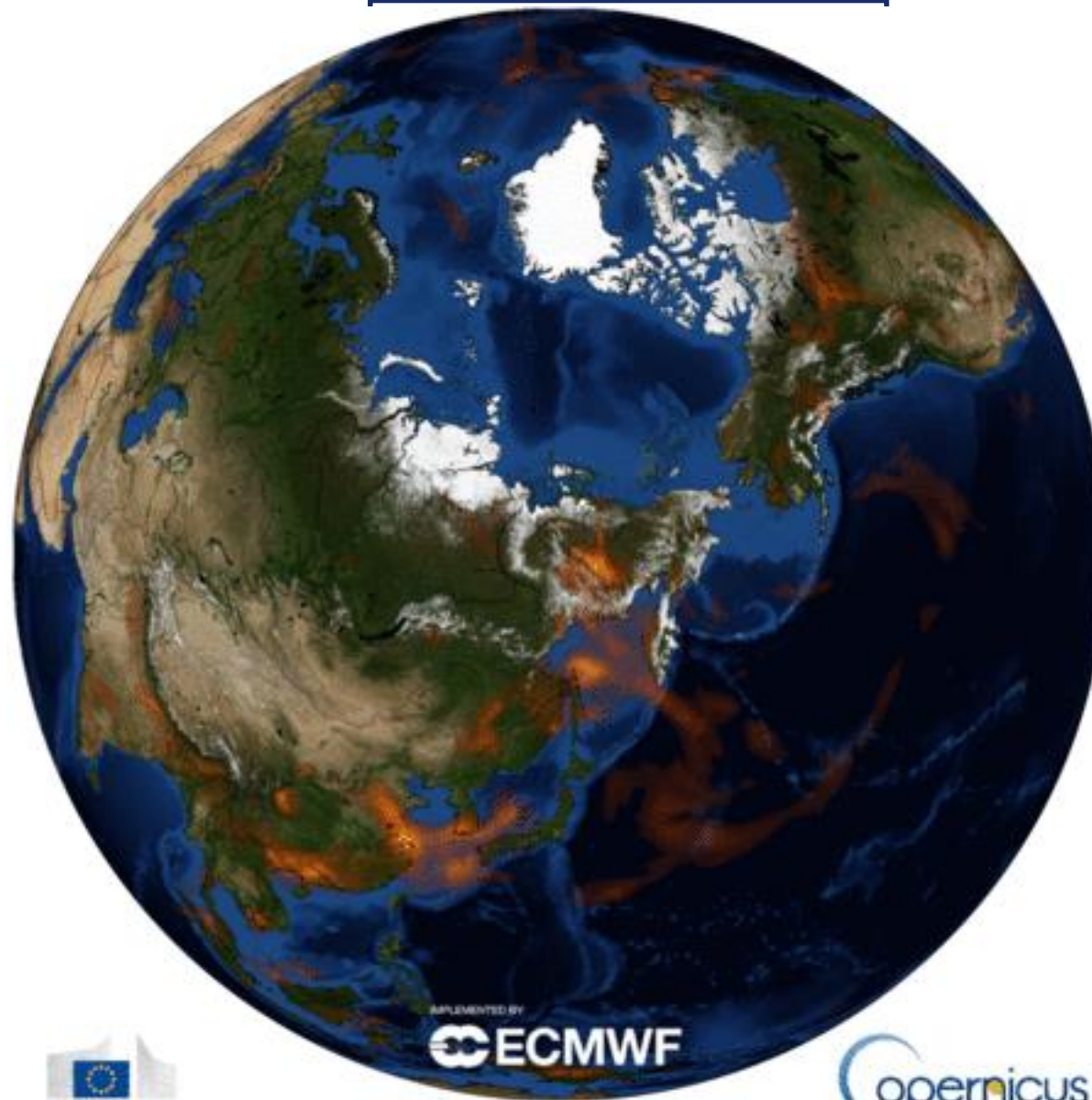
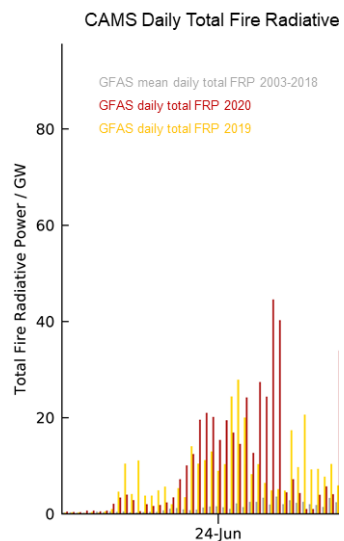
Total annual carbon emissions from wildfires in Arctic Siberia



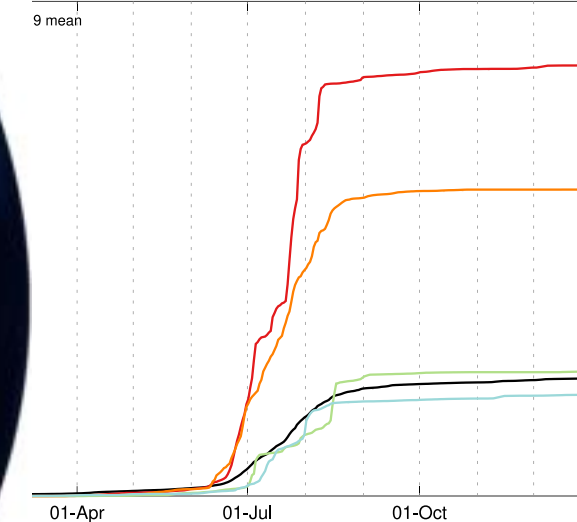


Atmosphere Monitoring

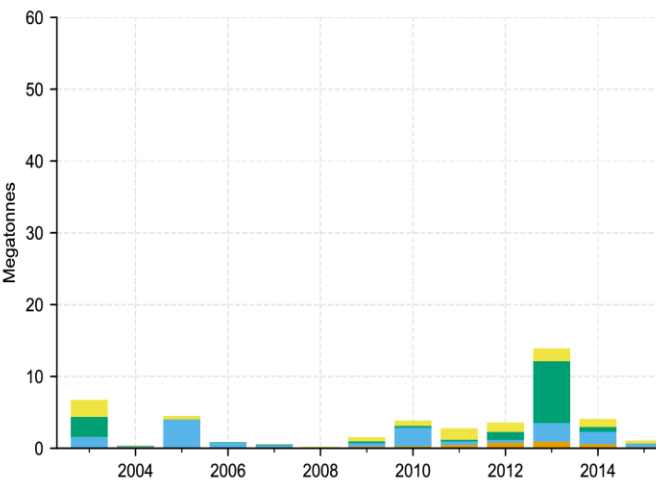
# Monitoring Arctic wildfires in 2019 and 2020



Daily Arctic Wildfire Carbon Emissions (GFASv1.2)



Total annual carbon emissions from wildfires in Ar

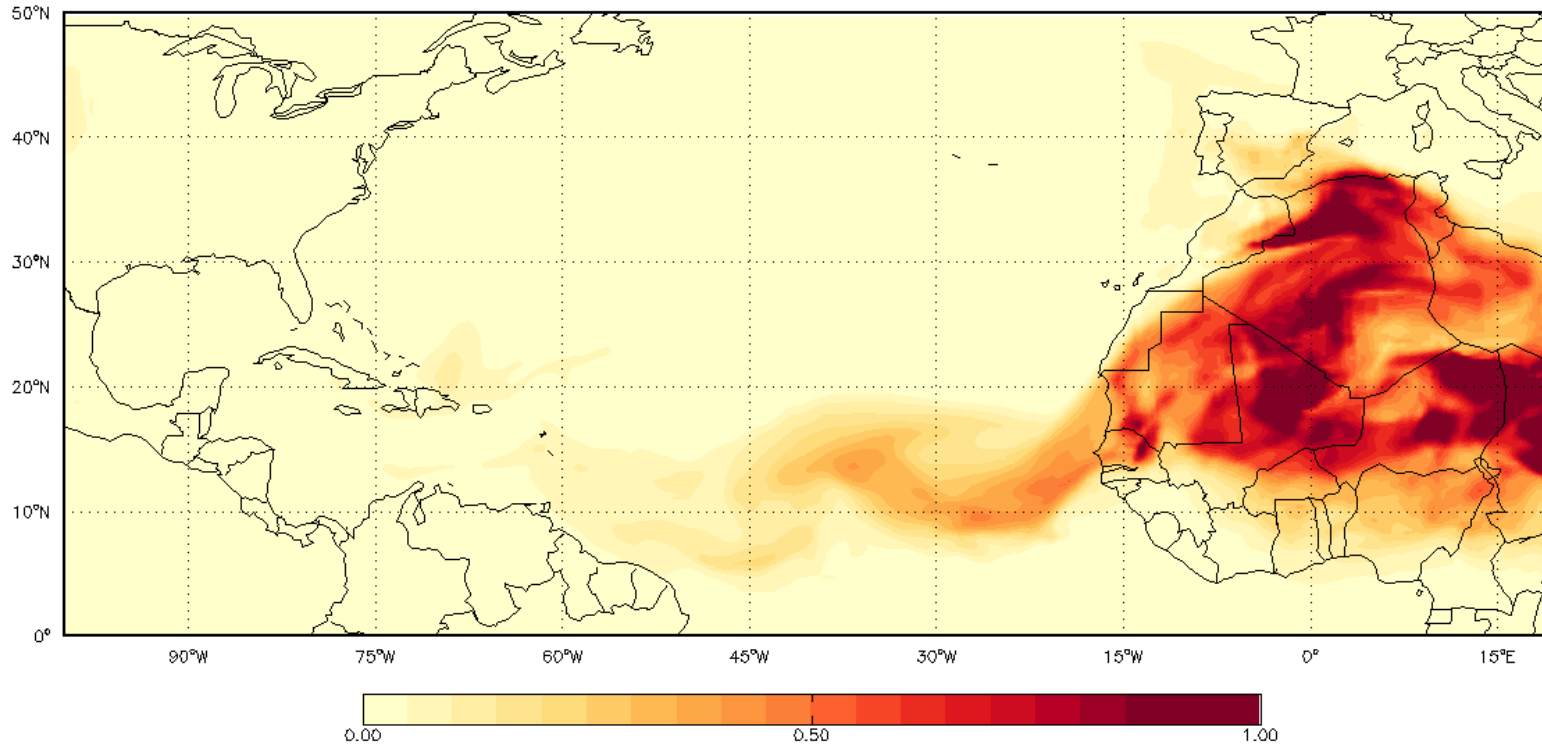






# 'Godzilla' Sahara dust plume

CAMS dust aerosol optical depth analyses from 1-22 June 2020



- Significant long-range transport of dust plume with very high aerosol optical depth across the Atlantic, from the Sahara to the Caribbean through June 2020.
- Monitored as case study in the CAMS Weather Room.



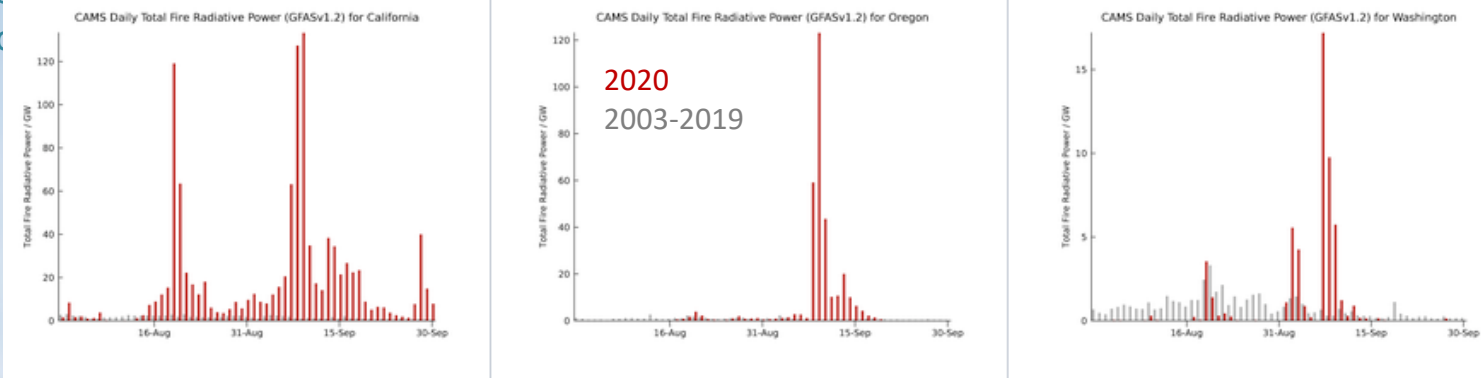




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# Monitoring California Wildfires

↓ CAMS GFAS daily total fire radiative power for California, Oregon and Washington

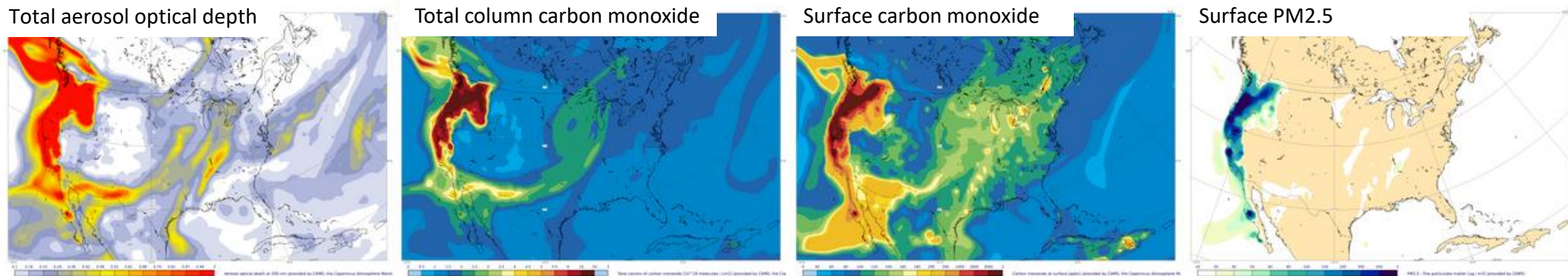


- Huge wildfires affected California and western US from mid-August to end September.
- Thick smoke clearly seen in visible satellite imagery.
- CAMS global forecasts of aerosol optical depth and carbon monoxide predicted long-range transport of smoke across North America and North Atlantic Ocean.

↓ Aqua MODIS visible satellite imagery over North America for 7-11 September 2020



↓ CAMS forecasts initialized 12 September at 00 UTC valid for 12 September at 12 UTC





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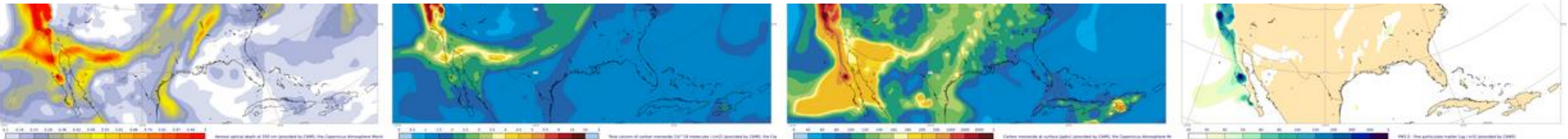
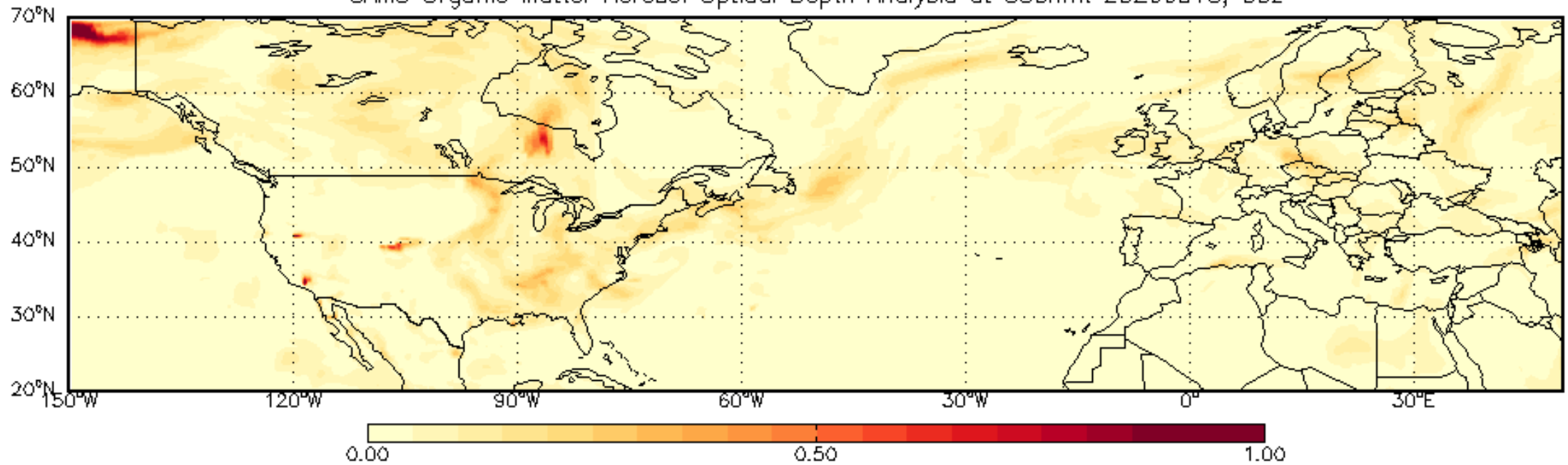
# Monitoring California Wildfires

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CAMS Organic Matter Aerosol Optical Depth Analysis at 550nm: 20200815, 00z



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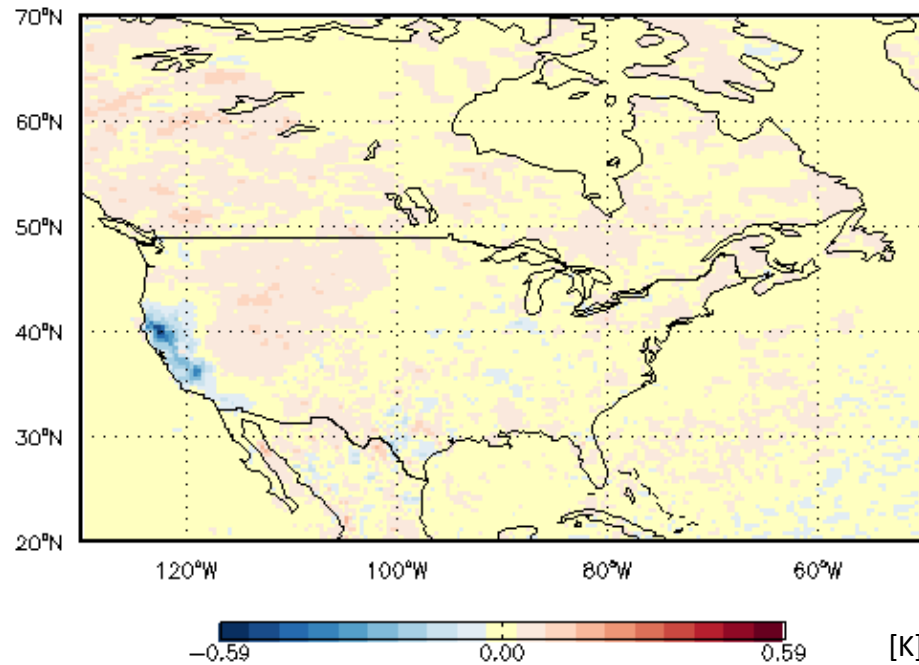




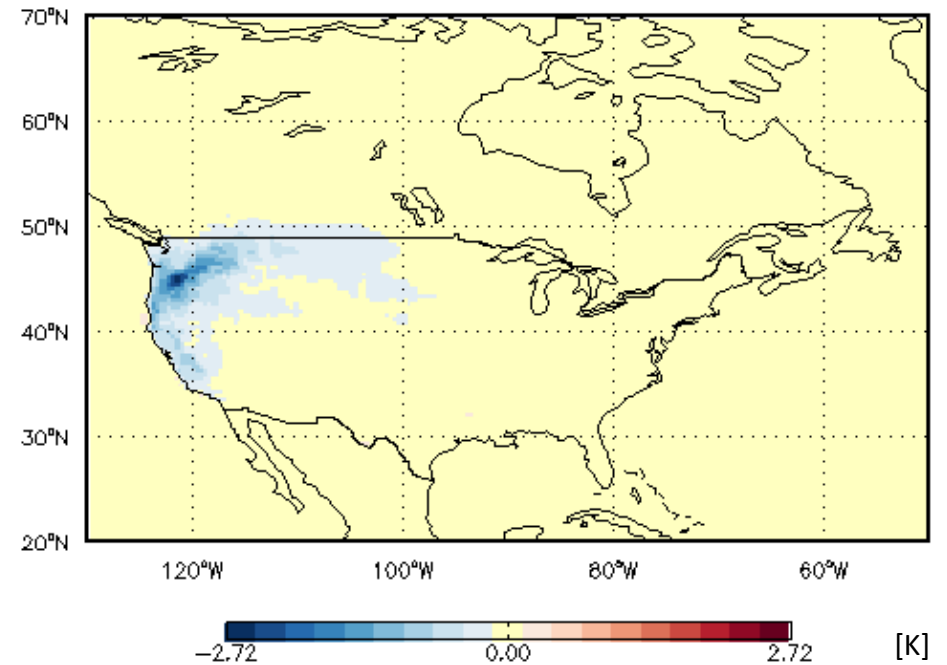
# Radiation impacts of California Wildfires

- CAMS operational forecasts include interactions between aerosols (and ozone) with the radiation fields.
- Comparison against parallel forecasts with no aerosol-radiation interaction allows us to evaluate instantaneous impact on radiation and 2m temperature.
  - In the days (1-8 Sept) prior to the largest fires, smoke impact on 2m T localized to locations in California.
  - In the days (9-19 Sept) the shape of the plume across northwest US reflected in reduced 2m T.

CAMS T2m difference: 1-8 Sept mean



CAMS T2m difference: 9-17 Sept mean





## Summary and Future Directions

- The CAMS Weather Room has implemented at ECMWF to monitor NRT operational products in relation to different case studies
  - Saharan dust, Arctic wildfires, and California wildfires shown as examples
  - Other cases include the Antarctic ozone hole, European heatwave and surface air quality
- Continuous development includes:
  - Flexibility in use of in situ observations for case studies (e.g., OpenAQ, field campaign observations)
  - Strengthening interactions between CAMS validation and policy activities for identifying and evaluating case studies
  - Linking to other Copernicus services (especially C3S and Emergency Management Service, fire danger forecasts run by ECMWF)
  - Case studies and tools for training activities