Copernicus Atmosphere Monitoring Service

Monitoring 2017 and 2018 Global Wildfire Emissions from Fire Danger to Atmospheric Composition

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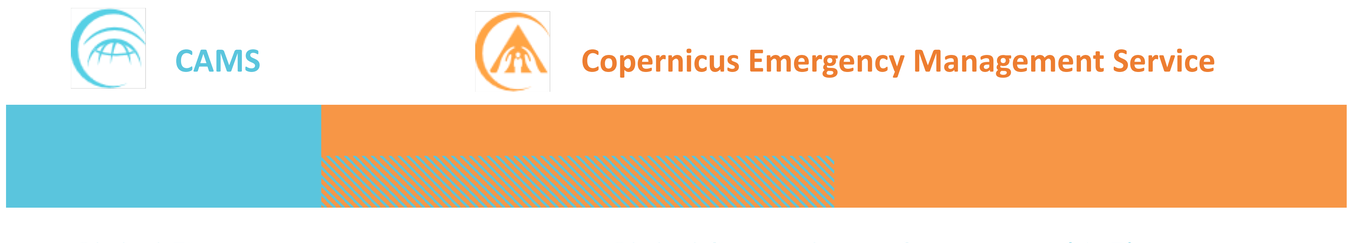
Introduction The European Centre for Medium-Range Weather Forecasts (ECMWF) provides monitoring and forecasting of global wildfire emissions and conditions through the Copernicus Atmosphere Monitoring and Emergency Management Services (CAMS and CEMS).

- CAMS monitors global wildfire emissions based on satellite observations of Fire Radiative Power from MODIS in the Global Fire Assimilation System (GFAS). atmosphere.copernicus.eu
- CEMS forecasts global fire danger with the Global ECMWF Fire Forecasting (GEFF) model. emergency.copernicus.eu



California, November 2018

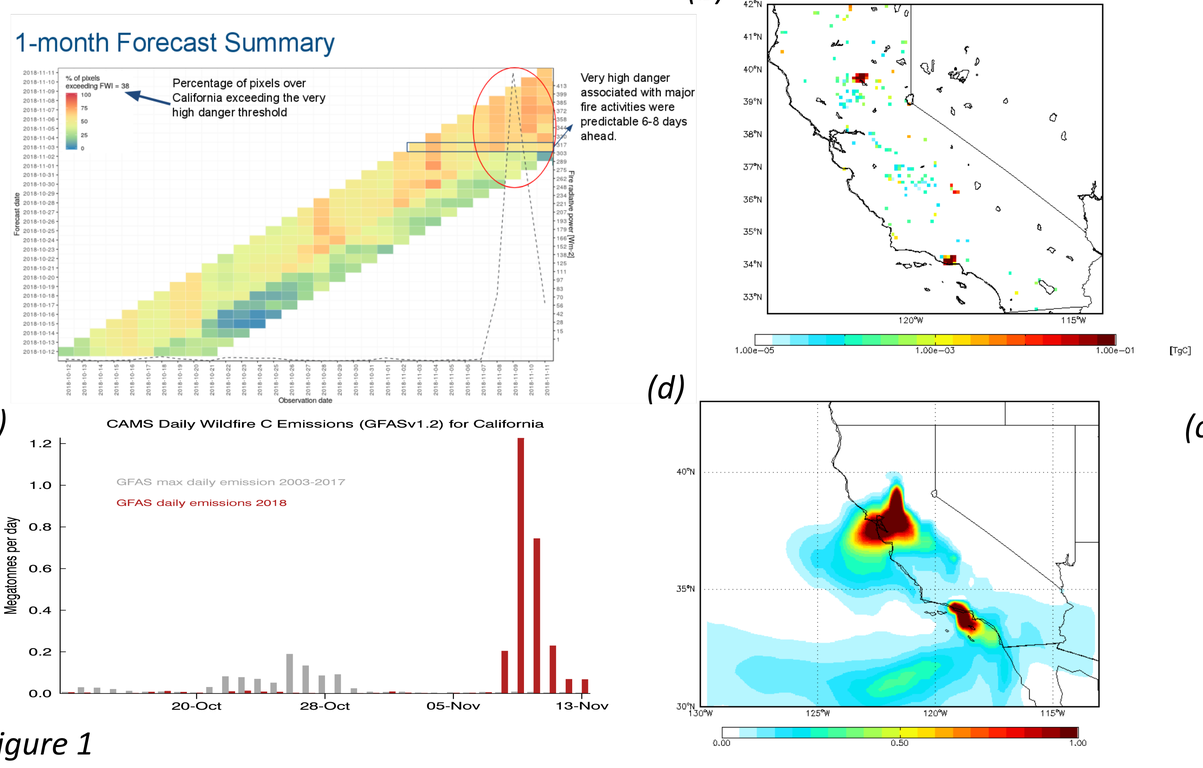


Figure 1

Portugal, June 2017

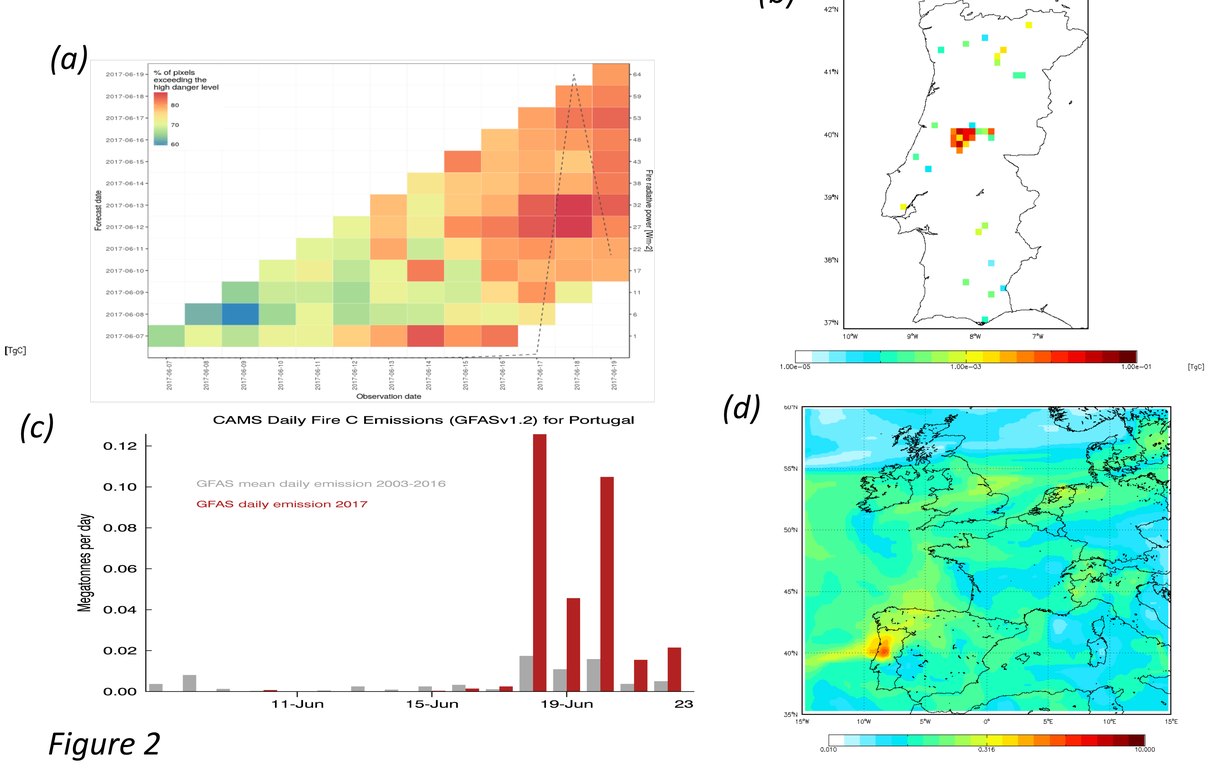


Figure 2

Near-Real Time Fire Danger Forecasts and Emissions Estimates The operational nature of GEFF, CAMS and GFAS allow us to provide up to date information on wildfires and their impact on atmospheric composition and air quality at the global scale. Two case studies for California and Portugal, shown above, highlight how this works in practice:

- 10-day fire danger forecasts (1a, 2a) show the exceedences of the very high danger threshold over the area of interest [di Giuseppe et al, ACP, 2018].
- Maps of monthly (1b, 2b) and time series of daily (1c, 2c) total carbon emissions show the extent and variability of current fire intensity and emissions, providing context relative to a climatology of the preceding years (back to 2003) [Kaiser et al., Biogeosciences, 2012].
- Fire emissions provide surface boundary condition to CAMS analyses and 5-day forecasts of atmospheric composition (1d, 2d) providing information onglobal air quality [Flemming et al., GMD, 2015].

Current Status and Future Outlook CAMS and CEMS provide operational, near-real-time, independent information on global fire weather and emissions. All data are free and open access.

- Future developments will bring elements of theses services closer together to provide end-to-end information on the role of fires in atmospheric composition.
- A diurnal cycle of fire emissions has been developed in GFAS to provide hourly emissions estimates based on FRP observations from Low Earth Orbit (MODIS, VIIRS, Sentinel-3) and Geostationary Orbit (SEVIRI, GOES, Himawari-8).
    - *Example (Figure 3) for Portugal fires between 17-22 October 2017: the diurnal cycle (including LEO and GEO observations) improves temporal profile of fire emissions.*
- Modelling of the fire emissions, following the fire danger forecasts will improve atmospheric composition forecasts with more realistic changes to environmental changes over the duration of the forecast (currently fixed in CAMS).

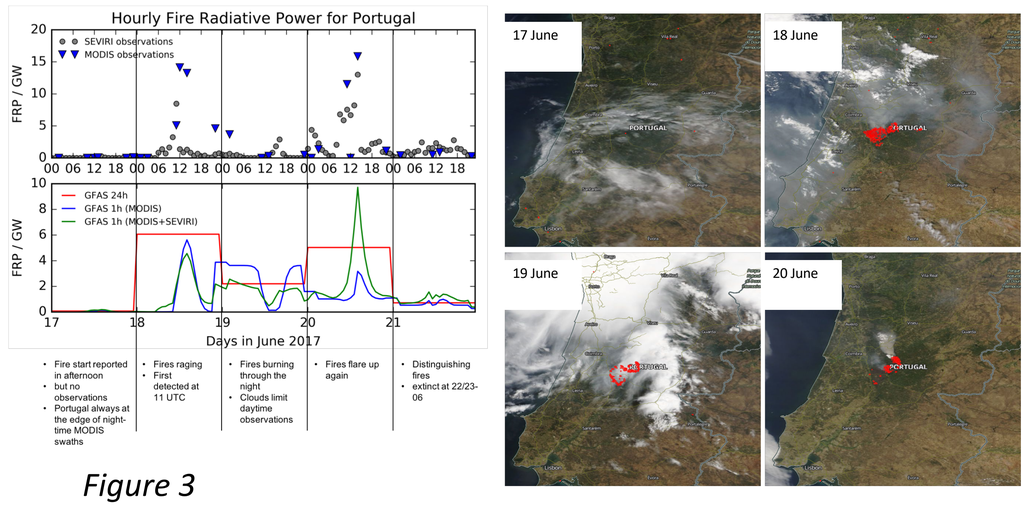


Figure 3

Further Information The Copernicus Atmosphere Monitoring Service is implemented by ECMWF on behalf of the European Commission and utilises NRT satellite observations of wildfire locations and emissions of aerosols and trace gases. 5-day forecasts of global aerosols and trace gases are produced operationally (initialised at 00 UTC and 12 UTC) with the ECMWF Integrated Forecast System (IFS). In addition to the operational analyses/forecasts a key product of CAMS is a reanalysis of global atmospheric composition from 2003 to the present day including satellite observations of AOD and total columns and profiles of reactive and greenhouse gases. Full documentation and information are available from the CAMS and CEMS websites.

ECMWF contributes to the Copernicus Emergency Management Service, providing early warning systems for flood awareness and forest fire information.

ON BEHALF OF ECMWF FOR THE EUROPEAN COMMISSION

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