4.139 Radiative impacts of wildfire smoke in the Arctic: perspectives from the Copernicus Atmosphere Monitoring Service.

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Abstract:

Recent years have witnessed significant transport of smoke pollution from wildfires in boreal forests to the high Arctic in the summer months. While Arctic smoke events are relatively short in duration, typically lasting a few days, aerosols in the smoke have a significant radiative impact (between 2-5 Wm^{-2} in net shortwave radiation at the top of the atmosphere) and can be deposited at the surface. The Copernicus Atmosphere Monitoring Service (CAMS), implemented by ECMWF on behalf of the European Commission, provides a unique perspective on the transport and impact of key pyrogenic pollutants, utilising near real-time satellite observations of wildfire locations and emissions of aerosols and trace gases. Five-day forecasts of global smoke aerosol and trace gases are produced operationally (initialised at 00 UTC and 12 UTC) with the ECMWF Integrated Forecast System (IFS), allowing prediction of pollution plumes up to several days ahead and the possibility to evaluate their impact on radiation and NWP. In addition to the operational forecasts a key product of CAMS is a reanalysis of global atmospheric composition from 2003 to the present day including satellite observations of

Aerosol Optical Depth and total columns and profiles of traces gases. Global wildfire emissions are estimated in CAMS with the Global Fire Assimilation System (GFAS) using satellite observations of Fire Radiative Power (FRP). We present a perspective on the occurrence and impacts of wildfire smoke aerosols in the high Arctic using: (i) CAMS real-time forecasts and their application to monitor a smoke plume from northern Canada and its radiative impact/surface deposition in August 2017; and (ii) 15 years of GFAS and CAMS reanalysis data to evaluate the inter-annual variability of boreal wildfire emissions, smoke transport and the potential impact on atmospheric radiation.