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IASI observations of pyrogenic trace gases during the 2017 Canadian boreal wildfire season

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The burning of forest vegetation releases large amounts of pollutants into the atmosphere; these have adverse effects on public health and the environment. Very intense fires initiate plumes of rising smoke and hot, turbulent air. When coupled with favourable atmospheric conditions, dense, towering, clouds form from the water vapour carried upwards by these powerful air currents; such clouds are given the name pyrocumulonimbus and are particularly associated with thunderstorms. These storms can in exceptional cases funnel the particulates and trace gases produced by wildfires directly into the Earth's lower stratosphere like a chimney. The 2017 boreal wildfire season exhibited a number of such storms, particularly in western Canada on 12 August. These fires created a plume of smoke and trace gases that rank amongst the biggest in the satellite era (post 1978).

Here we present (nadir) observations for a number of pyrogenic trace gases, such as carbon monoxide (CO) and ethene (C2H4), derived from Infrared Atmospheric Sounding Interferometer (IASI) measurements over the Canadian boreal region during August–September 2017. Observations are compared with the output of TOMCAT, a state-of-the-art offline three-dimensional chemical transport model (CTM), which includes an extensive tropospheric chemistry scheme and is forced using winds, temperature, and humidity from European Centre for Medium-Range Weather Forecasts (ECMWF) ERA-Interim meteorological analyses.