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Production and Transport of Ozone From Boreal Forest Fires

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In the summer of 2010, the BORTAS (Quantifying the impact of BOReal forest fires on Tropospheric oxidants over the Atlantic using Aircraft and Satellites) mission was planned by several universities and government agencies in the United Kingdom, Canada, and USA. Nearly 100 ozone soundings were made at 13 stations through the BORTAS Intensive Sounding Network, although aircraft measurements were unfortunately cancelled due to the volcanic eruption in Iceland.

2010 was actually an exceptional year for Canadian boreal fires. MODIS (Moderate Resolution Imaging Spectroradiometer) fire count data shows large fire events in Saskatchewan on several days in July. High amounts of NO_2 close to the large fires are observed from OMI satellite data, indicating that not all NO_2 is converted to PAN. Also associated with the fires, large amounts of CO, another precursor of ozone, are observed in MOPITT (Measurements Of Pollution In The Troposphere), AIRS and TES (Tropospheric Emission Spectrometer) satellite data in the middle to upper troposphere. These chemical conditions combined with sunny weather all favour ozone production.

Following days with large fire activity, layers of elevated ozone mixing ratio (over 100 ppbv) are observed downwind at several sites. Back-trajectories suggest the elevated ozone in the profile is traceable to the fires in Saskatchewan. Lidar profiles also detect layers of aerosol at the same heights. However, the layers of high ozone are also associated with low humidity, which is not expected from a combustion source, and suggests the possibility of entrainment of stratospheric air.