Long-range transport of forest fire aerosol observed by Raman lidar

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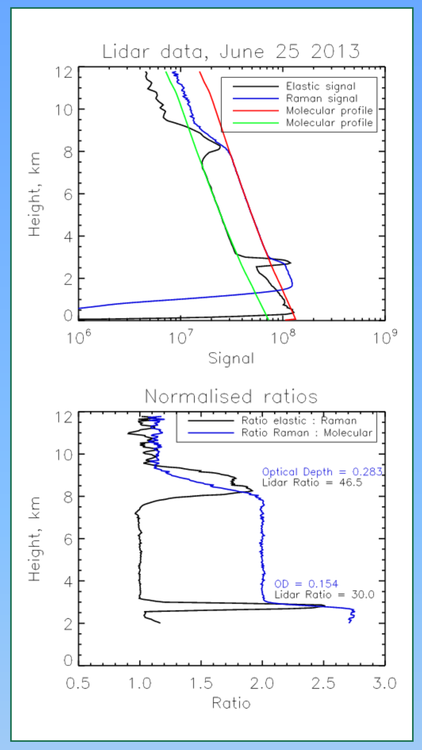
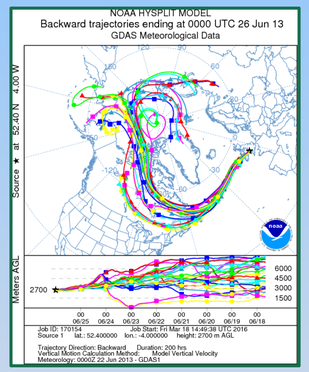
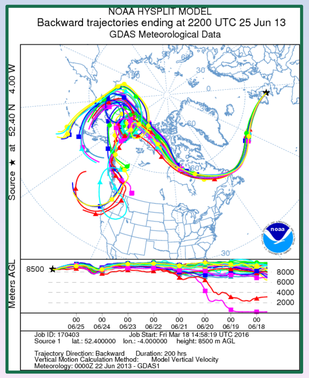
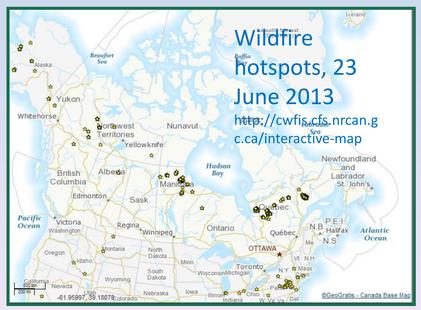
Observations of free tropospheric aerosol were made with a Raman lidar from Aberystwyth, Wales, during the summers of 2013 and 2014. Most of the observations are of cloud, characterised by large backscatter signals but relatively small optical depth. Occasionally, however, layers of darker material are observed, with a much enhanced ratio of optical depth to integrated backscatter (lidar ratio). The most likely origin for such layers is material lifted by forest fires over Canada. The spread of fire debris across high latitudes of the Northern Hemisphere in summer could lead to an increase in the atmosphere's optical opacity and so have implications for the radiation budget.

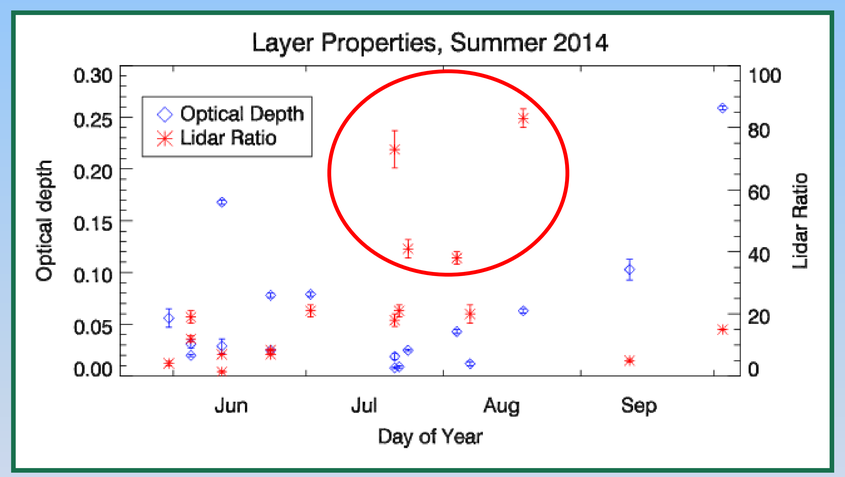


Layers of material observed with the Raman lidar in June 2013. The lidar data show two distinct layers, at 8-9 km and 2.5 – 3 km, with substantial optical depth. The upper layer has a lidar ratio of 46, more suggestive of aerosol than cirrus cloud. Back trajectories suggest a Canadian origin to the air – a location with copious forest fire activity at this time



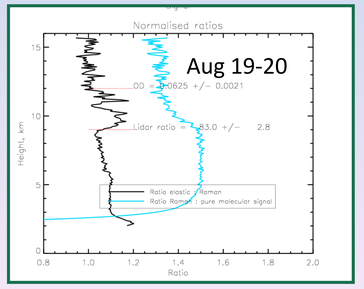


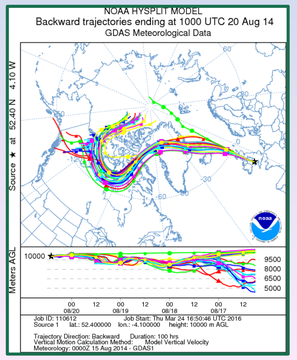


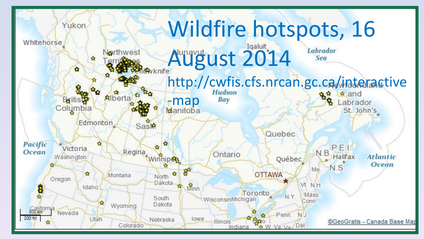


Darker layers (larger lidar ratio) coincide with the peak of the burning season over Canada and with trajectories going back to North America

Example from 2014: August 19-20







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