# Properties of Refractory Black Carbon over Northern Greenland During the Canadian Wildfire Season

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Measurements were made of refractory black carbon (rBC) with an extended range, single particle soot photometer (SP2XR, Droplet Measurement Technologies, LLC), at the Pituffik Space Base (76°32'N, 68°42'11"W), in northern Greenland, during the summer and autumn of 2024. The SP2XR measures light scattered from particles in the equivalent optical diameter (EOD) range from 100-500 nm, and mass concentration of rBC in the mass equivalent diameter (MED) range from 50 – 800 nm. In addition, an equivalent coating thickness (ECT) is extracted, calculated from the EOD and MED.

Black carbon arrives at this location from primarily three sources, local airport, aircraft traffic, ship emissions from the seaport at Nuuk, from the south of the measurement site, and from Canadian wildfires to that were burning out of control during this period. The measurements have been compared with back trajectories computed with the Navy Aerosol Analysis Prediction System Model reanalysis (NAAPS-RA) and the rBC properties are evaluated with respect to the source of the rBC and its age.

Figure 1 illustrates a day in August when back trajectory analysis identified air masses arriving from the west. The arrival of the carbonaceous particles is seen in this time series when the rBC number concentrations increase in the late morning (solid black curve), exceeding the non-rBC particle (green curve). The dashed black curve shows that more than 50% of the particles in the size range of the SP2XR contained rBC for almost 12 hours.

The time series shown in Fig. 2 illustrates how the size distribution of rBC mass concentration broadens during this same period of the day, with the MED increasing to the instruments maximum range of 800 nm. During this same time period, as shown in Fig. 3, the ECT is also seen to increase to more than 150 nm on rBC particles between 200 nm and 450 nm in MED.

Later in the day, another incursion of rBC is seen when once again the number and mass concentrations increase along with the equivalent coating thickness.

This presentation will be a comparative study that shows how the source, age and processing of rBC particles impacts their properties as quantified by the shapes of the size number and mass size distributions and how the mixing state changes as a function of size.

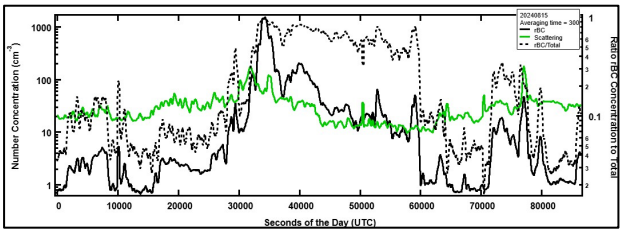


Figure 1. Time series of non-rBC and rBC number concentrations

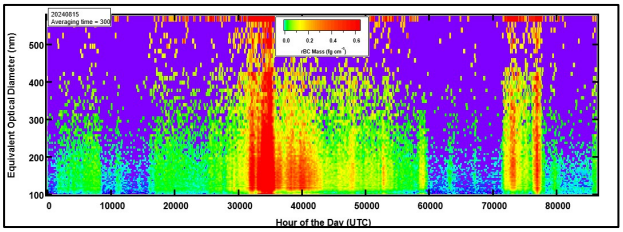


Figure2 Time series of the rBC size distributions of the mass concentration

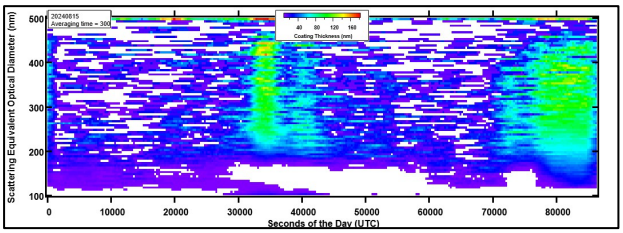


Figure 3 Time series of the size distributions of equivalent coating thickness on the rBC.

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