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Study of Arctic aerosol particle properties from ATR-42 aircraft in situ measurements during two POLARCAT campaigns conducted in 2008 during arctic spring and summer.

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The POLARCAT project aims to quantify the contribution and impact of trace gases and aerosols transported to the Arctic region. Within the frame of this project, the French ATR-42 research aircraft, equipped particularly with in-situ and remote sensing instrumention, was deployed during 2 measurement campaigns in 2008. While during the spring campaign the ATR-42 has been flying out of Kiruna, Sweden, the summer campaign was operated out of Kangerlussuaq, Greenland. Both campaigns aimed to characterize anthropogenic pollution plumes transported (from North America, Siberia) to the Arctic. This study presents primarily in-situ measurements of aerosol physical and optical properties. In particular, complete aerosol size distribution measurements (20 nm to 3 μm in diameter) have been performed next to measurements of absorption and scattering coefficients. In addition, complementary measurements of aerosol chemical in situ properties and aerosol remote sensing have been performed on board the same aircraft.

We will give an overview of the vertical distributions of aerosol number concentrations in distinct size modes. Besides clean background aerosol concentrations during the first days of both measurement campaigns, more polluted air masses have been observed towards the end of both campaigns. For the more significant pollution events observed we will give first estimates of BC concentrations derived from PSAP and refractory size distribution measurements.

Furthermore, first analysis of aerosol optical properties (extinction, absorption) from situ (nephelometer, photometer) and remote sensing measurements (lidar) will be compared to Mie calculations applied on measured aerosol size distributions, chemistry (refractive index), and measured humidity.

In addition, the aerosol nucleation phenomenon could be observed several times during the summer campaign.