Absorption Coefficient / Equivalent Black Carbon standardized dataset for long term impacts in the Arctic

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WP1: Ground-based component for SLCFs

T1.2: Improvement of data flow of near-real-time data from in-situ measurement stations

D1.2.1: Pilot DS for black carbon and aerosol absorption of Arctic Research Infrastructures

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Black Carbon (BC) aerosol generated by incomplete combustion of fossil fuels and biomass is a major anthropogenic pollutant especially in the Artic. BC found in the Arctic is transported mainly from high and mid-latitudes through atmospheric pathways with seasonal characteristics governed by the polar front and multi-annual larger circulation patters like NAO. Several modeling studies have simulated the BC annual variation in the Arctic. However, surface concentrations are generally underestimated and are in poor agreement with observations. The reasons for this discrepancy are uncertainties of BC emissions, as well as incomplete representation of wet scavenging and transport dynamics in models. Another issue of controversy is the metrics we use to describe black carbon physical or chemical properties like its mass concentration or optical properties. Recent progress on expressing measurements of black carbon by filter based light attenuation instruments have led to better representation of black carbon by means of its absorption coefficient. When a well-defined mass absorption cross section or mass absorption coefficient is available for this aged aerosol arriving at the arctic, the mass concentration of light absorbing carbon can be quantitatively determined. Here we present 20 years (1998-2018) of surface observations of the aerosol absorption coefficient $\mathbf{b}_{abs}$ (corresponding to Equivalent BC), obtained by means of a single wavelength and 7 wavelength aethalometers at the Zeppelin Observatory, Ny Ålesund, Svalbard. Our efforts are extended to provide a seamless data record of the well-defined equivalent black carbon and absorption coefficient regardless of the measurement techniques applied. The latter is important in the light of new aethalometer instruments currently installed in Arctic stations and other light absorbing carbon instruments.

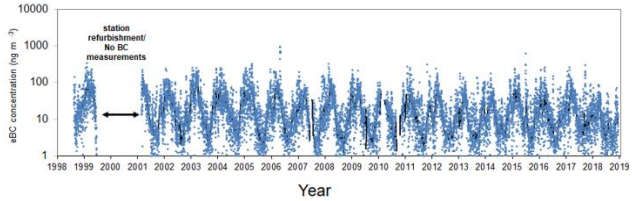

Figure 1. *Equivalent Black Carbon timeseries at the Zeppelin station, Ny Ålesund, Svalbard*

References

Black carbon levels observed in the High European Arctic are strongly modulated by North Atlantic Oscillation and Scandinavian large circulation patterns. V. K. Stathopoulos, N. Evangeliou, A. Stohl, S. Vratolis, C. Matsoukas and K. Eleftheriadis (to be submitted)

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