**Characterization of local Polycyclic Aromatic Hydrocarbon sources in the Arctic: Emission and deposition from Svalbard (Norway) settlements**

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Polycyclic Aromatic Hydrocarbons (PAHs) are organic compounds structurally composed of multiple aromatic rings. PAHs are neutral, nonpolar substances usually found in fossil fuels (petroleum and coal), often being generated during incomplete combustion (processes) of organic materials. In the largest settlements on Svalbard (Norwegian Arctic), electric power is produced by coal-fired power plants. Thus, PAH emissions from coal combustion are considered as markers for local atmospheric pollution in the Arctic environment. The objective of this study was to evaluate and characterise local PAH emissions as well as to assess this anthropogenic impact on the fragile Arctic environments

During two subsequent sampling campaigns in 2011 and 2012, simultaneous sampling for aerosol characterization and PAH quantification was conducted in the vicinities of two power plants in Longyearbyen and Barentsburg (Svalbard). Samples were collected at 7 different locations around both facilities. Particle/aerosol characterization was performed using Environmental Scanning Electron microscope (ESEM) at the Technical University Darmstadt (Germany). In turn, The trace analytical quantification of the air samples was done at the analytical laboratories of the Norwegian University of Life Sciences (NMBU), During the 2012 campaign (01.03.2012–14.03.2012), air samples were taken at 7 different locations in Barentsburg and Longyearbyen in distinct differences from the potential local contamination source. In 2014, a complementary study was performed on the assessment of PAH residues including transformation products ( nitro-PAH and oxy-PAH) n Svalbard soils as potential sink of the previously emitted PAHs. This soil sampling campaign was, thus, mainly conducted in the vicinity of coal and diesel combustion sources in Pyramiden (abandoned Russian Mining location, Svalbard; Norwegian Arctic).

The highest air levels of PAHs were found near Longyearbyen power plant (62 µg/m3 total PAH), being around 90% of the emissions via the gas phase. Benzo[a]pyrene and Benzo[a]fluoranthene were the major contributors to the total concentration of PAHs.

The PAH emission profile emitted by the coal fired power plant was assessed and compared with atmospheric samples collected at different distances from the power plant. The dominating PAHs directly emitted from the stack were Indeno(1,2,3)pyrene, Benzo(ghi)fluoranthene, Benzo(bjk)fluoranthene, Benzo(a)fluoranthene, Benzo(e)pyrene and Benzo(a)pyrene. However, the PAH patterns in the various samples only partially reflect this characteristic signature and are varying considerably between sites. This indicates the complex contribution of various PAH sources, either primary or secondary, even at locations