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ABSTRACT

Contamination of snow cover near Longyearbyen and Barentsburg settlements, Spitzbergen

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Contamination of snow has been investigated in Spitzbergen for many years, since more than a century-long coal mining and associated human activities resulted in large aerosol emissions to these Arctic landscapes covered by snow for 9 to 10 months a year.

In addition, Spitzbergen has been increasingly recognized as an area of background environmental research in context of both regional and global changes, and the snow represents a well suited medium for tracing contamination.

Despite a large number of studies on contamination of snow and subjacent soil cover in Spitzbergen have been documented in detail, some of their interpretations are opposite, and region-wide data integration and resulting perspective are still lacking.

The snow contamination was studied in Longyearbyen and Barentsburg settlements which are situated in the south-west part of Spitsbergen Island. Both towns are existing centers of the coal industry, where the main sources of contamination to the Arctic ecosystem include the following industrial and associated facilities – heating plant, seaport facilities, coal mines, storehouses and industrial estates, residential areas and infrastructure.

Snow cover around Barentsburg and Longyearbyen was sampled from the May 14th to June 27th, 2013, in 30 locations, with 28 of them being situated within potentially contaminated areas and others serving as background (reference) sites. Sampling incorporated the whole snow mass and was associated with morphological observations, thickness and density measurements.

Meltwater and suspended solids were further analyzed for a wide range of contaminants including PAHs, macro-ions and trace metals. Results have been correlated with available previously obtained data in contexts of comparative assessment of snow contamination, contribution of both local and remote natural and human-related sources of emissions, fallout rates of individual contaminants at

various locations of the studied area, measuring the release of contaminants from snow to soil cover.

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