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Characterization of dry atmospheric deposition following a dust event and its importance for ombrotrophic peatlands

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Atmospheric deposition is the only source of mineral matter for ombrotrophic peatlands. To characterize the mineral matter deposited on Å ijec bog in Pokljuka plateau in Slovenia, we used scanning electron microscopy coupled with energy dispersive spectrometry (SEM/EDS), using a JEOL JSM 6490LV SEM coupled with an Oxford INCA Energy 350 EDS system. We collected solid atmospheric deposition by sampling and filtering rainwater and snowmelt (0.6 μm filter) and using passive sampling technique. Samples were taken during average atmospheric conditions and after dust events. Particulate matter was transferred from filters to double-sided carbon tape and coated with carbon for better conductivity. Passive sampling technique allowed direct deposition of particles on the carbon tape, which was carbon coated prior to SEM/EDS analysis.

Samples impacted by dust events were richer with solid particles compared to other samples. This was especially well observed in passive deposition samples.

In all samples silicate particles predominate (50–70 %) and consist of two main groups: quartz and aluminosilicates. In rainwater filtrates and samples taken from upper layer of snow, which does not contain particles from dust event, there is higher percentage of aluminosilicate compared to quartz particles. In contrast, in samples with records of the dust events, quartz particles predominate, while in general there is a higher percentage (about 70%) of all silicate particles.

Carbonate and organic particles each represent 5–10 % in snow affected by dust events and 10 to 20% in snow not affected by dust events. Additionally, Fe-oxyhydroxides represent 5–10 % and based on their shape (angular and spherical) show both geogenic and anthropogenic origin, whereas most previously mentioned particles have geogenic origin. Iron-oxyhydroxides have similar percentages in all rainwater and snow samples.

Atmospheric deposition varies throughout the year and is highly dependent on weather conditions. Dust events represent periods or increased deposition being transported over long distances and therefore contribute to the mineral matter input to the peatlands.