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SEM/EDS characterization of atmospheric solid particles deposited on peatland

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Ombrotrophic peatlands receive mineral matter and water only from atmospheric deposition. Part of the atmospheric deposition represents solid particles, while a larger part is dissolved and deposited as precipitation. Solid atmospheric particles can be studied in different environmental media, such as precipitation – rainwater and snow [1; 2] and dry airborne deposition [2]. Presented research is conducted in the pristine environment of the Šijec bog on Pokljuka plateau in Slovenia.

We installed direct and indirect passive samplers to collect atmospheric deposition as precipitation and direct deposition of solid particles. Precipitation samples (rainwater and snowmelt water) were filtered to obtain solid particles. Particles were then characterized using a combination of scanning electron microscopy and energy dispersive spectroscopy (SEM/EDS).

Direct passive samplers were exposed on the peatland for 12 days. The particles deposited during this time were mostly of natural origin, predominantly silicates (quartz and Al-silicates), carbonates and organic matter. They are angular, while the organic matter is mostly spherical, and they all have varying size (1–60 μm). PTE-bearing particles, predominantly Fe-oxides are also present, have an angular shape, but they are smaller in size (average 2.5 μm with larger particles measuring up to 7 μm). They are mostly of natural origin, while spherical Fe-oxide particles originate from anthropogenic activities. The composition of particles in rainwater is similar, though contains more Fe-silicates of natural origin. The particles in snowmelt water are also similar. There are more anthropogenic spherical particles, especially Fe-oxides. Sulphates and REE-bearing particles are present in rainwater and snowmelt water, being more common in latter. They are smaller (<3 μm), angular and of natural origin.

SEM/EDS characterization of atmospheric particles in peatland shows that particles of natural origin predominate, although anthropogenic influence is also present, even though there are no important anthropogenic sources in the vicinity of the peatland.

[1] Talovskaya et al. (2017) Environmental Technology 39: 2288–2303. [2] Gaberšek & Gosar (2021) Science of the Total Environment 763.