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Trace elements in peat bog surface waters and *Sphagnum* moss porewaters: indicators of dissolution of atmospheric dusts from open pit mining and other industrial activities

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Open pit bitumen mining in northern Alberta generates considerable volumes of dust from the "sand" fraction of the Athabasca Bituminous Sands, as well as dry tailings, gravel roads, and aggregate quarries. The most reactive mineral phases in these dusts could potentially dissolve in the acidic waters (pH 4) of ombrotrophic bogs. Here, we explore the use of peat bog surface waters and *Sphagnum* moss porewaters as indicators of the chemical reactivity of these dusts. The main goal is to determine whether the elevated rates of dust deposition to peat bogs near bitumen mines and upgraders, has led to elevated concentrations of trace elements in the dissolved (i.e. < 0.45 μm) fraction of their surface waters. Water samples were collected in the summer and autumn of 2019 and analyzed in the metal-free, ultraclean SWAMP laboratory using ICP-MS. Concentrations in the autumn were typically 10-fold greater and are more precise, but consistent and distinct trends occur in both seasons. The elements most commonly elevated in bog waters near industry, relative to the control site, are Li, Fe, V and the lanthanides. Cadmium, Pb, Sb and Tl show no consistent trend with distance toward industry. Copper concentrations were greatest at the control site in both seasons. Taking the lithophile element concentrations as indicators of dust dissolution, the chalcophile elements are under-represented in bog waters near industry.

In regard to porewaters extracted from *Sphagnum* moss, most elements increase with distance toward bitumen mining and upgrading activities. In Alberta, however, the greatest Ni concentrations were found in samples collected downwind of the nickel refinery at Fort Saskatchewan. For perspective, samples were also collected from bogs in other regions of Canada. The greatest concentrations of Cd and Tl were found in moss from southern Ontario, and the greatest values for Pb and V occur in moss from a bog on Vancouver Island in British Columbia. In summary, trace elements in moss and bog waters are useful indicators of the chemical reactivity of aerosols and dusts. Suitable control sites are vital for understanding natural, background variations.