Pushing the limits of atmospheric trace metal detection in peat samples

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Based on their unique characteristics, such as isolation from the groundwater and lack of local sediment input, ombrotrophic peatbogs offer exceptional opportunities to study the long term atmospheric deposition of metals from various sources. Ireland has the second-highest proportion of peat cover in the EU, after Finland, and represents one of the few countries where a range of peatlands still exist in natural state. So far, significant pioneer studies on the Irish peat bogs were focussed on questions of regional scale and of limited scope in terms of metal deposition, often attributable to a single point source of contamination (e.g., historical mining [1]). There is thus significant potential for extracting metal deposition histories from Irish peat cores, particularly in view of the fact that the island is exposed to dominant weather systems from the North Atlantic, possibly carrying aerosols from as far afield as North America.

Existing peat core studies have additionally identified a rich record of tephra [2]. This is an expected consequence of Ireland's proximity to Iceland with its active volcanoes, but relatively little work has been conducted into deciphering the details of tephra chemistry at trace element level.

In order to better understand the dispersal of particulate and aerosol plumes, three peatbogs from the eastern part of Ireland (Meath, Wicklow, and Waterford) were collected and examined for their trace and ultra-trace (ppb-ppt) element compositions at high spatial resolution [3]. By pushing the limits of trace metal detection, we aspire to unravel the metal contribution from multiple sources, and to better understand the element mobility within the peat core. Additionally, by combining solution analyses and non-destructive imaging (e.g., environmental SEM) a more precise identification and discrimination between natural (e.g., volcanic) and anthropogenic inputs into the atmosphere can be made. Combined, this approach provides new, highly relevant insights into the general metal cycle at the Earth surface.

[1] O'Brien, W. (1996), *Royal Dublin Soc*. **12**, 16pp; [2] Hall & Pilcher. (2002), *The Holocene*, **12**, 223-230; [3] Marx *et al* (2010). *Environmental Pollution* **158**, 1615-1628.