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Occurrence of organic arsenic species in a 4-m deep free-floating mire

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Wetlands play a key role in the fate of major and trace elements, affecting their environmental mobility and ecotoxicity.

Arsenic (As) is a chalcophile element that is recognized as a serious health risk worldwide. Inorganic forms of this metalloid are dominant in soils, whereas the organic forms generally occur only in trace amounts. Nevertheless, methylation processes are responsible for the mobilization of As in several ecosystems, especially in anoxic conditions.

Peat cores from ombrotrophic bogs have been used to determine atmospheric depositional fluxes of total As over centuries, although the contribution of organic vs inorganic As species has been rarely considered. Here, 47 peat samples collected throughout a 400-cm deep, free-floating mire have been analysed for total As and for its organic species, including dimethylarsinic acid (DMA), methylarsonic acid (MA), trimethylarsine oxide (TMAO) and arsenobetaine (AB) by HPLC-ICP-MS.

Total As concentration throughout the profile ranged between 0.20 and 9.79 mg/kg (1.41$\pm$1.36 mg/kg; mean $\pm$ st. dev.), showing values that are quite low compared to other mire ecosystems. Organic As species (DMA+MA+TMAO+AB) account, on average, for 28$\pm$10% of total As (range 6-47%; median 28%), and for 41$\pm$14% of the extracted As (range 7-73%; median 42%). The relative abundance of organoarsenicals generally followed the order DMA$>$TMAO$\sim$MA$>>$AB, and was not correlated with main physical and chemical properties of peat, including its degree of decomposition.

There was, however, a highly significant (p $<$0.001) statistical correlation among all organic As compounds. This result provides new insights into the occurrence of organic As species in floating mires, suggesting a possible common biological pathway for their formation.