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sulfur fate in the peatlands: an in-depth analysis on a global scale

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Input of sulfur into peatlands either by anthropogenic or natural sources has been proposed to reduce CH_4 emissions, resulting in positive climate feedback. However, the long-term fate of sulfur in peatlands, particularly on a global scale under different input scenarios, remains poorly understood. Our previous studies have indicated that sulfur transformation primarily occurs at redox interfaces, where it is stabilized as organic sulfur, especially in the form of reduced sulfur in anoxic zones [1]. Building on this knowledge, we collected peat cores from various climate zones , and trophic status, including ombrotrophic bogs, poor fens and both degraded and restored peatlands. Using sulfur K-edge XANES analysis, we investigated sulfur forms abundant under different environmental conditions, enabling us to understand the fate of sulfur on a global scale. Furthermore, we aim to link to biogeochemical sulfur transformations to redox properties of organic carbon, potential greenhouse gas formation and carbon burial in peatlands. overall, this study provides valuable insights into forms and biogeochemical fate of sulfur in peatlands, enhancing our understanding of its role in these critical ecosystems.

[1] Wang, H., Yu, Z.-G., Broder, T., Goettlicher, J., Steininger, R., Wagner, S., et al. (2025). Elevated atmospheric sulfur deposition affects predominant forms of sulfur in ombrotrophic peatlands. Journal of Geophysical Research: Biogeosciences, 130, e2024JG008563.