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Microbially Mediated Release of As from Mekong Delta Peat Sediments

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23 **ABSTRACT**

24 Peat layers within alluvial sediments are considered effective arsenic (As) sinks under reducing
25 conditions due to the binding of As(III) to thiol groups in natural organic matter (NOM) and the
26 formation of As-bearing sulfide phases. However, their possible role as sources of As for anoxic
27 groundwaters remains unexplored. Here, we perform laboratory experiments to provide evidence
28 for the role of a sediment peat layer in releasing As. Our results show that the peat layer,
29 deposited about 8,000 years ago in a paleomangrove environment in the nascent Mekong Delta,
30 could be a source of As to porewater under reducing conditions. X-ray absorption spectroscopy
31 (XAS) analysis of the peat confirmed that As was bound to thiol groups of NOM and
32 incorporated into pyrite. Nitrate was detected in peat layer porewater, and flow-through and
33 batch experiments evidenced the release of As from NOM and pyrite in the presence of nitrate.
34 Based on poisoning experiments, we propose that the microbially mediated oxidation of arsenic-
35 rich pyrite and organic matter coupled to nitrate reduction releases arsenic from this peat.
36 Although peat layers have been proposed as As sinks in earlier studies, we show here their
37 potential to release depositional- and/or diagenetically-accumulated As.

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