Elemental sulfur dynamics in coastal lowland acid sulfate soil landscapes

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Elemental sulfur has an important role in the digenic transformation of precursor iron monosulfide minerals to pyrite [1],[2]. It and related polysulfide intermediates are known to enable the rapid formation of pyrite, including complex framboidal morphologies, and it is a key component for pyrite formation in sub-oxic environments such as sub-tidal sediments. Lesser known for elemental sulfur is its role in the contemporary sulfur-cycle of acid sulfate soil landscapes involving disordered mackinawite and acidifying oxidation processes.

This study examines the occurrence and dynamics of elemental sulfur from coastal lowland acid sulfate soil drain sediments and laboratory oxidative resuspensions and reductive incubations. Our results show the formation of elemental sulfur is a primary and short-lived product of disordered mackinawite (Figure 1). The kinetics of its formation and further oxidation to sulfate (accompanied by the liberation of acidity) or reduction to sulfide are quantified. These observations illustrate that elemental sulfur has a fundamental role in contemporary sulfur cycling in coaslat lowlands. The implications of elemental sulfur to water quality in coastal landscapes are discussed.

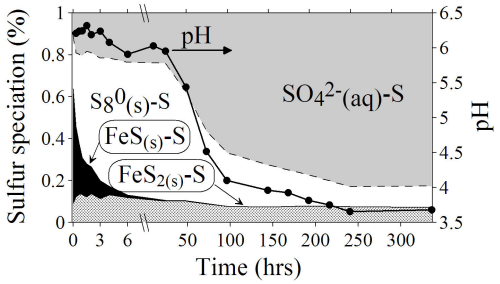

Figure 1. Changes to sulfur speciation and pH during oxidative resuspension of a drain sediment, showing the rapid initial formation of elemental sulfur (S_8^0) and subsequent oxidation to sulfate.

References

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