Volatile metabolite fluxes from natural salt marshes

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The status of ongoing, complex interactions between sulfur, iron and methane metabolisms in natural systems may be probed through headspace sampling of volatiles. Natural salt marshes are a useful testing ground for this appraoch since they incorporate substantial environmental and biological variability.

We quantified fluxes of dimethyl sulfide and methane from four regional (Essex, UK) coastal salt marshes over the course of an annual seasonal cycle. A single season subset of fluxes were measured for methane thiol. Four different dominant vegetation types (*Atriplex* sp., *Limonium* sp., Mud pan, and *Puccinellia* sp.) were studied from equivalent elevations within the salt marshes. Sediment characteristics, including pH, were profiled from each trace gas sampling location for further comparative analyses.

The trace gas fluxes measured from the Essex marshes were highly variable, with dimethyl sulfide fluxes in particular exhibiting multiple orders of magnitude during both efflux from and consumption by the net sediment/plant system. Poor correlation was observed between fluxes of methane and methane thiol and between methane and dimethyl sulfide. Fluxes of methane thiol and dimethyl sulfide were negatively and significantly correlated. Sub-surface pH distributions were bimodal, and do not predict surface fluxes of any of the measured trace gases.

The significant interction between dimethyl sulfide and methane thiol fluxes suggests that, broadly, modes of sediment sulfur cycling can be determined through surface trace gas profiling. However, further work needs to be done to incorporate methane (and other trace gas) fluxes into an overarching predictive framework.