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Disentangling the rates of carbonyl sulphide (COS) production and consumption and their dependency with soil properties across biomes and land use types

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Soils both emit and consume the trace gas carbonyl sulphide (COS), leading to a soil-air COS exchange rate that is the net result of two opposing fluxes. Partitioning these two gross fluxes and understanding their drivers are necessary to estimate the contribution of soils to the current and future atmospheric budget of COS. Here we compiled results from microcosm experiments on soil COS sources and sinks and their temperature sensitivity (Q_{10}). Measurements were performed at different moisture and temperature levels on soils from different biomes and land use types in order to obtain a large range of physical-chemical properties and identify the drivers of COS consumption and production rates.

We found that COS production rates from moist and air-dried soils were not significantly different for a given soil and that the COS production rates had Q_{10} values (*ca.* 3-4) that were larger and more variable than the Q_{10} for COS consumption (*ca.* 1-1.5). Across the range of biomes and land use types, COS production rates co-varied with total soil nitrogen (N) and the first-order COS uptake rate co-varied most with microbial N content, with surprisingly little influence of soil pH. These relationships are then used to provide an updated global scale estimate of COS production and uptake by oxic soils.