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COS, CO_2 and H_2O eddy covariance flux measurements over *Agave sisalana*

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Carbonyl sulfide (COS) has gained attention as a proxy for stomatal conductance and photosynthesis. It is taken up by the plants through their stomata, similar to carbon dioxide (CO_2), and destroyed at the chloroplast surface by the enzyme carbonic anhydrase in a hydrolysis reaction. The main limiting factor of COS uptake in the leaves has been found to be the stomatal control. Thus, COS flux measurements have been linked to stomata-controlled carbon and water fluxes. However, existing studies, both in the field and in the laboratory, have predominantly focused on C3 and C4 plants, leaving a gap in understanding COS exchange in crassulacean acid metabolism (CAM) plants.

CAM plants, such as sisal (*Agave sisalana*), aim to minimize water loss by closing stomata during the day and opening them at night. During nighttime, they take up CO_2 but also other gases, including COS, from the atmosphere. CO_2 is stored as malic acid until light becomes available during daytime and it can be utilized in photosynthesis. This allows the plants to avoid water loss in harsh environments and reach high water-use efficiencies.

In this study, we measured COS fluxes with the eddy covariance (EC) technique over a sisal plantation for the first time. The measurement period covers three weeks during the rainy season in Kenya in November and December 2019. We show that COS and CO_2 fluxes followed a similar diurnal pattern, with uptake observed during nighttime, while water (H_2O) fluxes showed an opposite cycle with highest evaporation observed during daytime. We also show that the soil COS fluxes, measured with soil chambers, were positive under radiation (i.e., indicating COS emission) and negative (i.e., indicating COS uptake) in the dark, and soil COS emissions increased with increasing soil temperature. Our aim is to quantify the canopy conductance of *Agave sisalana* using COS together with H_2O and CO_2 flux measurements at the ecosystem scale. Our study provides valuable insights into the intricate interplay of COS with water and carbon fluxes in ecosystems dominated by CAM plants.