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Marine cycling of the climate relevant trace gases carbonyl sulfide (OCS) and carbon disulfide (CS2) in the Peruvian upwelling regime

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The ocean is a major source for the climate relevant trace gases carbonyl sulfide (OCS) and carbon disulfide (CS2). While the greenhouse gas CS2 quickly oxidizes to OCS in the atmosphere, the atmospheric lifetime of OCS of 2-7 years leads to an accumulation of this gas and makes it the most abundant reduced sulfur compound in the atmosphere. OCS has a counteracting effect on the climate: in the troposphere, it acts as a greenhouse gas causing warming, whereas it also sustains the stratospheric aerosol layer, and thus increases Earth's albedo causing cooling. To better constrain the important oceanic source of these trace gases, the marine cycling needs to be well understood and quantified. For OCS, the production and consumption processes are identified, but photoproduction and light-independent production rates remain to be quantified across different regions. In contrast, the processes that influence the oceanic cycling of CS2 are less well understood. Here we present new data from a cruise to the Peruvian upwelling regime and relate measurements of OCS and CS2 to key parameters, such as dissolved organic sulfur, chromophoric and fluorescent dissolved organic matter. We use a 1D water column model to further constrain their production and degradation rates. A focus is set on the influence of oxygen on the marine cycling of these two gases in oxygen depleted zones in the ocean, which are expected to expand in the future.