| Component | Notes | Critical data gaps |
|---|---|---|
| Vascular plant leaves | Vascular plant leaves have a well-established exchange of OCS that follows stomatal conductance. OCS is destroyed by both RuBisCO and CA in plant leaves, though it most often encounters CA first. The point of destruction is different for OCS and $CO_2$, though the correlation between their uptakes is consistent under high-light conditions. | Nocturnal uptake and role of phyllosphere is not well characterized, and "mesophyll" conductance to COS is not well constrained. |
| Non-vascular plants and lichen | Few studies have addressed non-vascular plants. Bryophytes and lichen have been found to take up OCS depending on their water content, sometimes regardless of light level. | Activities to support scaling up OCS fluxes for non-vascular plants are needed for the assessment of their importance to ecosystem fluxes. |
| Soil | Most soils are generally small sinks of OCS, making up less than 10 % of the total ecosystem flux. Non-desert soils exhibit large OCS emissions under hot and dry conditions. These OCS-emitting soils include both agricultural soils and some uncultivated soils. | It is unknown what controls the magnitude of the soil source term. |
| Terrestrial ecosystem | Ecosystem-scale flux measurements are available only from a handful of studies on a limited number of ecosystems and during relatively short periods of time. | No studies from the tropics and only one study in boreal forests have been published. |
| Regional terrestrial | The highly mechanistic leaf-enzyme kinetic approach to modeling plant–atmospheric OCS exchange yielded similar results to the mechanistically simple LRU approach when focusing on the peak of the North American growing season. However, laboratory studies demonstrate that LRU is not constant. | The minimum spatial and temporal scales at which the constant LRU approximation is viable are unknown. Uncertainties in non-plant OCS fluxes, particularly from soils, remain under-constrained at regional spatial scales. |
| Surface ocean | While the surface ocean is generally thought to be a source of OCS to the atmosphere, surface measurements of OCS are relatively sparse. | More continuous measurements covering full diurnal cycles are needed especially for the Pacific, Indian, Southern, and Arctic oceans. |
| Deep ocean | Concentration profiles have been reported from only very few stations in the Atlantic Ocean (e.g., Cutter et al., 2004; Flöck and Andreae, 1996; Von Hobe et al., 2001). Understanding deeper ocean OCS production could allow us to model OCS ocean surface fluxes more accurately. | More data are necessary to make clear predictions of the relationship between deep and surface ocean OCS fluxes. |
| Regional ocean | Surface measurements comprise different oceanic regimes including several meridional Atlantic transects and oligotrophic and upwelling regions. | Especially, data from the Arctic and Southern oceans are missing. |
| Freshwaters | There are few quite small datasets of OCS concentrations in lakes and rivers. | No OCS fluxes from freshwater bodies currently exist. |
| Global, modern | Global satellite products currently lack coverage over the land, and the locations of TCCON sites are purposely chosen to observe atmospheric background. | A new satellite and data product would be necessary to distinguish surface fluxes, e.g., anthropogenic and ocean OCS sources. |
| Global, paleo | Recent advances have allowed better interpretation of OCS in firn and ice air. There are still only a handful of cores that have been analyzed for OCS. | OCS observations from ice cores in the Northern Hemisphere are critical to GPP interpolar comparisons. |