
Two-year assessment of surface concentrations and fluxes of carbonyl sulfide (OCS) in a suburban atmospheric measurement site in France (Gif-sur-Yvette)

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Résumé

We investigated on an hourly basis the diurnal and seasonal variations of atmospheric carbonyl sulfide (OCS) surface concentrations from August 2014 to July 2016 at Gif-sur-Yvette (GIF, 48.71N-2.15E, 170m asl, 7m agl), a suburban atmospheric measurement site in France. The amplitude of the mean seasonal cycle of OCS at GIF is 100 ppt and is about 15 ppt higher than at Mace Head (Ireland). Vertical profiles, measured with an infrared spectrometer at a high tower located about 2 km away from GIF, show net uptake of OCS during the night. OCS fluxes and deposition velocities were calculated for nocturnal situations of low boundary layer height using the Radon-Tracer Method. Nocturnal OCS uptake rates ranged from -1.5 to -20.7 pmol.m⁻².s⁻¹ and were on average equal to -7.3 ± 4.1 pmol.m⁻².s⁻¹ (n= 112), about four times stronger than in the Harvard Forest (Commane et al., 2015). Deposition velocities ranged from 0.09 to 1.06 mm s⁻¹, with an annual mean of 0.35 mm s⁻¹. We found strong similarities between OCS and H₂ dry deposition velocities in terms of annual mean and ranges of variation, and data showed linear correlation between the two ($v_{\text{OCS}}/v_{\text{H}_2} = 1.4 \pm 0.2$, n= 45). This study provides strong evidence of the loss of OCS near the ground via non-photosynthetic processes.

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