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Tropical sources and sinks of carbonyl sulfide observed from space

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According to current budget estimations the seasonal variation of carbonyl sulfide (COS) is governed by oceanic release and vegetation uptake. Its assimilation by plants is assumed to be similar to the photosynthetic uptake of CO_2 but, contrary to the latter process, to be irreversible. Therefore COS has been suggested as co-tracer of the carbon cycle. Observations of COS, however, are sparse, especially in tropical regions. We use the comprehensive data set of spaceborne measurements of the Michelson Interferometer for Passive Atmospheric Sounding (MIPAS) to analyze its global distribution. Two major features are observed in the tropical upper troposphere around 250 hPa: enhanced amounts over the western Pacific and the Maritime Continent, peaking around 550 pptv in boreal summer, and a seasonally varying depletion of COS extending from tropical South America to Africa. The large-scale COS depletion, which in austral summer amounts up to -40 pptv as compared to the rest of the respective latitude band, has not been observed before and reveals the seasonality of COS uptake through tropical vegetation. The observations can only be reproduced by global models, when a large vegetation uptake and a corresponding increase in oceanic emissions as proposed in several recent publications is assumed.