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# Sulfur isotope fractionations in carbonyl sulfide sink reations in atmosphere.

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Carbonyl sulfide (OCS), a relatively inert tropospheric sulfur compound is thought to play an important role as a source of background stratospheric sulfate aerosols (SSA). The main sink for OCS in the stratosphere is photolysis which reaches 80% of the total chemical sink at above 20 km; other sinks include reactions with O($^3$P) and OH. In order to investigate isotope fractionation in OCS sink reactions at present atmosphere, we undertook laboratory experiments. First, we investigated wavelength dependence of kinetic isotope effect in OCS photolysis. The absolute ultraviolet (UV) absorption cross sections of OCS isotopologues O$C^{32}$S, O$C^{33}$S, and O$C^{34}$S were measured using labeled samples prepared in the laboratory. The observed cross section of O$C^{32}$S is consistent with previous reported cross sections of natural abundance samples. The peak positions for labeled samples were shifted in a systematic way. Isotopologue absorptions cross sections were not only shifted in energy but in intensity. In particular, the O$C^{33}$S isotopologue had the largest cross section of the measured OCS isotopologues. This finding indicates that OCS photolysis may have a positive mass-independent effect on sulfur in the stratosphere. In addition, relative rate constants of OCS sink reaction with O($^3$P) and OH were investigated using photochemical chamber.

Keywords: isotope fractionation, photolysis, sulfur cycle, carbonyl sulfide, wavelength dependence