

## 一次元光化学モデルによる工業化前産業硫化カルボニールとその展望 Pre-Industrial Carbonyl Sulphide studied by 1-D photochemical model, future implications

\*Danielache Sebastian<sup>1,2</sup>、新開 万純<sup>1</sup>

\*Sebastian Danielache<sup>1,2</sup>, Masumi Shinkai<sup>1</sup>

1. 上智大学 理工学部 物質生命理工学科、2. 地球生命研究所

1. Department of Materials & Life Sciences, Faculty of Science & Technology, Sophia University, 2. Earth-Life Science Institute

Carbonyl sulfide (OCS) has a large lifetime for tropospheric conditions making it the most abundant reduced sulfur compound in the atmosphere. Stratospheric oxidation of OCS produces a sulfate aerosol layer between 17 and 30 km. This stratospheric sulfur aerosol (SSA) also known as the Junge Layer affects the planet's Albedo and catalysis the hydrolysis of  $\text{N}_2\text{O}_5$ , promoting mid-latitude ozone depletion. While volcanic eruptions are an important source of stratospheric sulfate they are sporadic. Recent studies have extended the isotopic database and the kinetic data related to this compound. Ice core studies show that pre-industrial tropospheric levels of OCS were 372 ppt while current levels are 500 ppt. In this study, we create a 1-D photochemical model that includes stable isotopes has an additional tool for model calibrations and consider the historical variation of anthropogenic emissions of OCS and its tropospheric precursor  $\text{CS}_2$ .

In order to calculate the OCS atmospheric vertical profile, we developed a one-dimensional photochemical model that takes into account chemistry, transport, deposition, stable isotopes, and high-resolution UV absorption spectrum. This last feature is important since the main isotopic imprint of the stratospheric oxidation pathway of OCS is produced by photo-dissociation. The combination of the updated kinetic isotopic data with different emission scenarios presents a new hypothesis that challenges the current understanding of the stratospheric sulfur aerosol. Our findings show that 34% of today's SSA is anthropogenic. Furthermore, the anthropogenic contribution to SSA means that an estimate of  $-0.16 \text{ Wm}^2$  of radiative forcing should be accounted in pre-industrial pollution-free models.

キーワード：成層圏エアロゾル、硫黄同位体

Keywords: SSA, Pre-Industrial