PHOTOCHEMICAL FORMATION OF SULFUR-CONTAINING AEROSOLS

JAY A KROLL, VERONICA VAIDA, *Department of Chemistry and Biochemistry, University of Colorado, Boulder, CO, USA*.

In order to understand planetary climate systems, modeling the properties of atmospheric aerosols is vital. Aerosol formation plays an important role in planetary climates and is tied to feedback loops that can either warm or cool a planet. Sulfur compounds are known to play an important role in new particle aerosol formation and have been observed in a number of planetary atmospheres throughout our solar system. Our current understanding of sulfur chemistry explains much of what we observe in Earth's atmosphere; however, several discrepancies arise when comparing observations of the Venusian atmosphere with model predictions. This suggests that there are still problems in our fundamental understanding of sulfur chemistry. This is concerning given recent renewed interest in sulfate injections in the stratosphere for solar radiation management geo-engineering schemes. We investigate the role of sunlight as a potential driver of the formation of sulfur-containing aerosols. I will present recent work investigating the generation of large quantities of aerosol from the irradiation of mixtures of SO_2 with water and organic species, using a solar simulator that mimics the light that is available in the Earth's troposphere and the Venusian middle atmosphere. I will present on recent work done in our lab suggesting the formation of sulfurous acid, H_2SO_3, and describe experimental work that supports this proposed mechanism. Additionally I will present on new work showing the highly reactive nature of electronically excited SO_2 with saturated alkane species. The implications of this photochemically induced sulfur aerosol formation in the atmosphere of Earth and other planetary atmospheres will be discussed.