

World Conference on

Climate Change

October 24-26, 2016 Valencia, Spain



Agustin J Colussi

California Institute of Technology, USA

‘Sizing’ heterogeneous chemistry in the conversion of gaseous dimethyl sulfide to atmospheric particles

The oxidation of biogenic dimethyl sulfide (DMS) emissions is a global source of cloud condensation nuclei. The amounts of the nucleating $\text{H}_2\text{SO}_4(\text{g})$ species produced in such process, however, remain uncertain. Hydrophobic DMS is mostly oxidized in the gas-phase into $\text{H}_2\text{SO}_4(\text{g})+\text{DMSO}(\text{g})$ (dimethyl sulfoxide), whereas water-soluble DMSO is oxidized into $\text{H}_2\text{SO}_4(\text{g})$ in the gas-phase but into $\text{SO}_4^{2-} + \text{MeSO}_3^-$ (methane sulfonate) on water surfaces. Thus, $R=\text{MeSO}_3^-/\text{non-sea-salt-SO}_4^{2-}$ ratios would therefore gauge both the strength of DMS sources and the extent of DMSO heterogeneous oxidation if $R_{\text{het}} = \text{MeSO}_3^-/\text{SO}_4^{2-}$ for $\text{DMSO}(\text{aq}) + \cdot\text{OH}(\text{g})$ were known. Here we report that $R_{\text{het}}=2.7$, a value obtained from online electro-spray mass spectra of $\text{DMSO}(\text{aq}) + \cdot\text{OH}(\text{g})$ reaction products, which quantifies the MeSO_3^- produced in DMSO heterogeneous oxidation on aqueous aerosols for the first time. On this basis, the inverse R -dependence on particle radius in size-segregated aerosol collected over Syowa station and Southern oceans is shown to be consistent with the competition between DMSO gas-phase oxidation and its mass accommodation followed by oxidation on aqueous droplets. Geographical R variations are thus associated with variable contributions of the heterogeneous pathway to DMSO atmospheric oxidation, which increase with the specific surface area of local aerosols.

Biography

Agustín J Colussi is a Senior Research Scientist at CALTECH since 1998 and has published more than 200 papers in environmental physical chemistry.

ajcoluss@caltech.edu