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A novel flow reactor for studying the hydrolysis of N_2O_5 on aqueous H_2SO_4 solutions coated with organic surfactants DANIEL KNOPF, Institute for Terrestrial and Planetary Atmospheres, Stony Brook University, LORI COSMAN, ALLAN BERTRAM, Dept. of Chemistry, UBC, PAYAM MOUSAVI, SATYA MOKAMATI, Dept. of Mech. Eng., UBC — A flow reactor has been developed which allows the study of heterogeneous kinetics on an aqueous surface coated by organic monolayers. Computational fluid dynamics simulations have been used to determine the flow characteristics for various experimental conditions. A mathematical framework has been developed to derive the true first order wall loss rate coefficient from the experimentally observed wall loss rate. Validation of the flow reactor was performed by measuring reactive uptake coefficients of well studied systems as a function of flow velocity and pressure. We determined the reactive uptake of N_2O_5 on aqueous H_2SO_4 solutions coated with a monolayer of 1-octadecanol, 1-hexadecanol, stearic acid, and phytanic acid. The reactive uptake decreased by approximately a factor of 17–61 in the presence of insoluble, straight-chain organic monolayers compared to uncoated solutions. However, the branched monolayer (phytanic acid) did not significantly affect the N_2O_5 uptake. The reactive uptake coefficients measured on aqueous H_2SO_4 subphases show a relationship to the surface area occupied by the surfactant molecules. However, data obtained with other subphases do not overlap with this trend.

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