HIGHLIGHTS OF THE SWAS MISSION: H_2O, O_2, AND ASTROCHEMISTRY

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For more than four years, NASA's Submillimeter Wave Astronomy Satellite (SWAS) has been conducting pointed and mapping observations along thousands of lines-of-sight within our Galaxy in the lines of several important atoms and molecules, including the ground-state transition of ortho-$H^2_{16}O$, ortho-$H^2_{18}O$, and a low-lying transition of O_2. Due to the presence of large amounts of H_2O and O_2 in our atmosphere a telescope like SWAS, situated above the atmosphere, offers the most direct means of studying these key molecular species. To date SWAS has detected water along most lines-of-sight observed, yielding a range of inferred abundances spanning a factor of 100,000, while molecular oxygen remains universally underabundant. To understand these results, it's important to include the role of gas-grain interactions in interstellar chemistry. Unfortunately, uncertainties associated with such processes as dissociative recombination, molecular photodissociation, gas-grain binding energies, grain surface chemistry, and grain thermal properties continue to limit the accuracy of chemical models. Fortunately, many of these uncertainties are amenable to study in the laboratory. This talk will focus on the current state of SWAS observations and our emerging understanding of the processes that produce water in the Galaxy (and suppress the production of molecular oxygen). I will also review the laboratory studies that can directly improve our understanding of astrochemistry.