Astrochemistry: Recent Successes and Current Challenges
Abstract Book IAU Symposium No. 231, 2005
D. C. Lis, ed.

DOI: 00.0000/X000000000000000X

What Have We Learned from SWAS?

Edwin A. Bergin[1]

[1]Department of Astronomy, University of Michigan, Ann Arbor, MI 48109, USA
email: ebergin@umich.edu

Abstract. In the past few years our knowledge of the abundances of the astrophysically and biologically important molecules water and molecular oxygen in the interstellar medium advanced considerably, in part due to observations from the Submillimeter-Wave Astronomy Satellite (SWAS). During its operational lifetime SWAS found that molecular oxygen did not have a pervasive presence in the Galactic interstellar medium. In contrast, water was detected in emission and/or absorption in a variety of Galactic sources (star-forming regions, circumstellar envelopes, supernova remnants). In this talk we will summarize the observational legacy of SWAS and the initial interpretation of results, which require nearly all available atomic oxygen in the centers of dense cores to be locked in the solid state. We will also present a new comprehensive theory regarding the formation of simple oxygen-bearing molecules in giant molecular clouds. This theory links the formation of gas phase water to that of water ice, but also to the presence of local sources of ultraviolet radiation.

Keywords. astrochemistry, ISM:molecules, ISM:clouds, ISM:abundances