

Water Vapor in Molecular Clouds

Gary J. Melnick¹, Edwin Bergin², David Hollenbach³,
Michael Kaufman⁴, Di Li¹, Ronald Snell⁵

¹Harvard-Smithsonian Center for Astrophysics, 60 Garden Street, Cambridge, MA 02138, USA
email: gmelnick@cfa.harvard.edu

²Department of Astronomy, University of Michigan, 501 E. University Ave., Ann Arbor, MI
48109, USA
email: ebergin@umich.edu

³NASA Ames Research Center, MS 245-3, Moffett Field, CA 94035 USA
email: hollenbach@ism.arc.nasa.gov

⁴Department of Physics, San Jose State University, San Jose, CA 95192, USA
email: kaufman@bluesun.sjsu.edu

⁵Department of Astronomy, University of Massachusetts, Amherst, MA 01003, USA
email: snell@astro.umass.edu

Abstract. During 5.5 years of highly successful operations, the *Submillimeter Wave Astronomy Satellite (SWAS)* surveyed more than 300 distinct sources (and more than 6800 lines-of-sight) within our Galaxy. Ground-state ($1_{10}-1_{01}$) ortho- H_2O emission, and in some cases absorption, was observed toward most of these sources. However, addressing the question of where the gaseous water resides within molecular clouds and at what abundance has required a more detailed examination of the H_2O data along with corollary ground-based molecular line data. We present the results of a combined *SWAS* and Five College Radio Astronomy Observatory study of several molecular cloud regions. This study suggests that gaseous H_2O is largely restricted to a thin layer of gas – a few magnitudes of visual extinction, A_V , thick – near the cloud surface. Within 1-2 A_V of the cloud surface H_2O is photodestroyed by ambient UV photons that permeate the interstellar medium, and inward of this gaseous H_2O layer, most of the water is in the form of H_2O -ice on grain surfaces.

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