Astrophysics Seminar

From Protoplanetary Disks to Exoplanetary Atmospheres: New Views from Hubble

Dr. Kevin France, University of Colorado

Tuesday, March 5 ❖ 12:30 P.M. ❖ 184 NSH

The composition and spatial distribution of molecular gas in the inner few AU of young (< 10 Myr) circumstellar disks are important components to our understanding of the formation and evolution of extrasolar planetary systems. In the first part of this talk, I will present results from a far-ultraviolet spectroscopic survey of H2 and CO emission in protoplanetary disks. Using the new and refurbished spectrographs onboard the Hubble Space Telescope, we observe tens to hundreds of molecular emission lines in every gas-rich disk spectrum, independent of the evolutionary state of the dust disk. We use these data to constrain the composition and distribution of material in the inner molecular disk, and to reconstruct the local Lyman-alpha radiation field. We find that Lyman-alpha dominates the UV energy budget in all cases. In the second part of this talk, I will describe the role of ultraviolet spectroscopy in the study of exoplanetary atmospheres. Using the deepest ultraviolet observations ever obtained of a transiting extrasolar planet, we measured the atmospheric mass loss rate from the well-studied "hot Jupiter" HD209458b. I will close by describing first results from a spectroscopic survey of M-dwarf exoplanet host stars, highlighting the ubiquity of chromospheric time-variability and the importance strong Lyman-alpha radiation to atmospheric chemistry and the production of potential biomarkers on Earth-like planets in the habitable zones of these systems.

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