CONTROL ID: 2257800

TITLE: Water, UV shielding, and Organic Molecules in the Terrestrial Planet Region of Disks

ABSTRACT BODY:

Abstract Body: Water vapor is abundant in the inner few AU of protoplanetary disks, as shown by the common detection of mid-infrared emission lines of warm water in T Tauri disk atmospheres. Simple organic molecules are also abundant. The properties of the water and organic molecule emission (column densities and abundances) hint at an active disk chemistry and the synthesis of complex organic molecules. Because T Tauri disks have experienced significant grain growth and settling, the water in the disk atmosphere is expected to be a significant UV opacity source. Recent models of disk atmospheres show that the absorption of stellar FUV photons by water and other molecules not only heats the disk atmosphere but also shields the disk midplane from UV radiation. The properties of the molecular layers synthesized in the models are in good agreement with the observed infrared molecular emission from T Tauri stars. In addition to describing these model results, we will present direct observational evidence for the photodissociation of water and its role in shielding T Tauri disks. Detailed study of the mid-infrared OH emission spectrum reveals the signature of a photochemical origin for the OH, i.e., OH production through photodissociation of water by FUV photons at 1150-1400 A, most likely dominated by Lyman alpha. The nearly ubiquitous presence of rotationally hot OH emission in classical T Tauri stars implies that photodissociation of water is common in the terrestrial planet region of the disk. The resulting UV shielding by water could be important in facilitating a rich organic chemistry in the disk midplane.

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