NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND TECHNOLOGY RESUME

TITLE

The Evolution of Young Stellar Object Disks and Their Environment

PERFORMING ORGANIZATION
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DESCRIPTION *(a. Brief statement on strategy of investigation; b. Progress and accomplishments of prior year; c. What will be accomplished this year, as well as how and why; and d. Summary bibliography)*

a. Strategy: By carrying out direct imaging and spectroscopic observations of young, pre-main sequence stars in nearby molecular clouds we have begun:

- to define the frequency with which disks of ~ solar system size and mass form around young stars, and to understand the timescale for disk evolution;
- to characterize the early radiation (ultraviolet and kev particle) environment of circumstellar disks through study of the evolution of stellar winds, wind/disk interactions and the uv and optical emission characteristics of young stars;
- to understand the evolution of the solid and gaseous constituents of disks through observations of absorption features in circumstellar gas, broad emission features produced by organic compounds on grain surfaces, and absorption features (e.g. ice) produced. in grain mantles.

These programs offer the possibility of relating results from astrophysical studies of the environment of newly-formed stars to the record of planet formation preserved in the solar system.

b. Accomplishments:

We completed a spectroscopic survey of 30 T Tauri stars with ages ranging from ~2×10^5 to 3×10^7 years. From analysis of [O I] and [S II] emission lines, we conclude that all but two of the stars in our sample are surrounded by optically opaque disks of dimension ~50 au. The two remaining objects show evidence consistent with partial disk clearing (at an age ~3×10^6 yr).

R and I band CFHT observations yielded detections of disks of dimension ~100 au surrounding 5 additional T Tauri stars.

Analysis of the spectra of low mass young stars of the FU Ori class provide *kinematic* evidence of accretion disks through detection of a correlation between observed absorption line width and the lower excitation potential of the transition; low excitation lines formed in the cooler, outer parts of the disk are narrower than their high excitation counterparts.

c. Anticipated Accomplishments:

We expect to complete an analysis of the infrared emission properties of a large (~ 60) sample of low mass young stellar objects which will permit us to characterize the dependence of disk dust mass on the age of the parent star and to place astrophysical limits on the epoch of disk clearing.

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