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INVESTIGATING GRAIN GROWTH IN DISKS AROUND SOUTHERN T TAURI STARS AT LONG WAVELENGTHS.

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Disks of dust and gas are observed around many young stars. Planetary systems such as our own Solar System are thought to form in these circumstellar disks: the solid particles will coagulate to form larger grains, which will grow to eventually form planets. The grains mainly consist of silicates, and as they grow in size, their mineralogy may change from amorphous to more crystalline, as observed by ISO and more recently by the Spitzer Space Telescope [1-2], see also the poster by Kessler-Silacci *et al.* at this conference. Although the qualitative picture of grain growth has become much clearer over the last few years, the quantitative details regarding, e.g., the timescale over which grain growth occurs and how this relates to the disk physical structure (e.g., temperature and density profile) are still under discussion.

A large sample of solar-mass T Tauri stars and intermediate-mass Herbig Ae stars have recently been observed with the IRS spectrometer on board the Spitzer Space Telescope, in the context of the “Cores to Disks” (c2d) legacy [3] and other programs. Most sources show 10 and 20 μm amorphous silicate features (e.g., [2]), and confirm and strengthen the results of earlier ISO and recent ground-based 10 μm observations (e.g., [4]) of other sources by extending them to lower-mass objects and larger samples. The data indicate a large variety of silicate features, ranging from strongly-peaked silicate bands with steeply-sloped Spectral-Energy Distributions (SEDs) to “boxy” silicate profiles and flat SEDs.

One possible explanation for the different spectra and SEDs is that grain growth and the shape of the disk are related, in particular whether the disk has a “flaring” or “self-shadowed” disk geometry [5]. In these models, the larger, more massive dust grains will settle to the midplane as the grains grow, and the flared disks evolve into the geometrically somewhat flatter self-shadowed disks. To what extent this process is related to the age of the star is still under debate; the large samples of objects observed by Spitzer can address whether this evolution is a gradual one or involves random, stochastic processes or environmental effects. The models make specific predictions regarding the slopes of the SEDs in the mm-wavelength range and the relation with the 10 μm features [6]. Thus, complementary data at longer wavelengths are needed to test them.

We have recently observed a sample of T Tauri stars in the southern Lupus and Chamaeleon star-forming clouds at 3 mm wavelength using the Australian Telescope Compact Array (ATCA). These regions are rich in T Tauri stars but cannot be reached from observatories on the northern sky. Our ATCA sample is a subsample of the sources studied by Spitzer [2]. We have combined these new data with 1 mm and radio fluxes from the literature to determine the mm spectral slopes. In this poster, we present the results of the ATCA data and study the relation between these slopes and the strength and shape of the 10 and 20 μm silicate features.

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