Spitzer observations of circumstellar discs: T Tauri stars in the star forming cloud MBM12

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Discs around young stars are the birthplace of planets. We use *Spitzer* spectra to constrain disc and dust evolution in T Tauri stars in the 2 Myr-old MBM12 cloud. We model the 10 micron feature, and relate dust properties to stellar parameters and disc properties.

Observations

- with IRS: 7 members detected (spectral type K3 to M5)
- all show the 10 micron silicate emission feature, probing warm dust located in the disc atmosphere

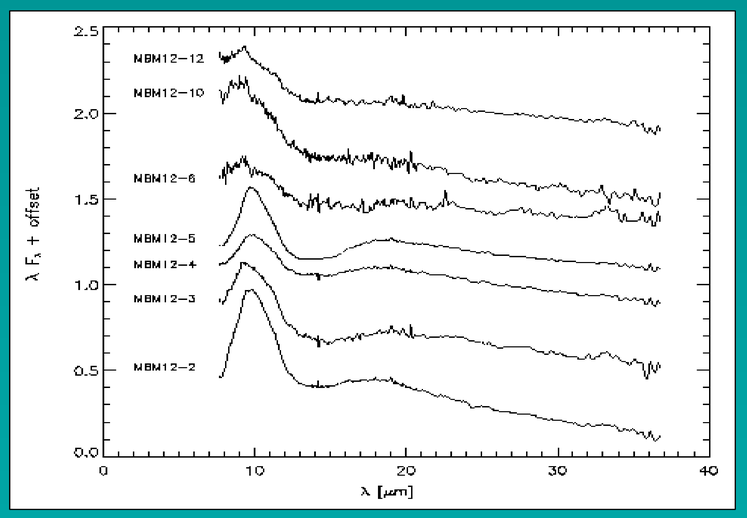
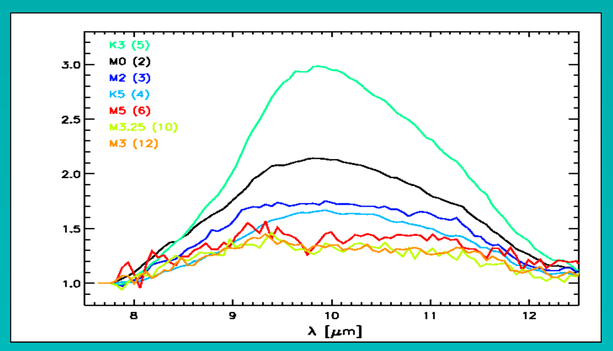


Fig. 1: *Spitzer*/IRS spectra of 7 TTS. A wide variety in feature shapes and strengths is observed.

Silicate feature: evidence for grain growth



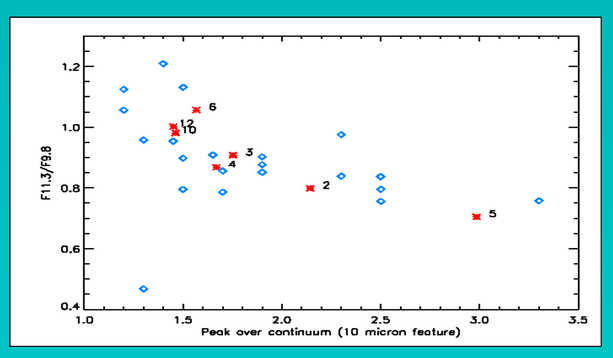


Fig. 2: Up: Continuum-normalised 10 micron spectra. The later the spectral type, the weaker the feature, indicative of grain growth. Below: Relating feature shape and strength with dust growth.

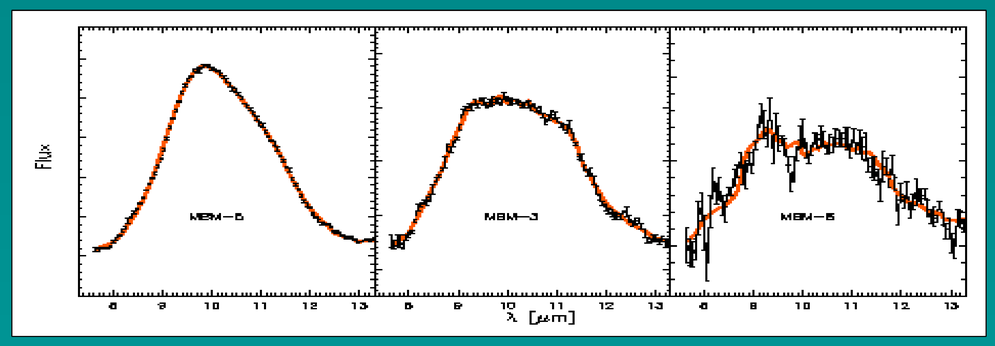
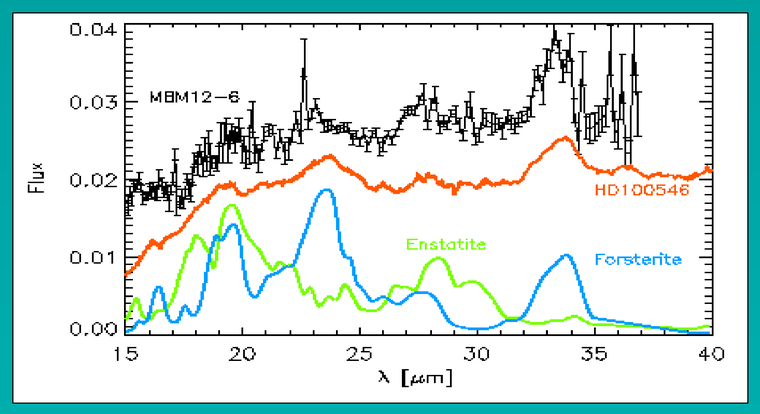


Fig. 3: Fit by the TLTD model (2 Layer Temperature Distribution, Juhász et al. 2008), and the following species: amorphous silicates, carbon and silica, as well as forsterite and enstatite, of 0.1, 1.5 and 6.0 micron.

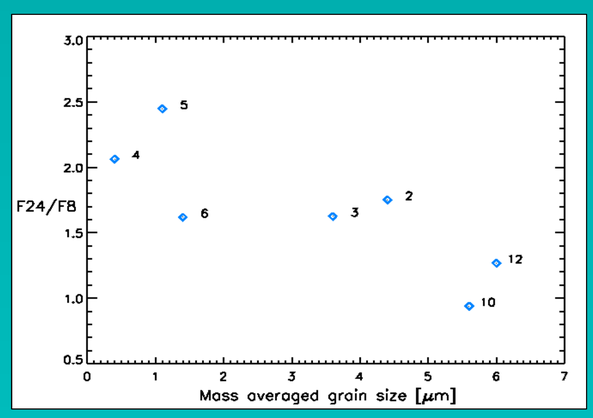
Crystalline dust

- varying amount of crystallinity in sample (2 to 76% for MBM12-6)
- crystalline mass fraction not related to spectral type



Disc geometry versus grain growth

- flux ratio 24/8 micron: proxy for degree of disc flaring: flaring discs intercept more stellar light at longer λ than flat discs.
- the larger the flux ratio (larger flaring angle), the smaller the derived grain size.
- sources with larger grains tend to have less flaring discs: => more grain growth and settling into disc mid-plane.



Conclusions

We studied the dust around 7 TTS in MBM12, and fitted the 10 micron feature with the TLTD approach. We found:

- evidence for grain growth, later spectral types have larger dust grains
- large variety in crystalline mass fraction, independent of spectral type and not related to grain growth
- relation between disc flaring and grain size, pointing to dust settling