Is there something like a typical T Tauri disk in Taurus/Auriga?

Silvia Vicente, Inga Kamp, and the GASP5 team

Introduction:
GASP5 (Gas in Protoplanetary Systems, Dent et al. 2013) is a Herschel Open Time key program studying the evolution of gas in protoplanetary disks across the age and mass spectrum. PACS was used to survey the Taurus/Auriga molecular cloud (140 pc; 1-3 Myr) in the continuum and in several gas lines such as [OI] 63 μm, 145 μm ([CII] 158 μm, OH, H₂O, and CO. The goal was a statistical study of gas in these disks in particular potential correlations between the different observables. The [OI] 63 μm is the strongest cooling line detected within the target sample of 76 class I-III objects; 9 of them are known transitional disks. Howard et al. (2013) report a tight correlation between the [OI] 63 μm line flux and the neighboring continuum flux for disk sources not associated with detected jets/outflows and excluding the transitional disks.

Interpretation using the DENT grid of models:
We use the DENT grid (Disk Evolution with Neat Theory) of 300 000 parameterized disk models (Woitke et al. 2010, Kamp et al. 2011) to understand the physics behind the observed correlations and to assess the possible diversity in disks surrounding low-mass stars at the evolutionary stage of 1-3 Myr. We separate the sample in “protoplanetary disks” (12 sources) and “transitional disks” (9 sources) and leave out disks for which outflows or jets have been identified.

In this poster we focus on the following observed correlations:
1) Correlation [OI] 63 μm vs continuum at 70 μm (Howard et al. 2013)
2) Non-correlation [OI] 63 μm vs continuum at 850 μm (Howard et al. 2013)

References
Dent, B., Thi, W.-F., Kamp, I., & GASP5 team, 2013, PASP 125, 477

Disk properties
If we select from the DENT grid those models that are compatible with the observed Taurus disk sample (above), we can reproduce the absolute values of observed [OI] 63 μm line and 70 μm continuum fluxes (Fig.1). The DENT grid is very coarse (see tables in Fig.6). However, we find a trend towards
- a dust-to-gas ratio of 0.1 to 0.01
- surface density power law Σ(ν) ∝ r⁻²
- a dust-to-gas mass ratio in the inner disk (Fig.5)