THERMAL DUST OR JET?

A multi-wavelength study of the compact emission in transition disks

Alessia A. Rota [1]
rota@strw.leidenuniv.nl

with Jurrian Meijerhof,[1] Nienke van der Marel,[1] and Logan Francis[1]

1 Leiden Observatory, Leiden, The Netherlands

Goals of the project

Transition disks are protoplanetary disks with large cavities in their dust distributions. Continuum emission close to the star has been detected inside the cavity of many of these disks[1].

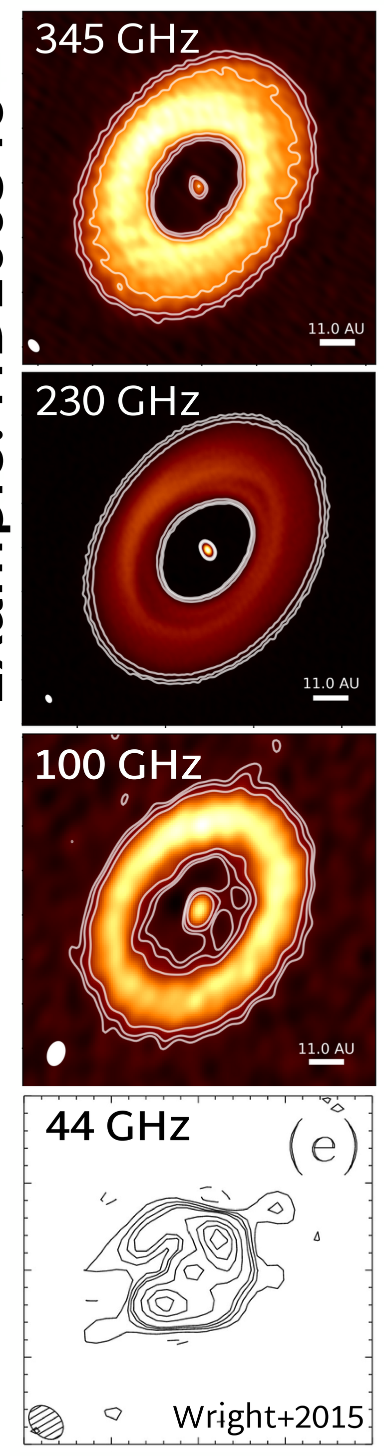
How do gas and dust flow toward the central star supplying material to the inner disk?

Is the compact emission detected close to the star associated with grain growth or with non-thermal emission from a jet?

Sample and Method

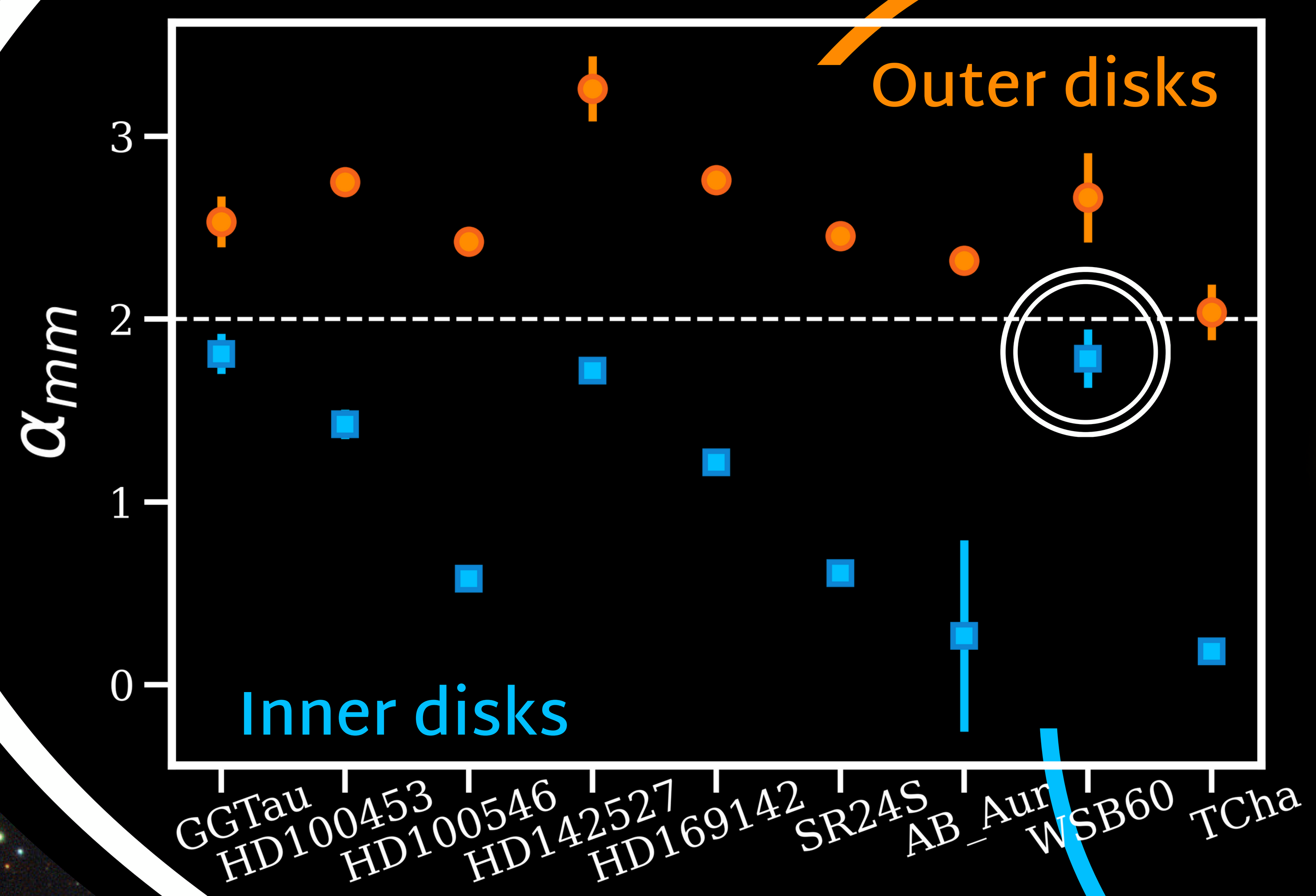
The sample consists of **9 transition disks** for which the emission close to the star is detected in high-resolution (0''.015 - 0''.45) archival ALMA continuum observations in Band 3, Band 4, Band 6 and/or Band 7. These data are combined with centimeter observations [2-8] **to study the spectral index of the inner and outer disks separately**.

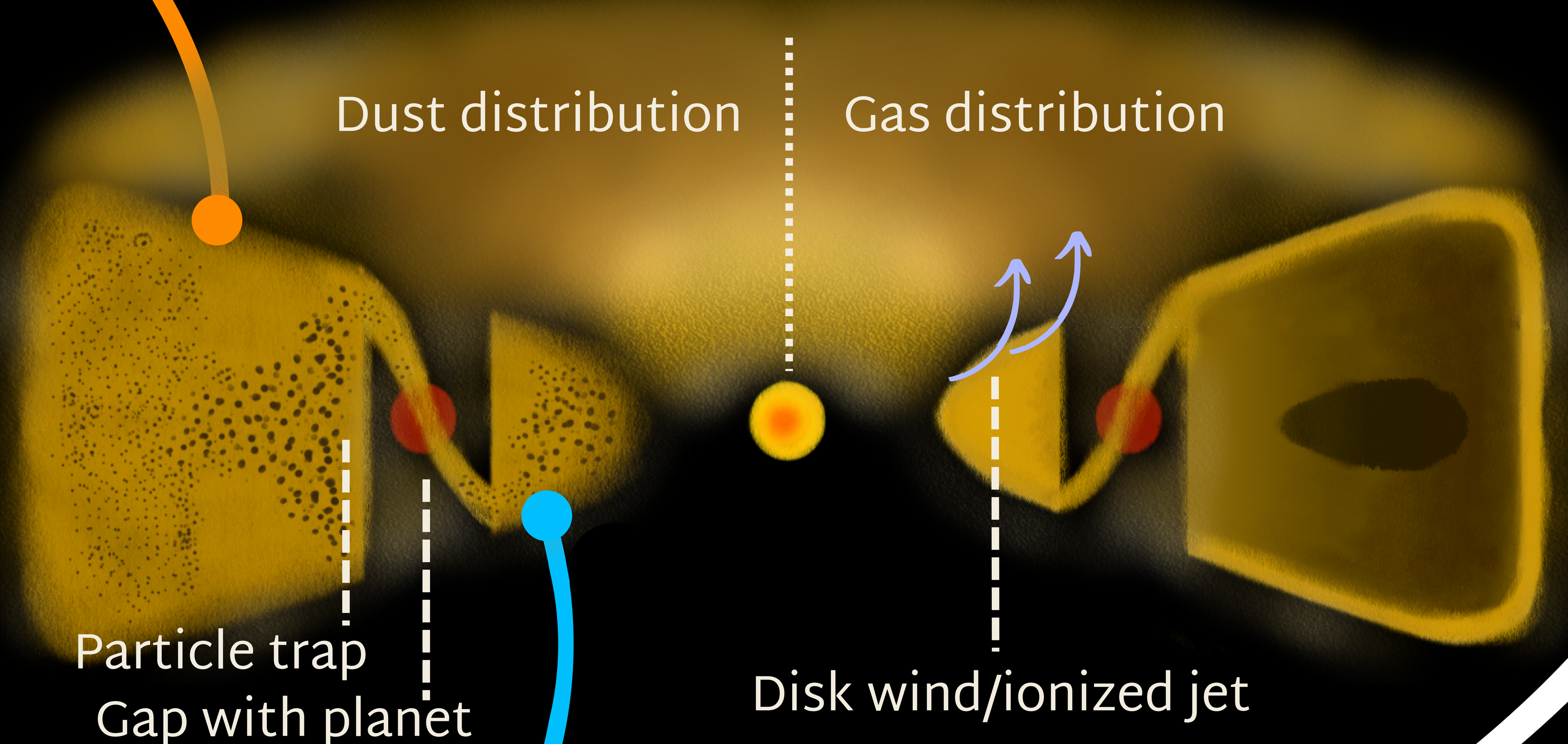
The flux of the compact emission is estimated with a 2D-gaussian fitting, while the total flux of the disk with aperture photometry. The spectral index α of the emission is then estimated with a multi-wavelength analysis: $F_\nu \propto \nu^\alpha$



Main result

The spectral indices for the compact emission suggest non-thermal processes, as opposed to thermal emission from a dust inner disk.





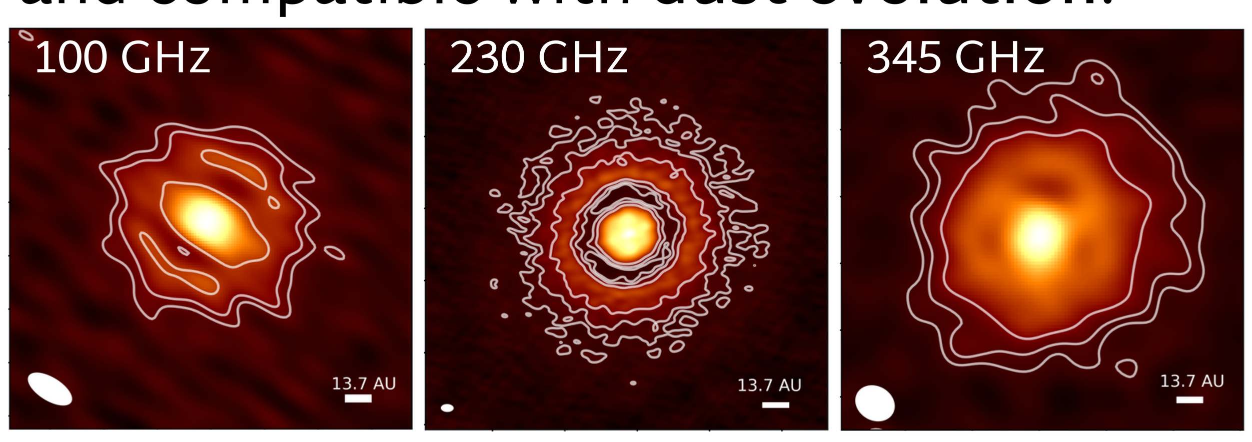
Conclusions

The **lack of mm-dust grains** in the majority of inner disks in transition disks suggests that either:

- all mm dust grains have drifted quickly towards the central star
- grain growth is less efficient in the inner disk
- grains grow rapidly to planetesimal sizes in the inner disk

Exception: WSB60

The disk around WSB60 is the only disk in the sample of which the emission close to the star is **spatially resolved** and compatible with **dust evolution**.



References: [1]Francis and van der Marel 2020, [2]Wright+2015, [3]Norfolk+2021, [4]Zapata+2017, [5]Ubach+2012, [6]Ubach+2017, [7]Casassus+2015, [8]Osorio+2014