

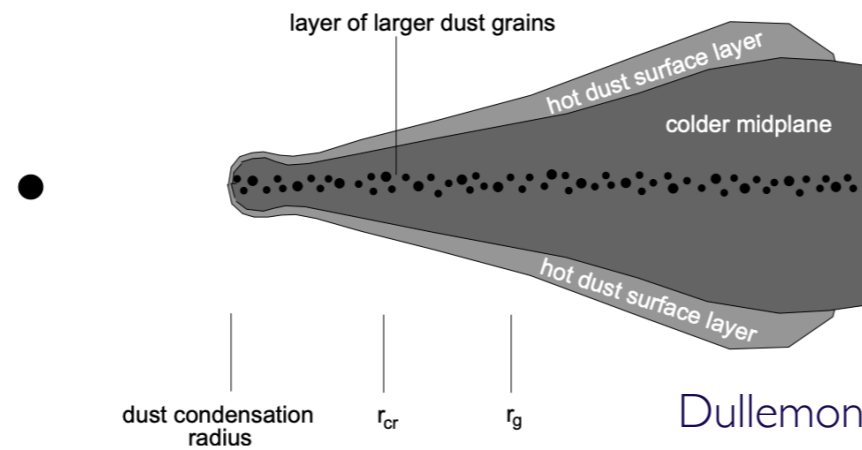
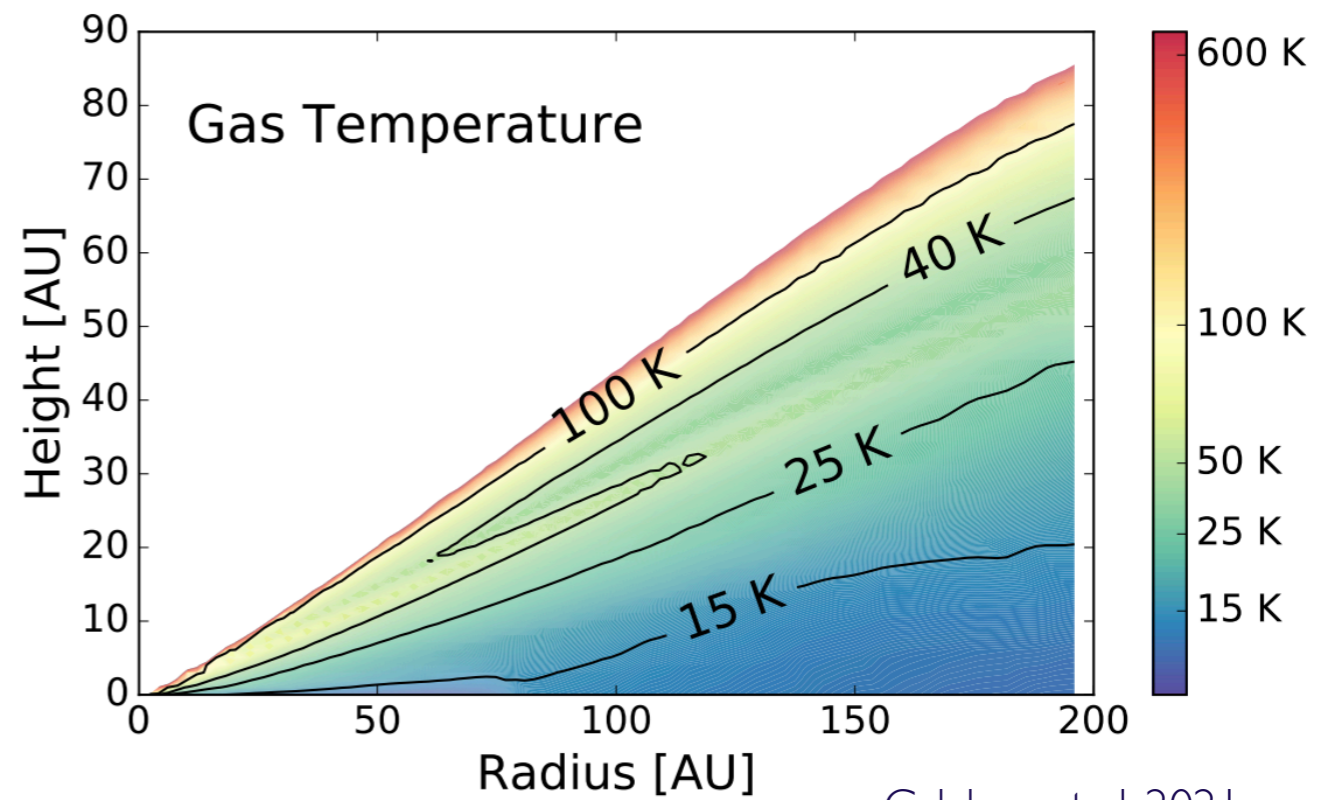
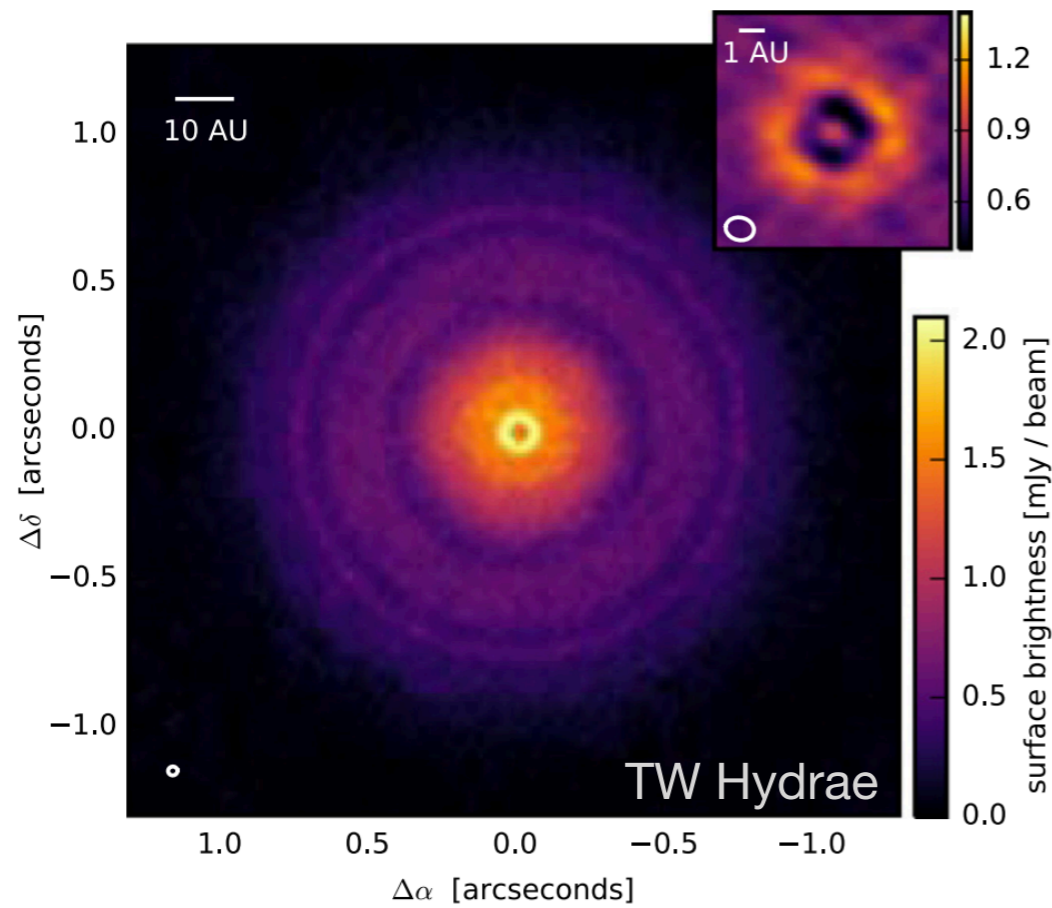


What sets the temperature at disk scales in deeply embedded protostellar sources?

María José Maureira

Postdoc (MPE)

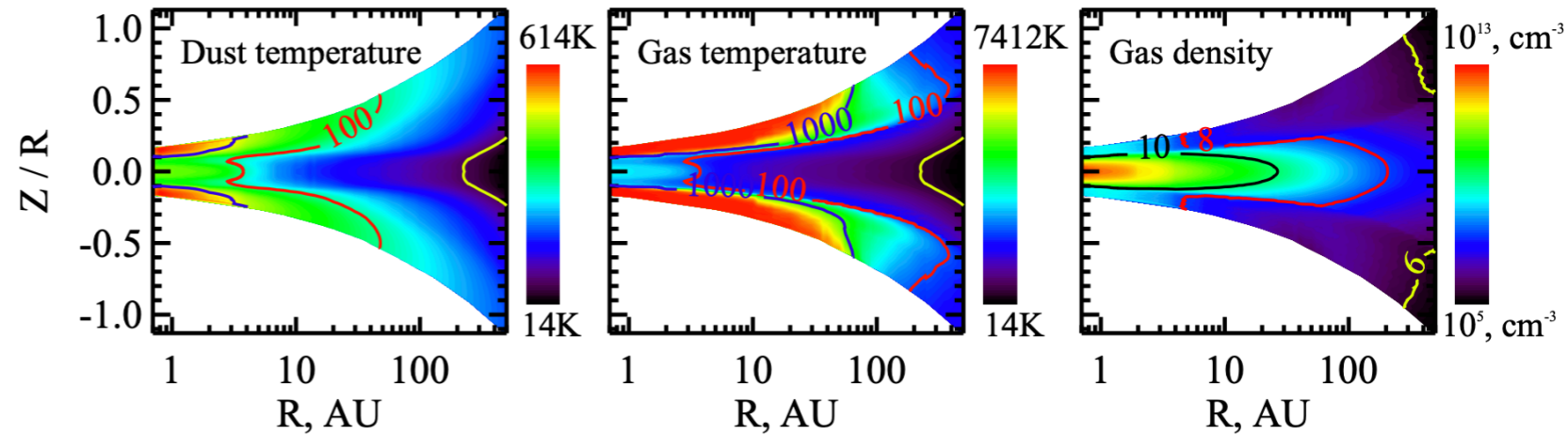
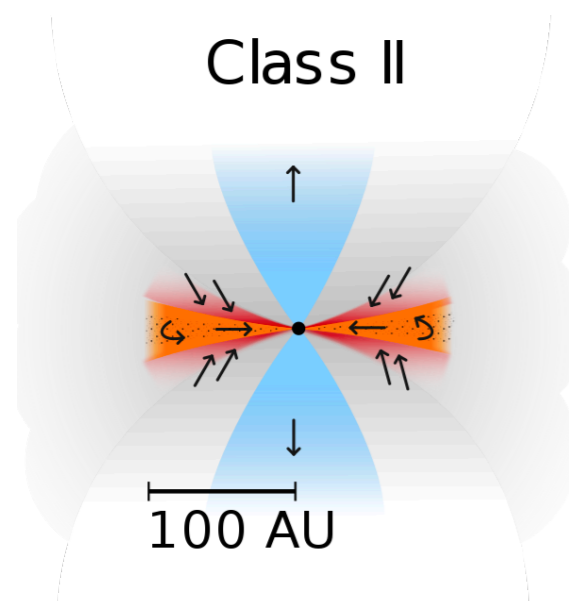
Structure of a (*Class II*) circumstellar disk



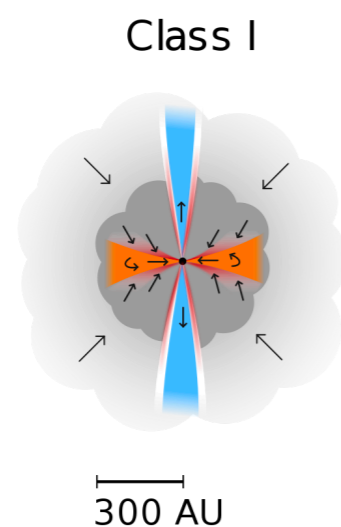
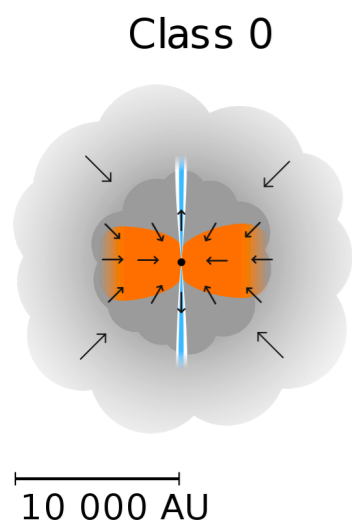
...and
already
planets
formed

The disk is heated through the protostellar radiation producing a layered temperature structure with a cold mid plane (a passive disk)

Class 0 != Class II, what about the disks?



Henning & Semenov 2013

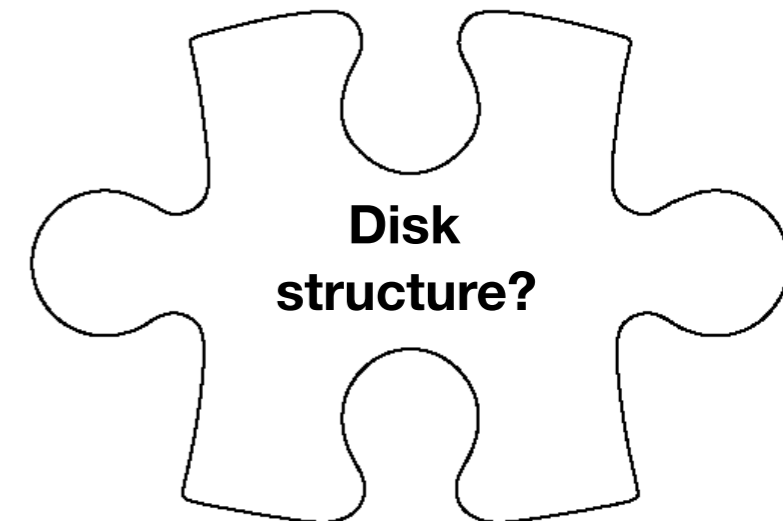


Embedded and thus heavily accreting

—> more massive, more optically thick

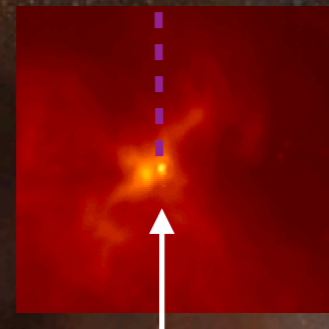
—> high density-> compression heating, shock heating?

—> outbursts

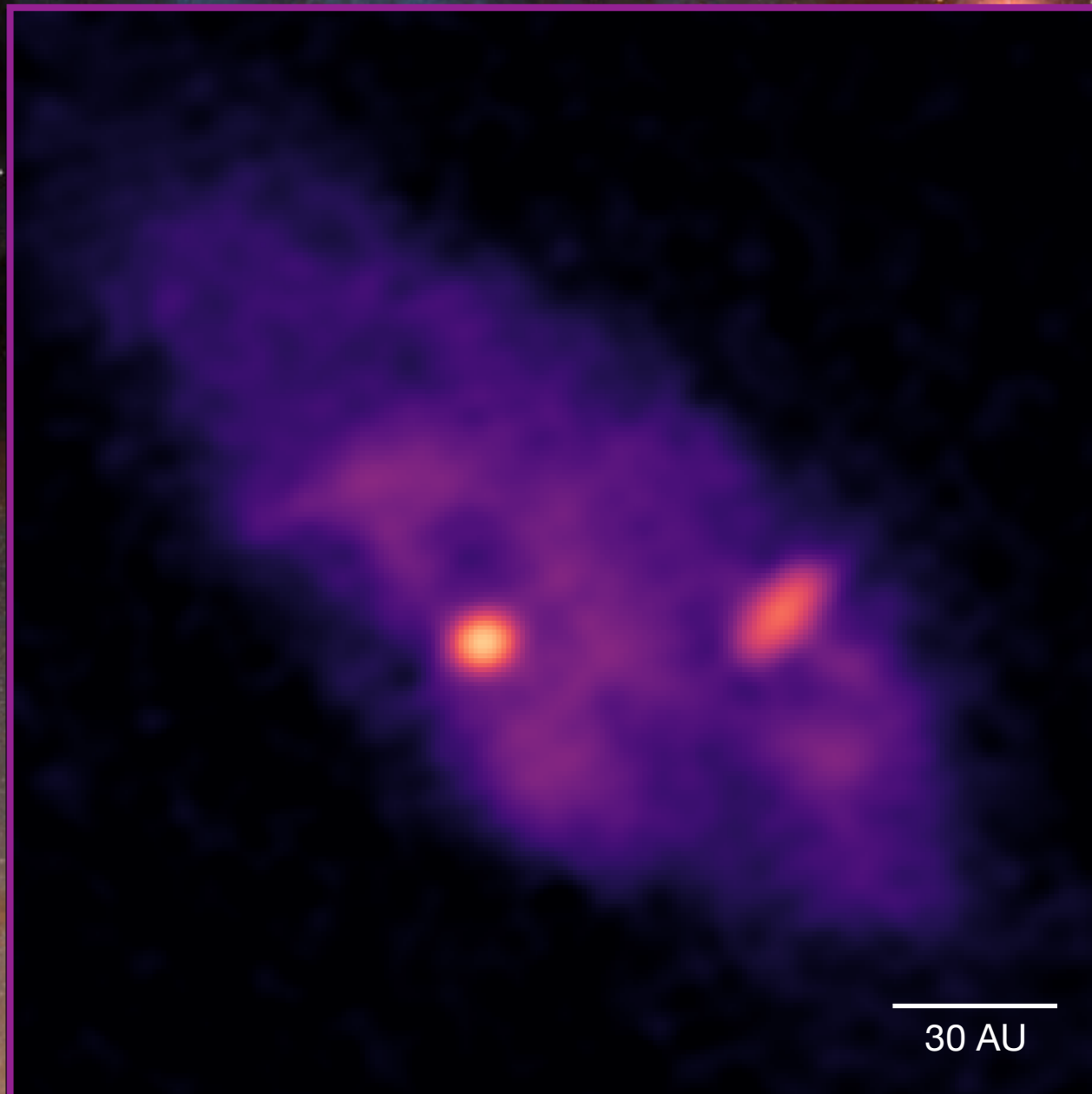
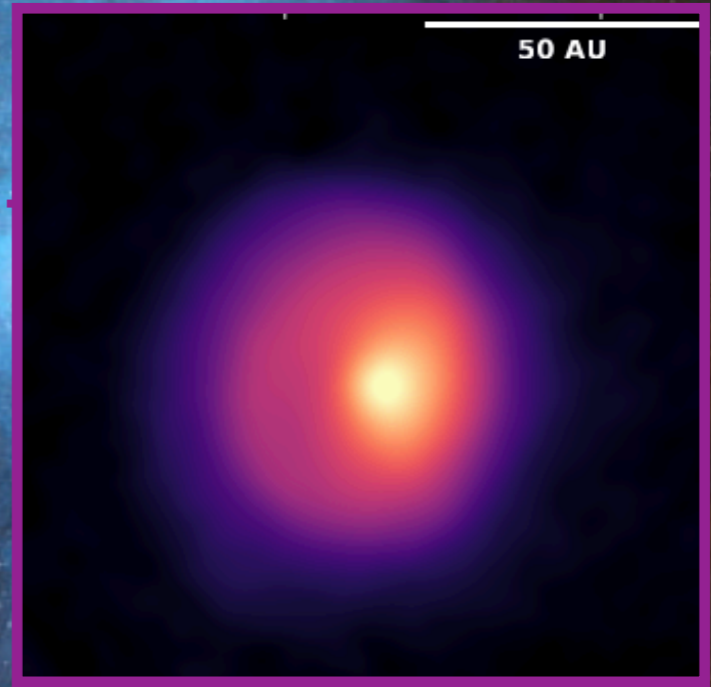
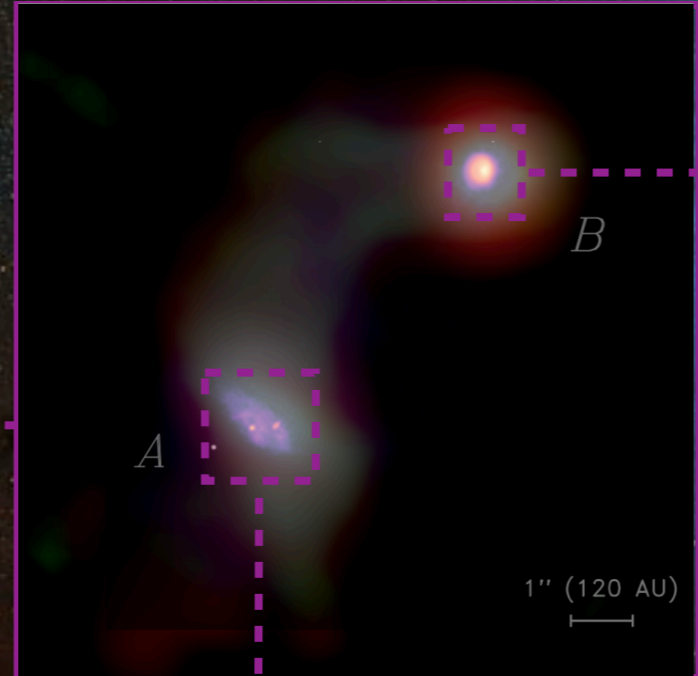


IRAS 16293-2422

Class 0

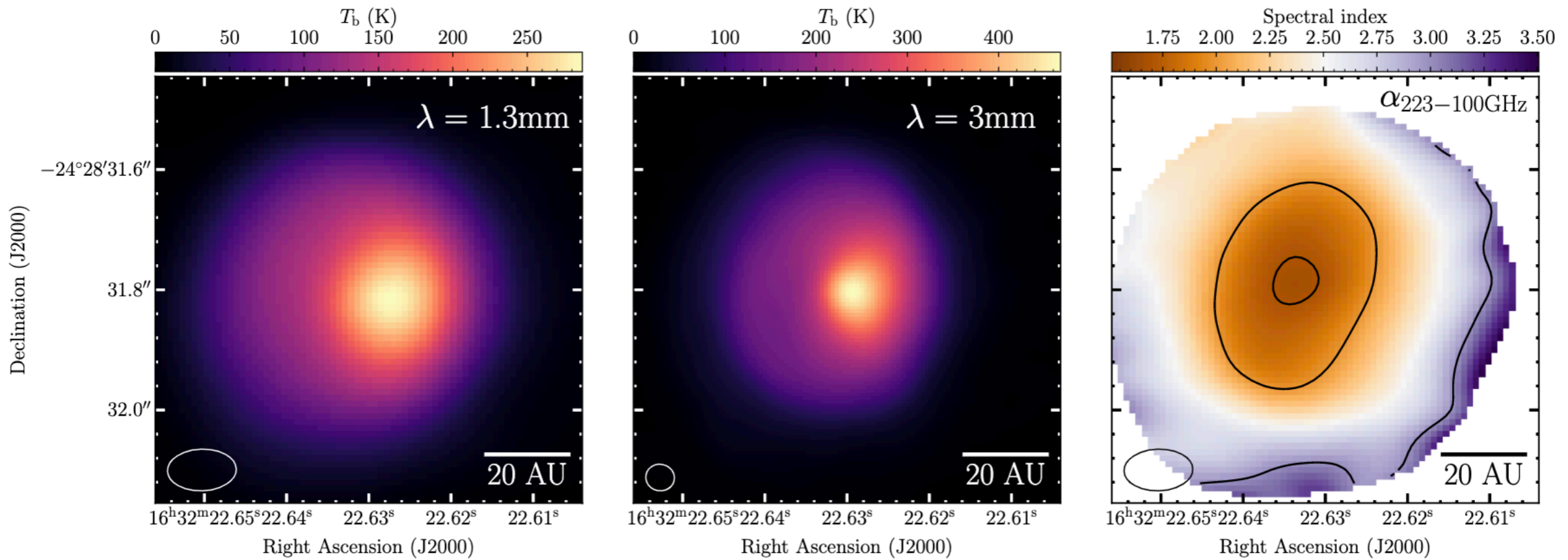


4-6 Msun within
few 1,000 au

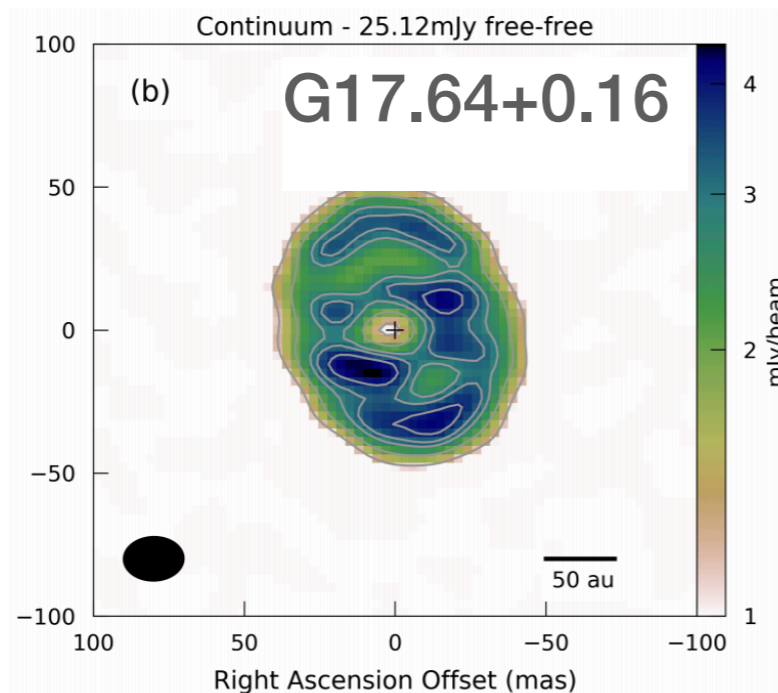


Jorgensen et al. 2016
Maureira et al. 2020
Zamponi, Maureira, Caselli et al. (submitted)

The Class 0 IRAS 16293 B

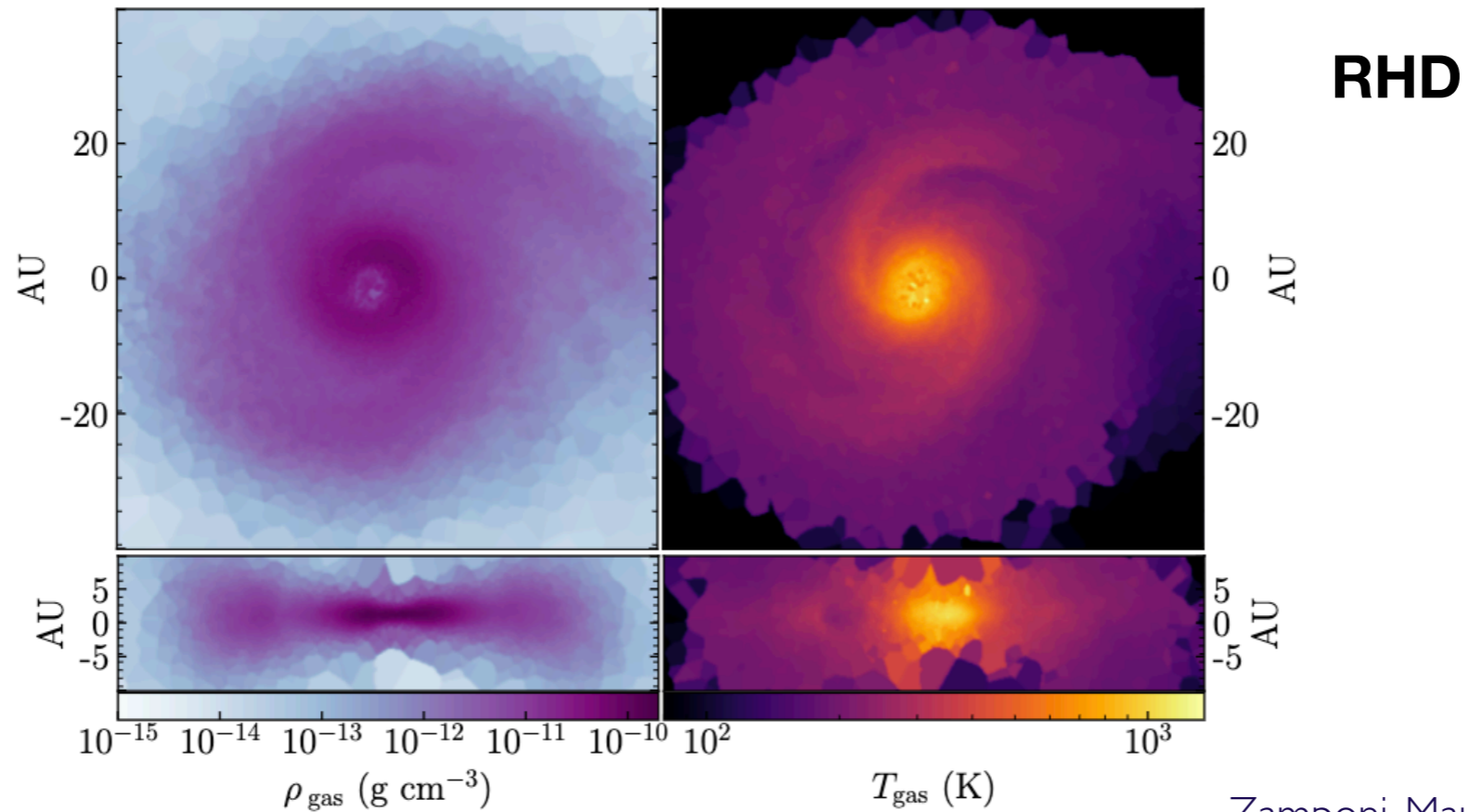
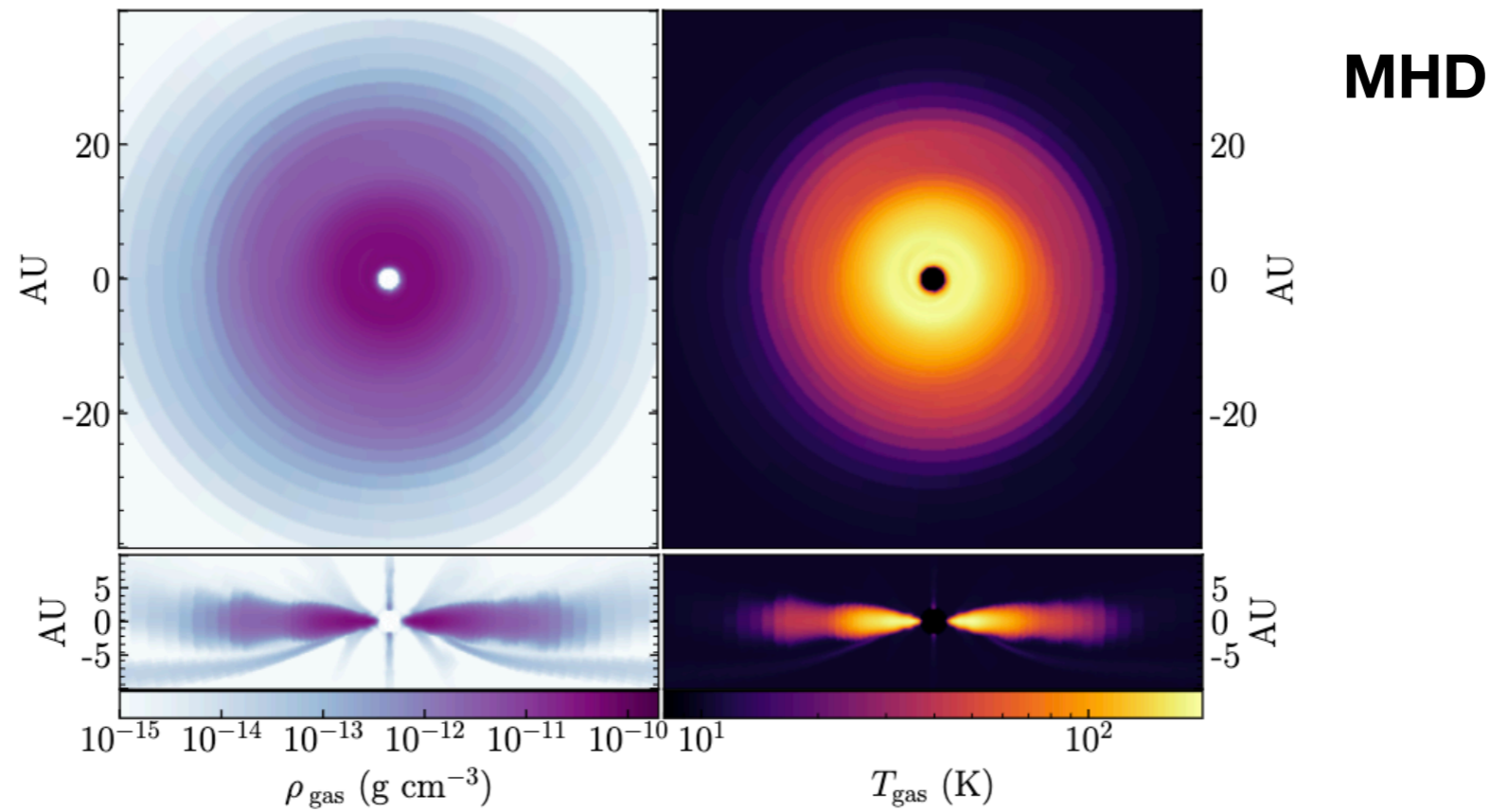


Zamponi, Maureira, Caselli et al. (submitted)



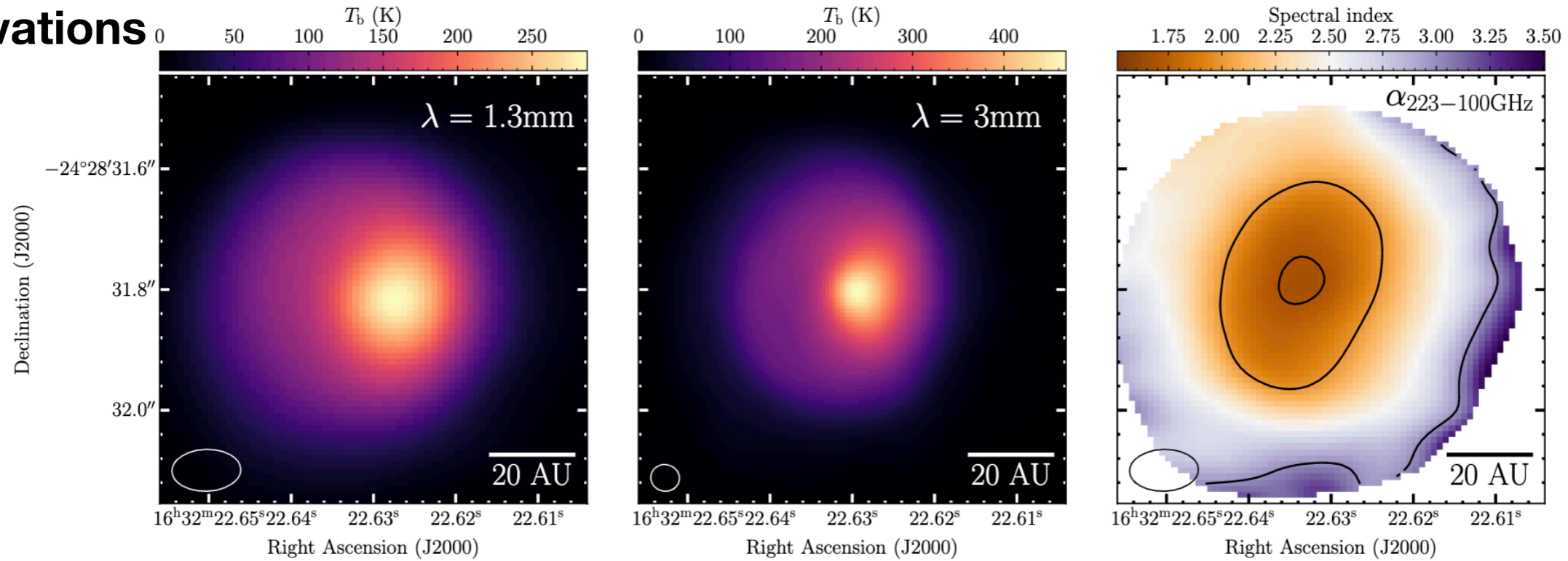
What type of disk structure can reproduce the observations?

Disks formed in simulation of core collapse

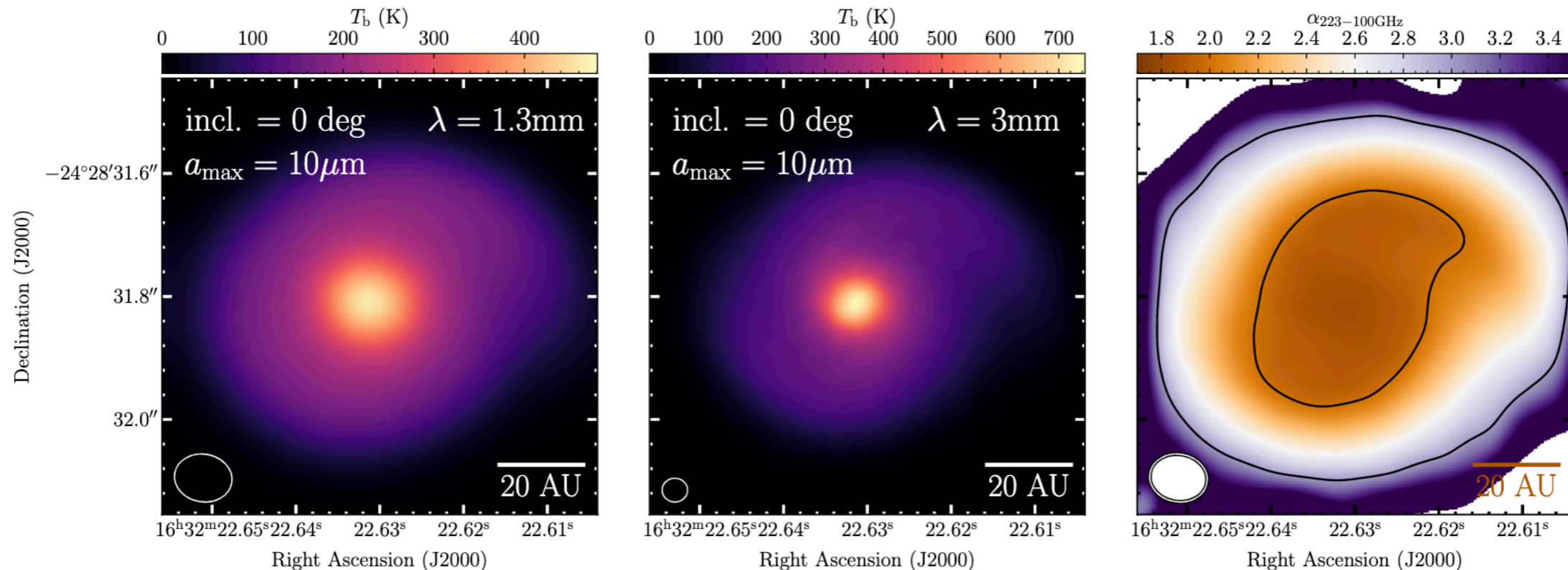


Example of a hot Class 0 disks too optically thick to be heated only passively

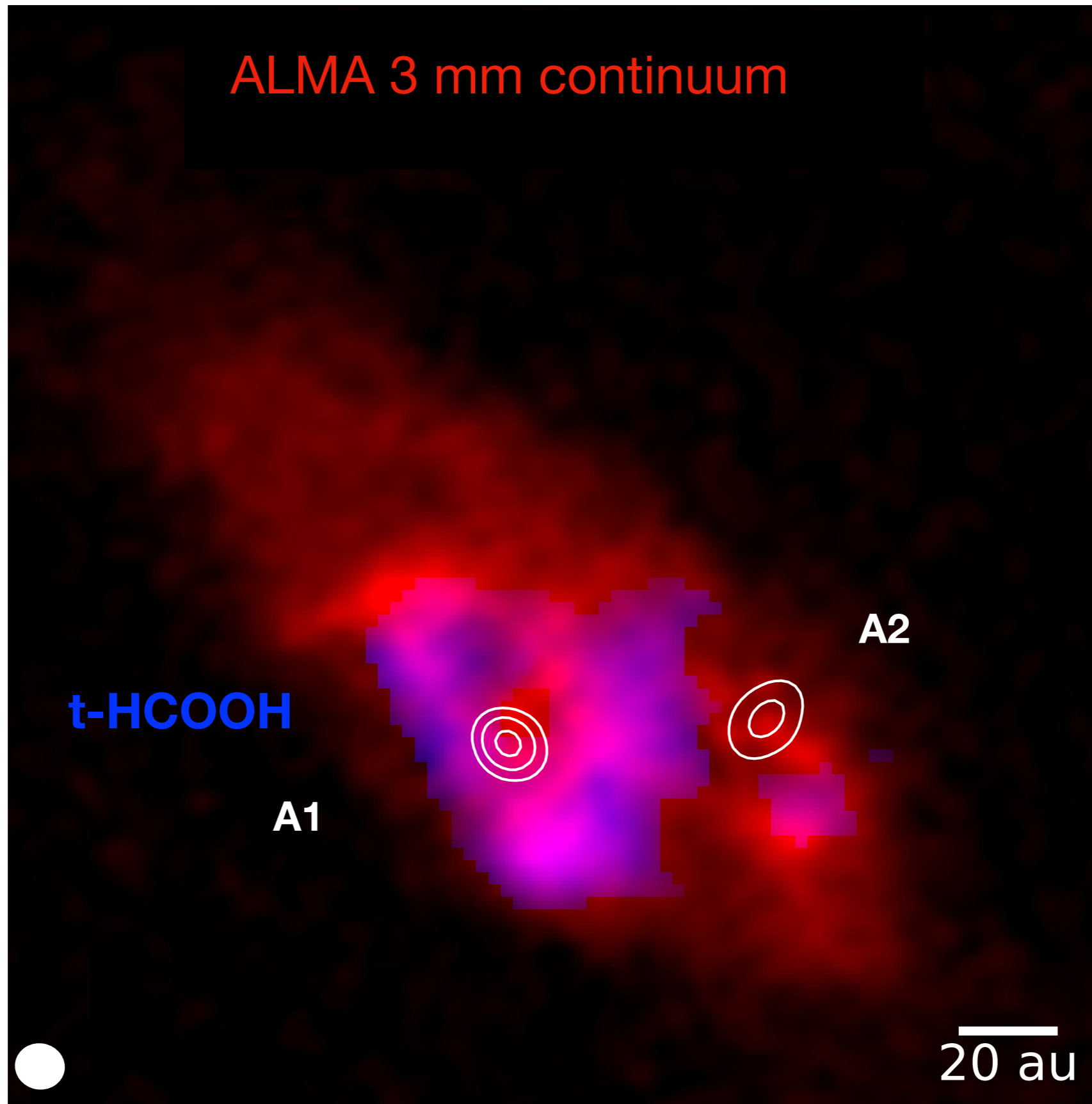
observations



Synthetic observations

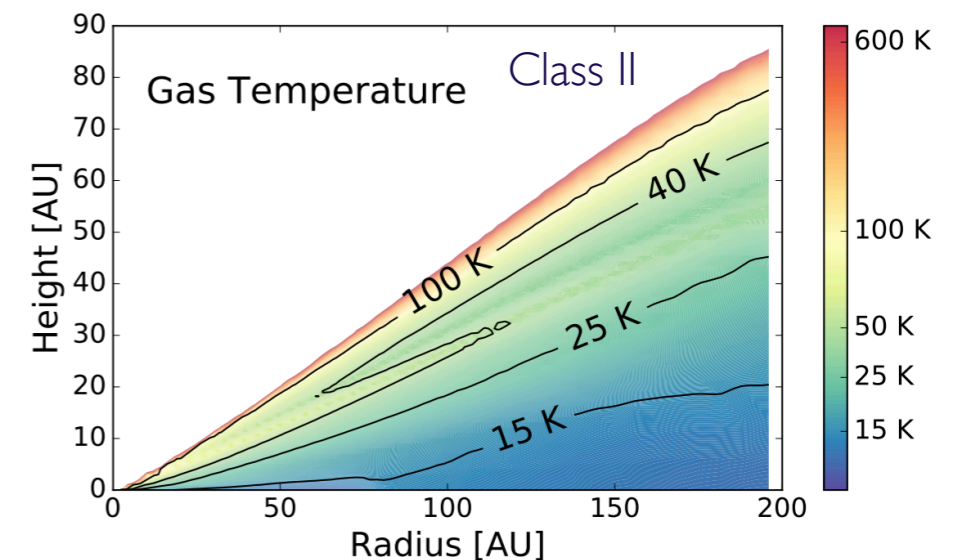
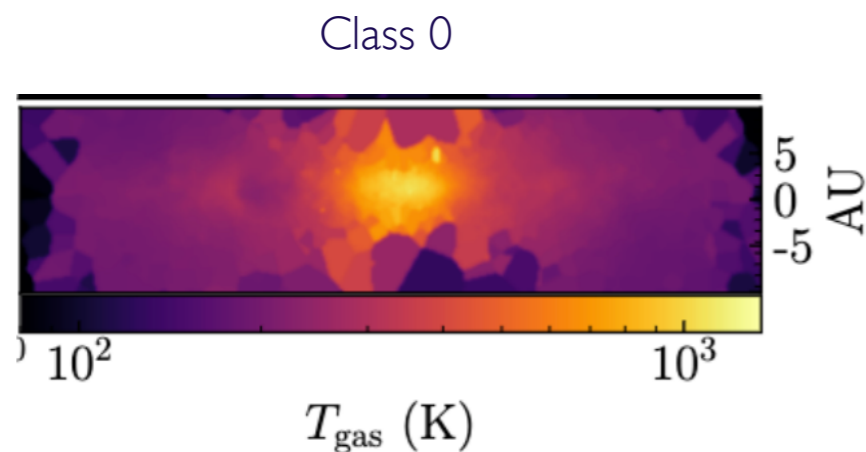


Example of localized hot spots around a binary system (shocks?)



The questions....

- There is evidence that Class 0 disks are warmer, with a hot midplane and opt thick: should we start considering compressive and shock heating? Or in most cases the temperature is still driven by accretion luminosity from the central source? Could this be the source of low spectral index instead of grain growth?



- If these heating mechanisms are important, what are the implications for planet formation?
 - a) When can then dust settle/grow? Perhaps at the Class I stage?
 - b) What about chemical reprocessing, what is the chemical budget for early planet formation?

Misalignment between disk and envelope rotation

