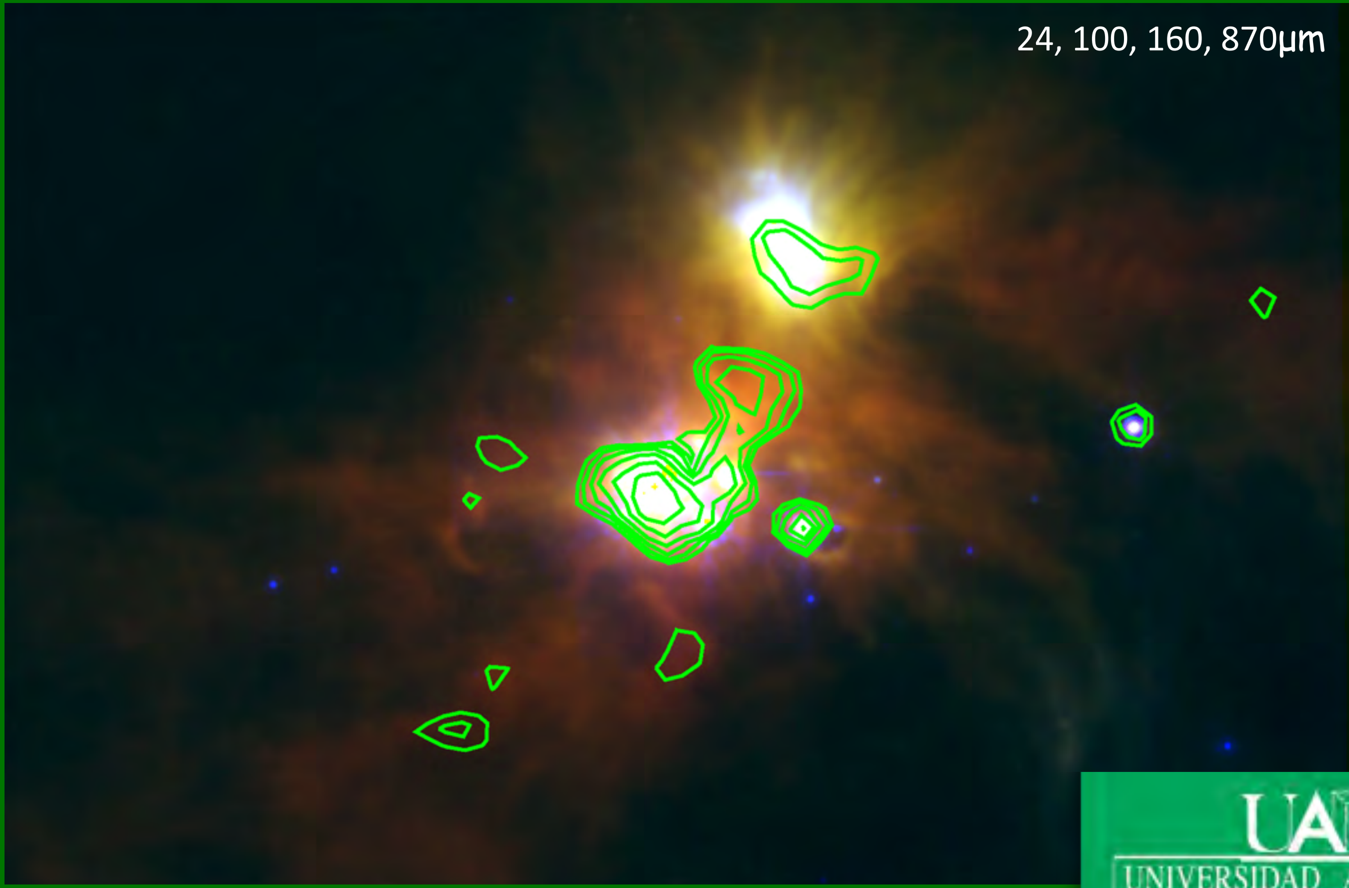
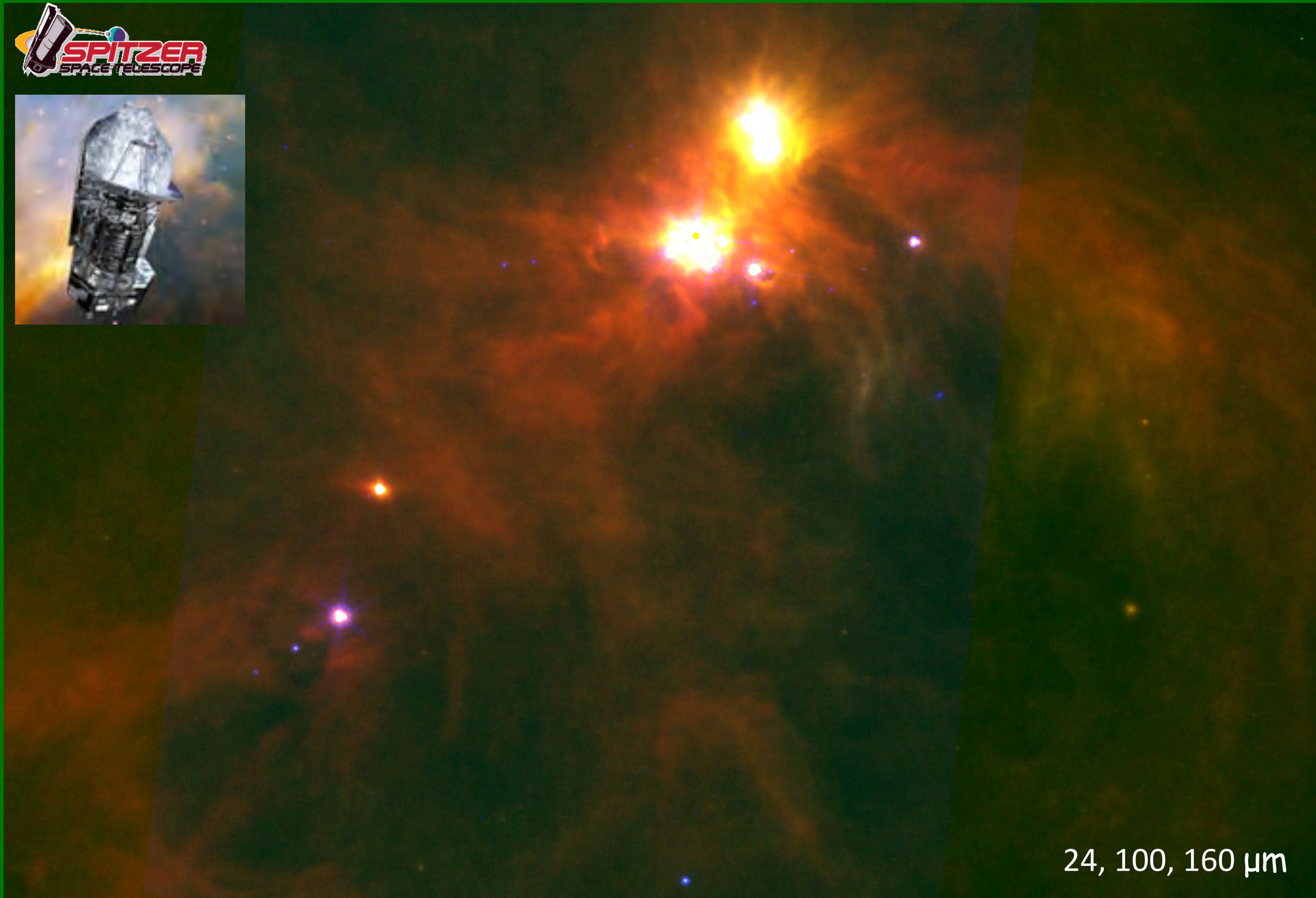
Star formation and disk evolution history of a sparse region: The Coronet cluster



Aurora Sicilia-Aguilar

Th. Henning, H. Linz, O. Krause, P. André, & Gould Belt Project

A multiwavelength view of the Coronet cluster



A multiwavelength view of the Coronet cluster

-Optical images reveal a 13pc extended cloud at 170 pc. The Coronet is a small part of it, around some HAeBe stars.
[Loren 1979; Marraco & Rydgren 1981; Taylor & Storey 1982; Wilking+1985; Knude & Hog 1998]

-Several mm/submm observations reveal embedded objects.
[Henning+1994; Chini+2003; Groppi+2004; Nutter+2005]

-X-ray observations reveal a moderate number of interm. and low-mass TTS. [Garmire&Garmire 2003; Forbrich & Preibisch 2007]

-Optical observations reveal accretion in low-mass members
[López-Martí+ 2005, 2010; Sicilia-Aguilar+ 2008, 2011]

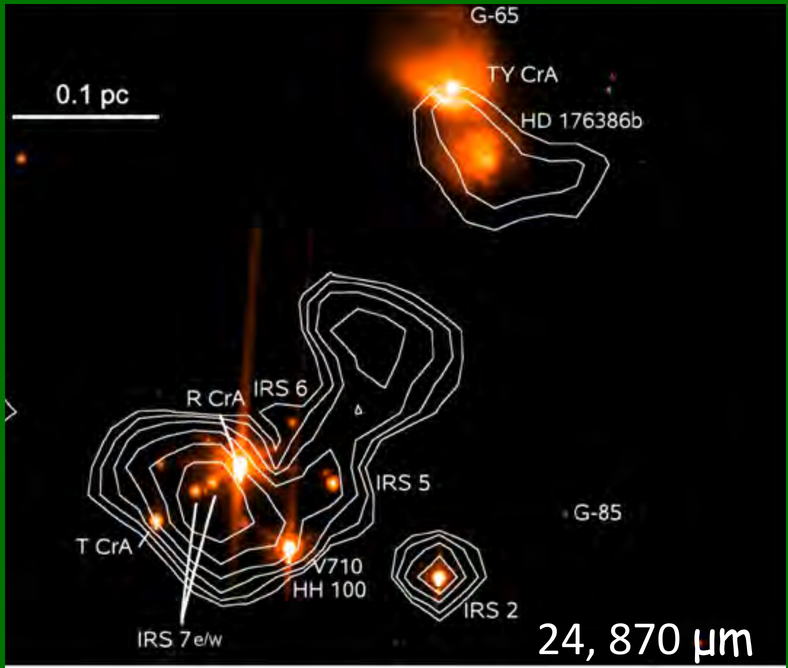
- Spitzer data show disks in all stages of evolution
[Sicilia-Aguilar+2008; Peterson+2011]

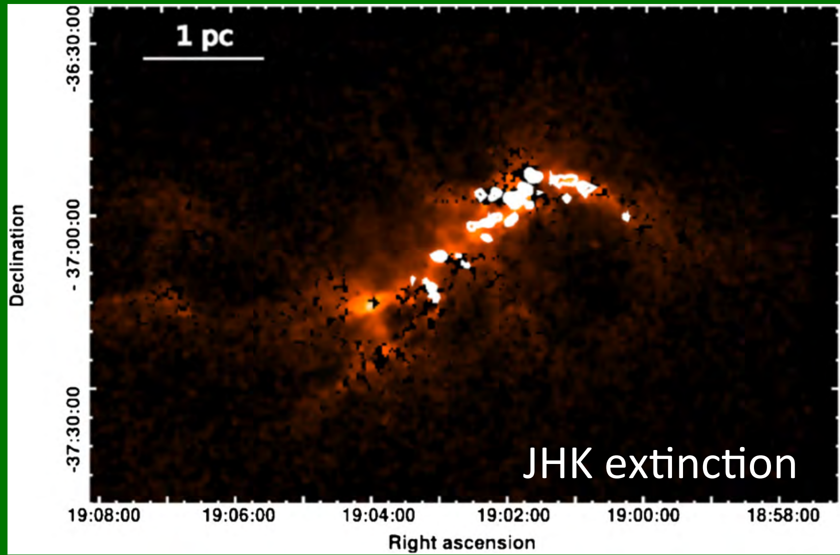
- Extinction maps reveal that star formation happens in the densest parts [Kainulainen+2009]

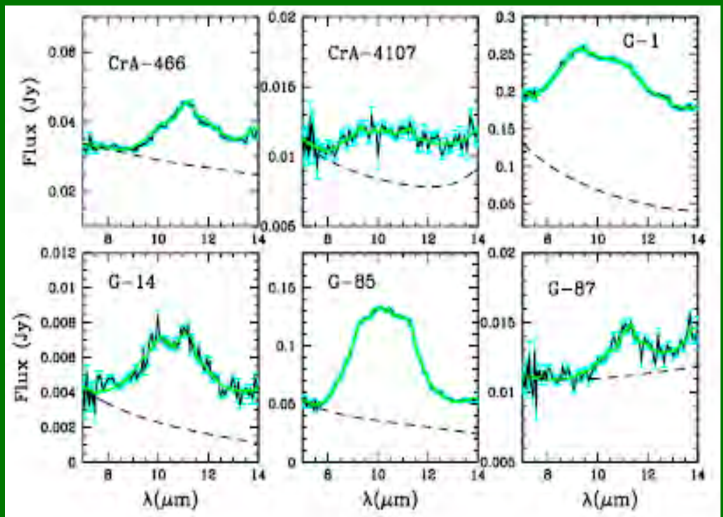
- APEX/LABOCA data show several dense clumps and some disks/protostars [Sicilia-Aguilar+ 2011]

And now: Herschel/PACS!

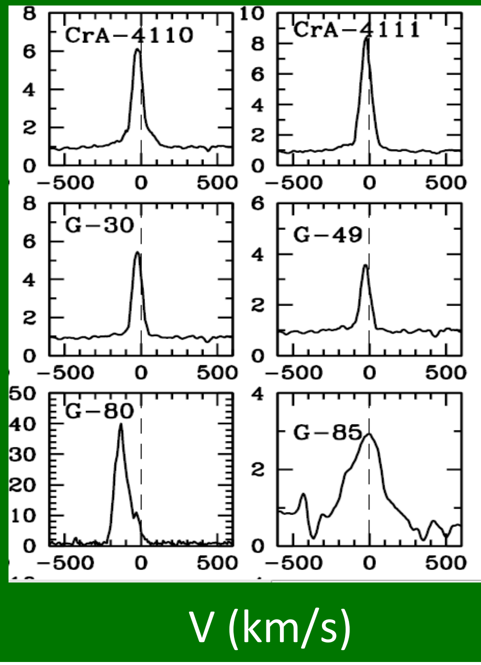
Why multiwavelength? Too much going on!



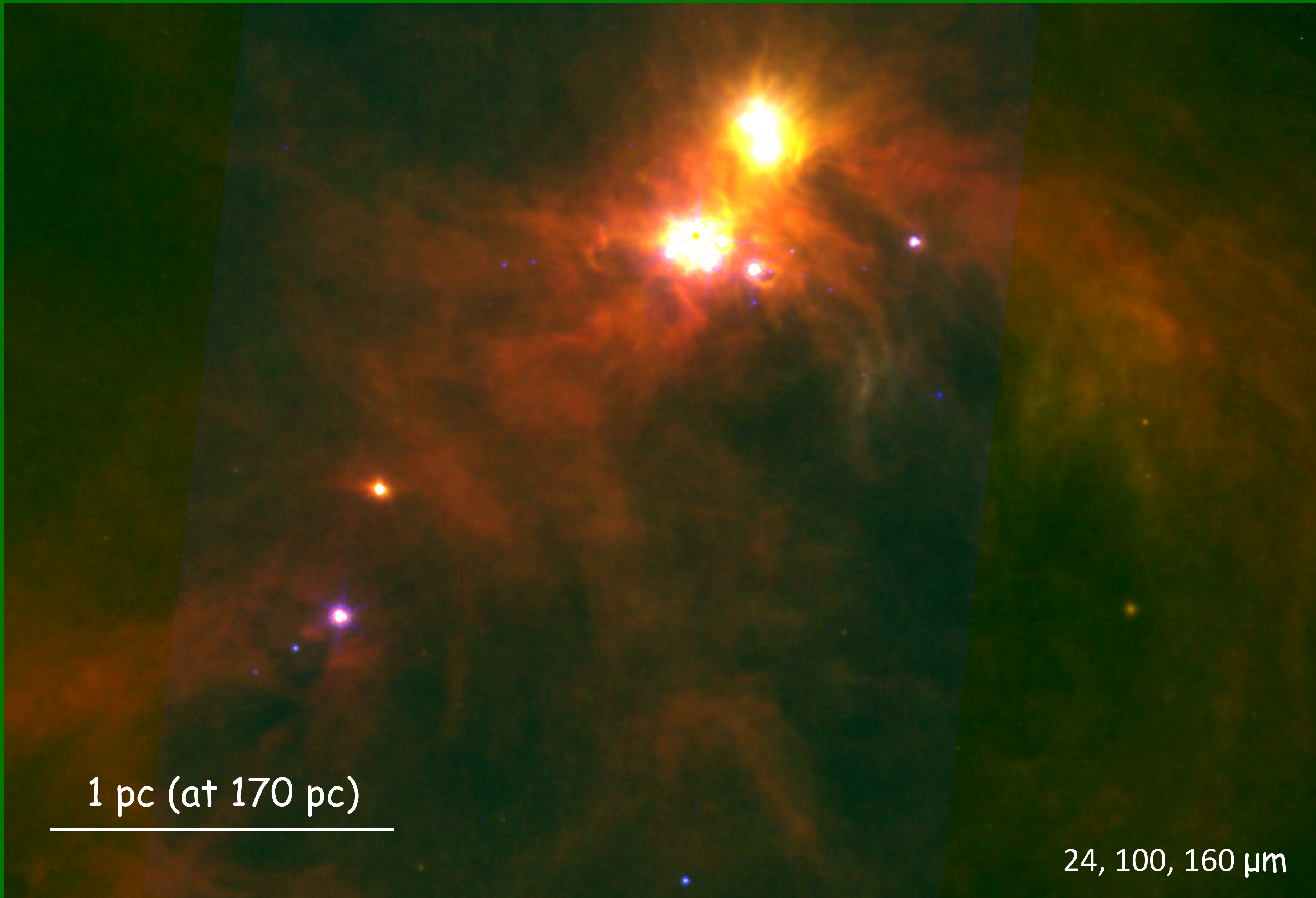




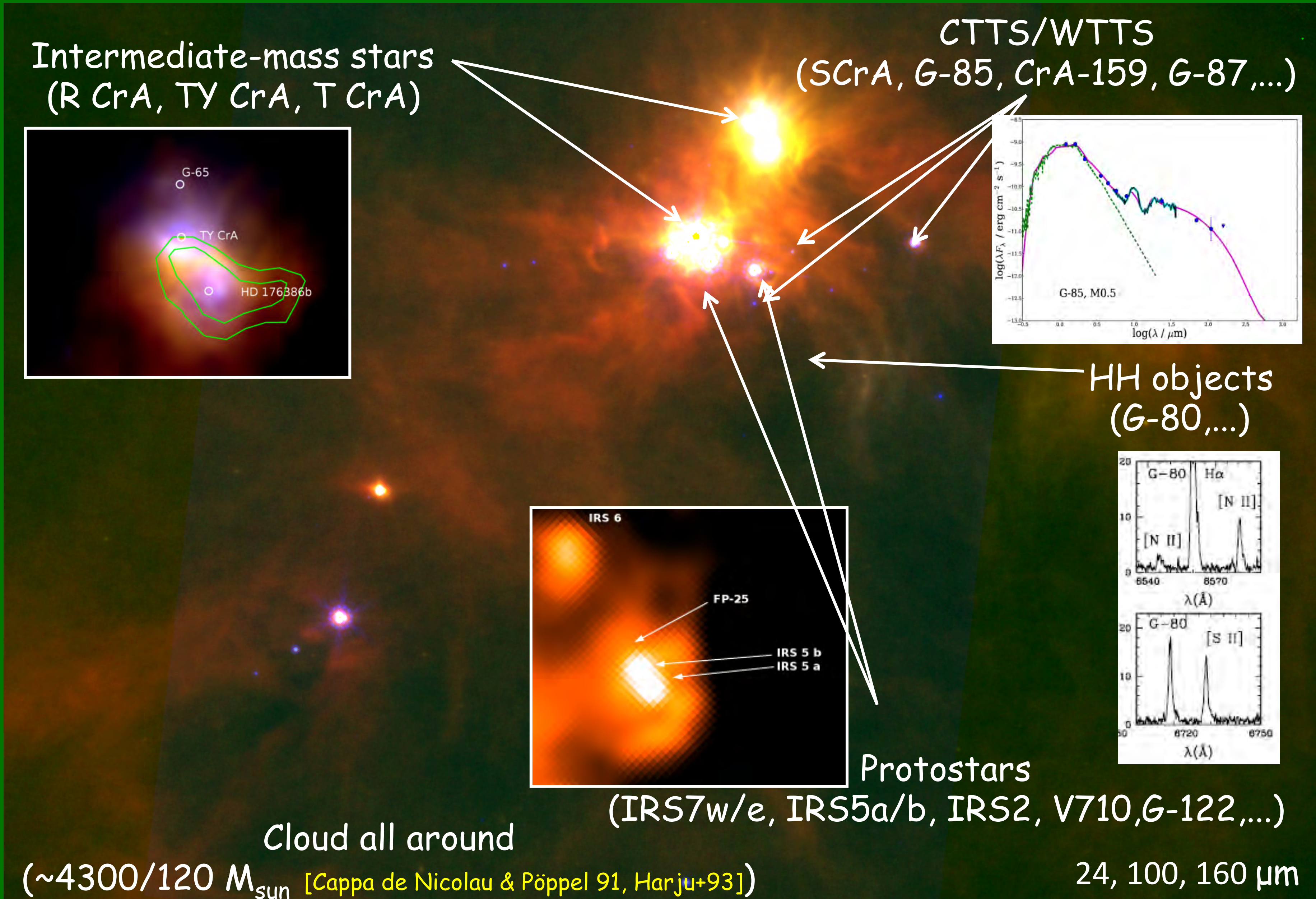
- Star formation
- Disks
- Dust grain evolution
- Accretion/shocks
- ...



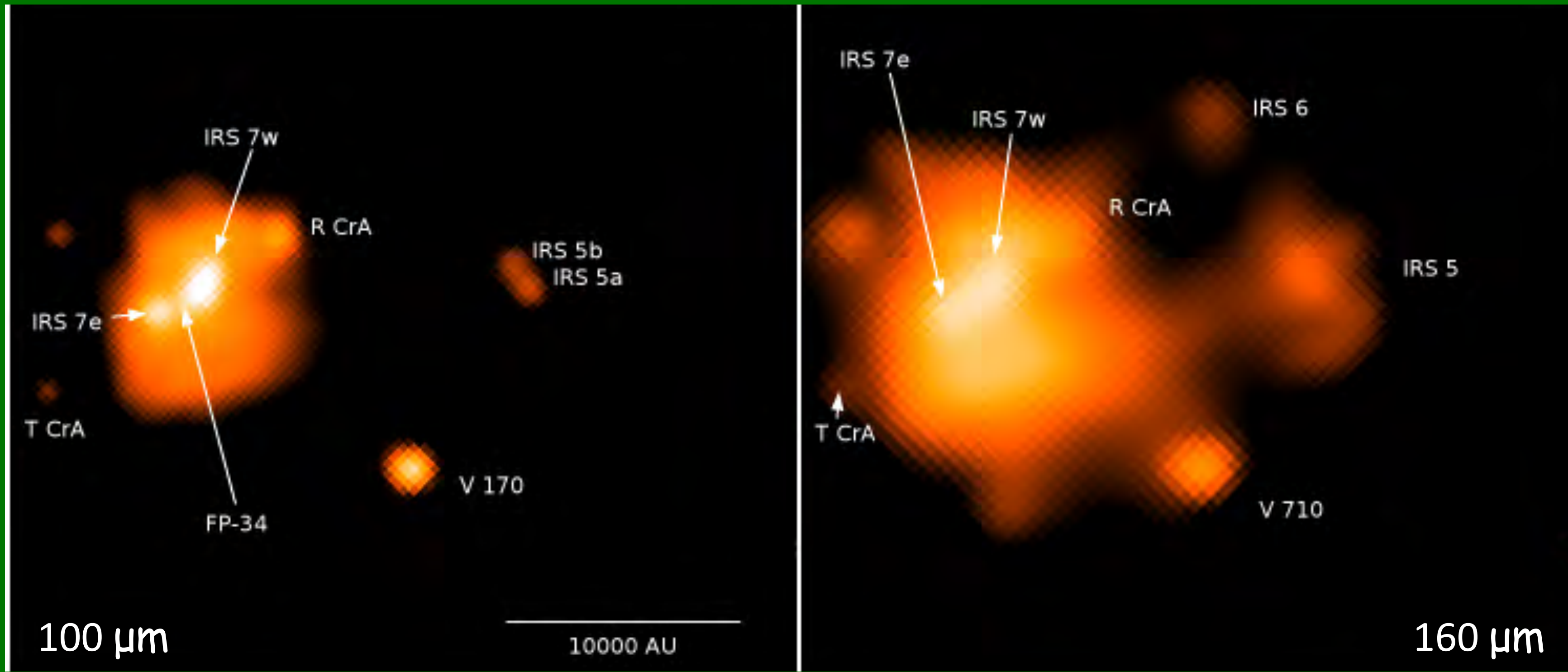
The inhabitants of the Coronet



The inhabitants of the Coronet

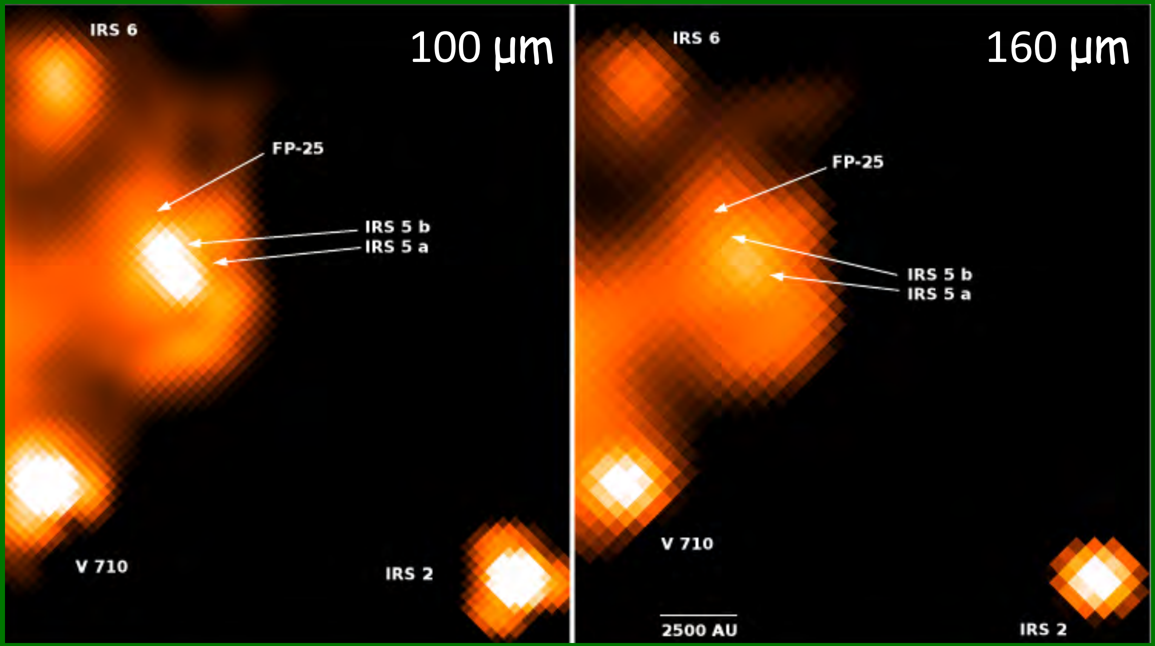


The birth of the Coronet members



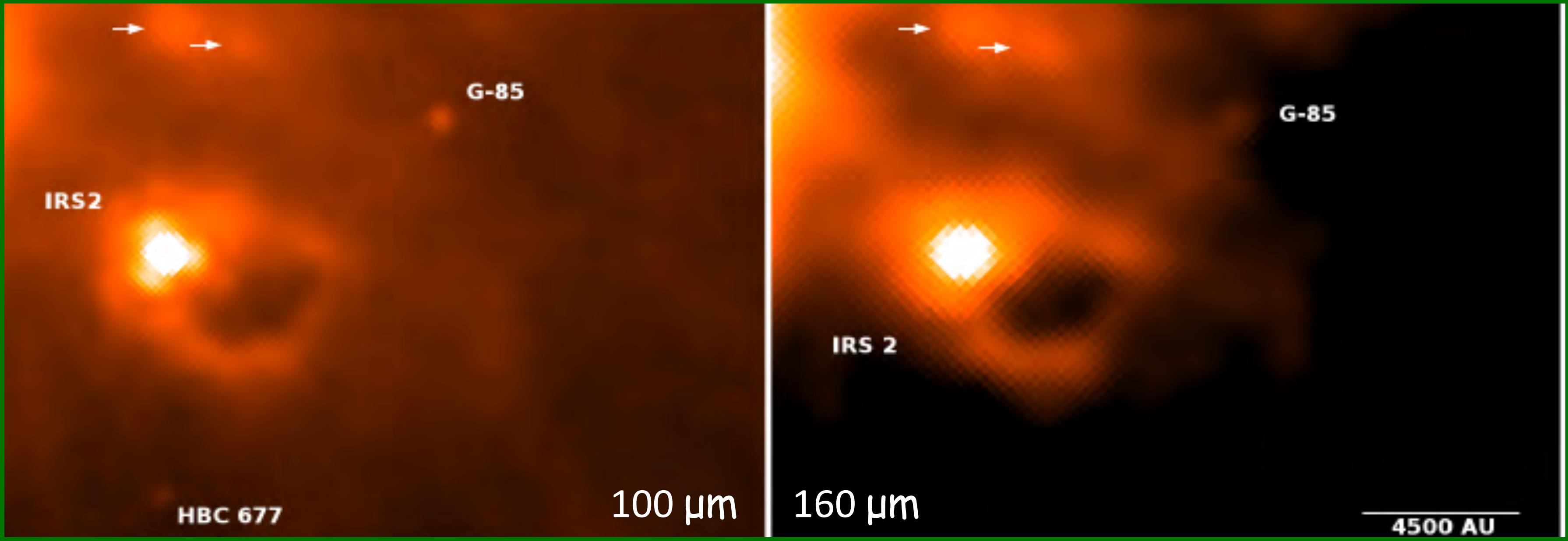
The cluster center:
a compact group of new-born stars,
mostly progenitors of HAeBe and massive TTS

The birth of the Coronet members

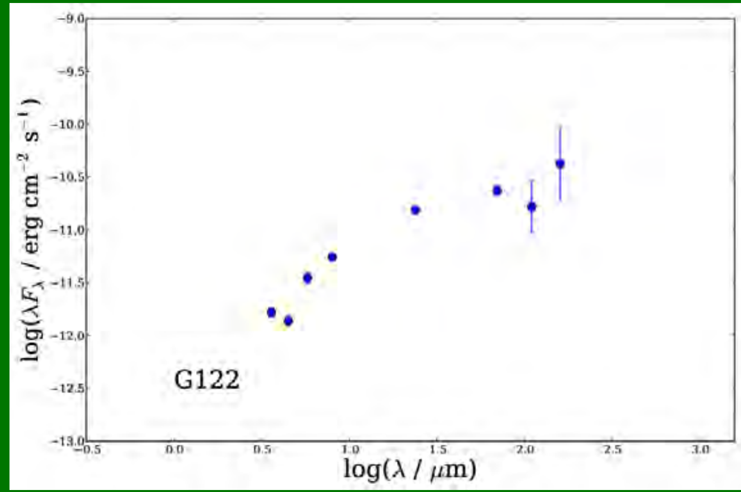


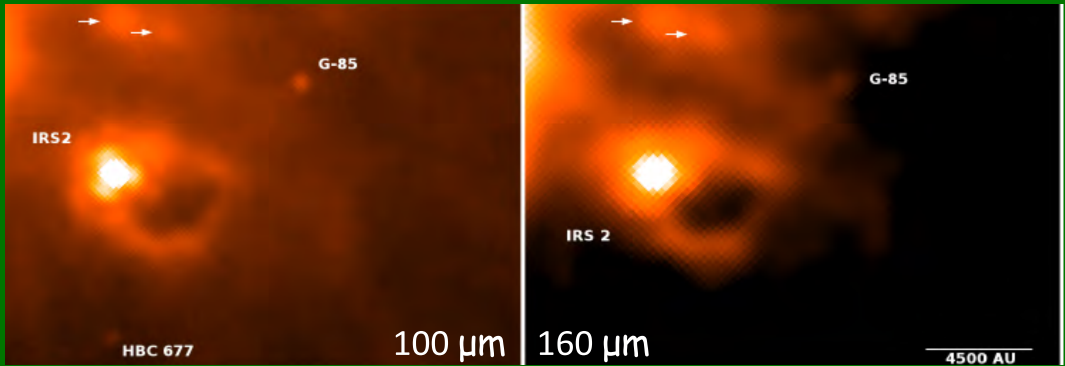
The cluster center:

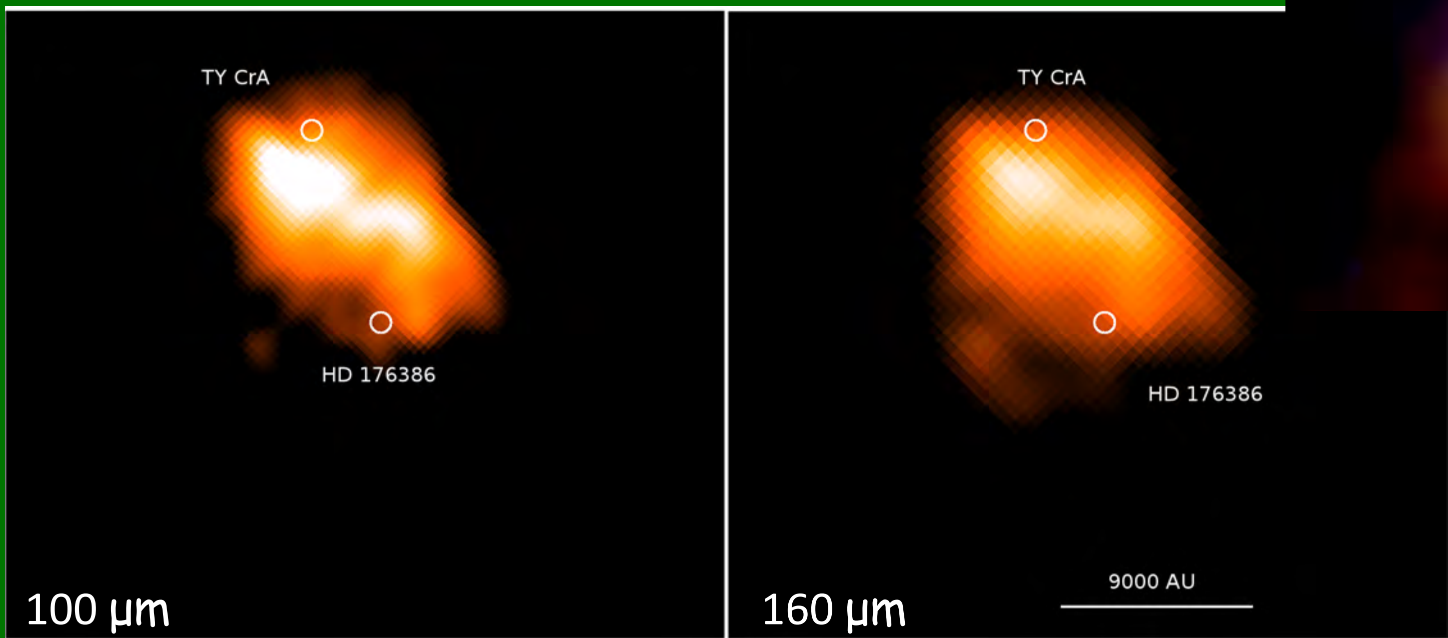
New-born binaries,
bubbles,
very low-mass protostars

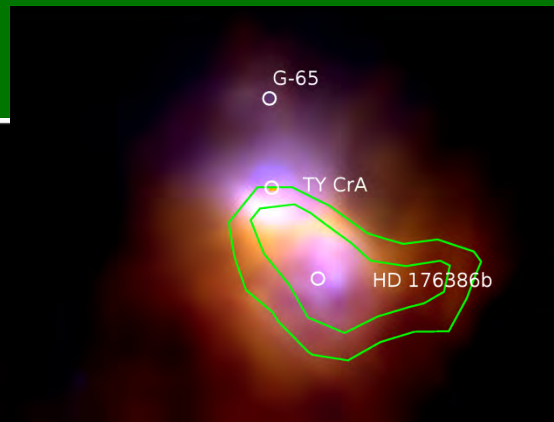


More members to be born?









Places with no (evident) star formation

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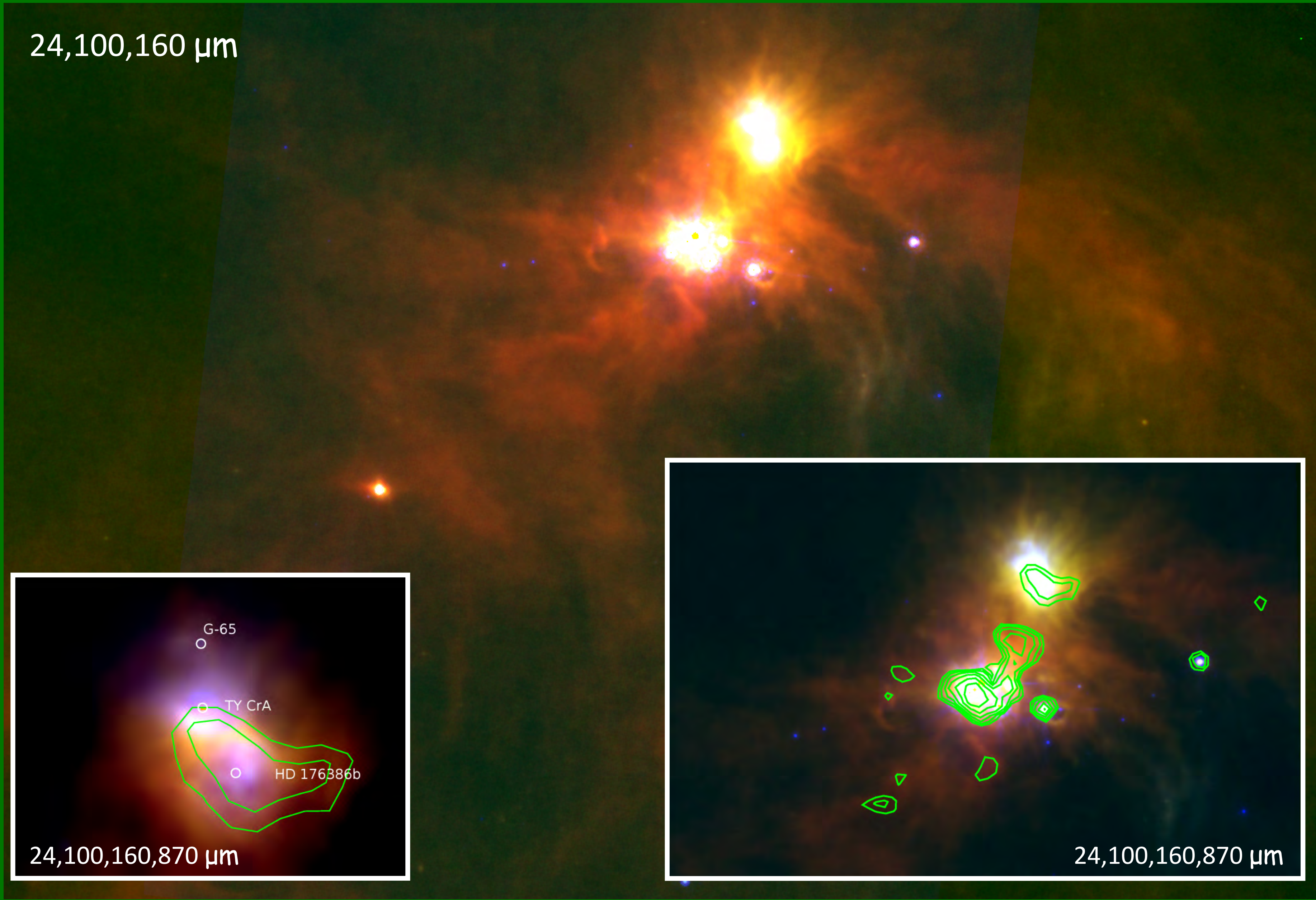
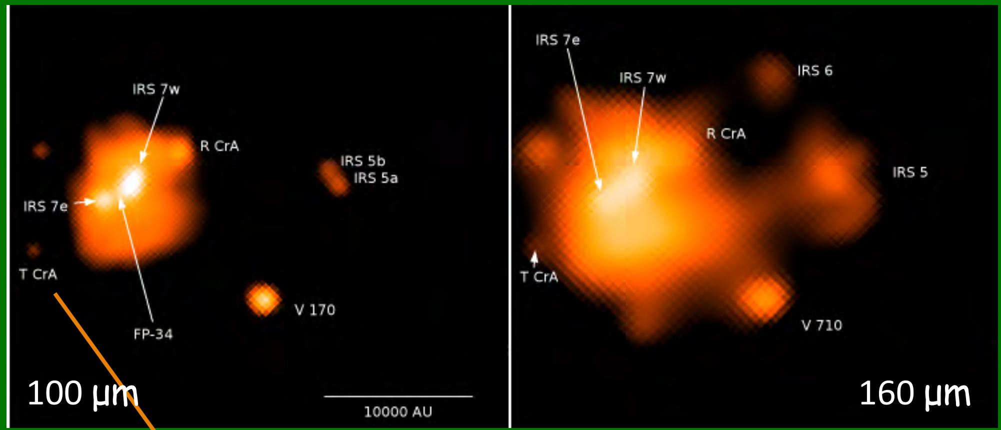
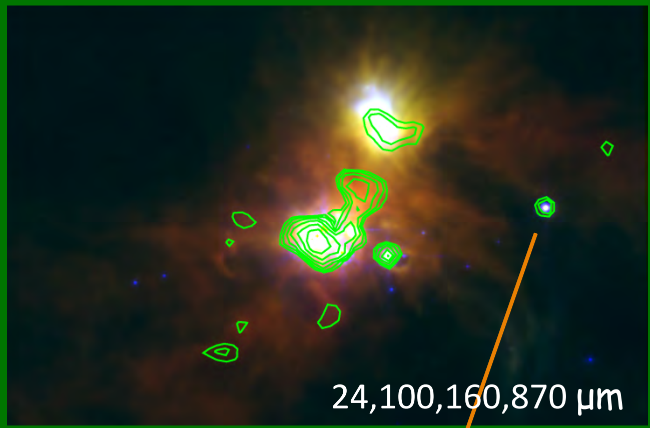
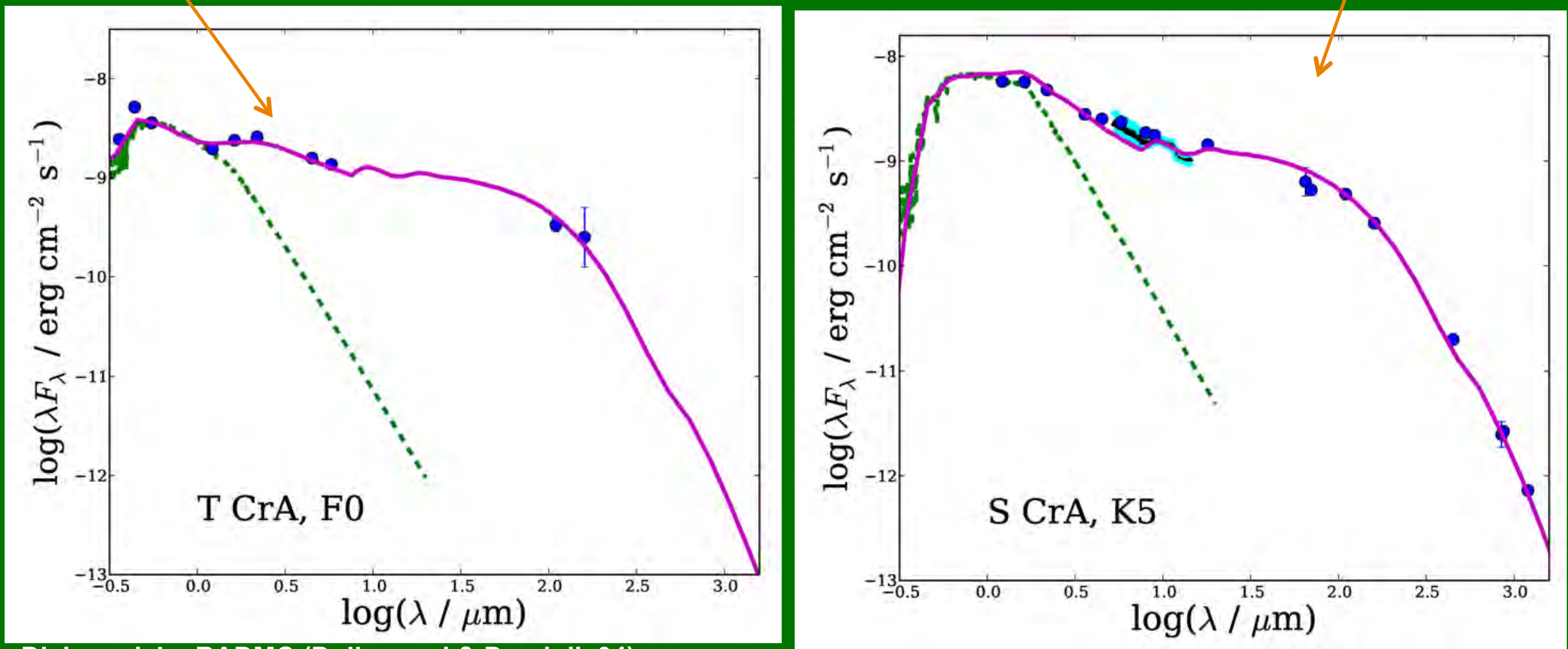


The intermediate-mass stars with disks



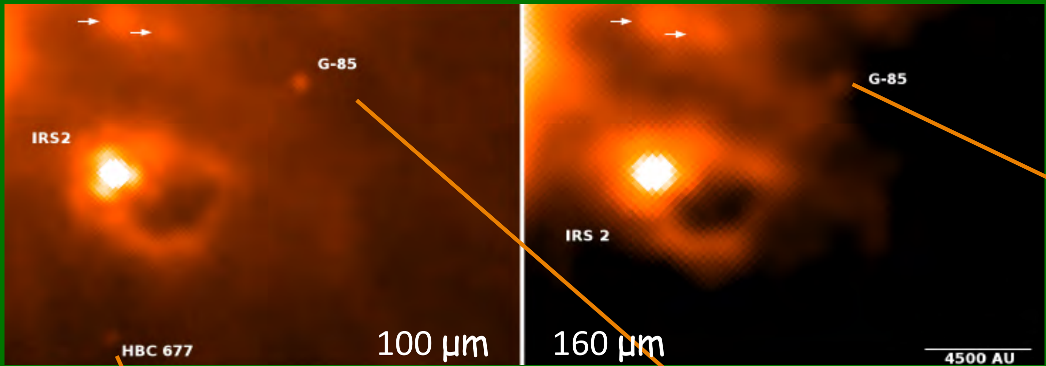


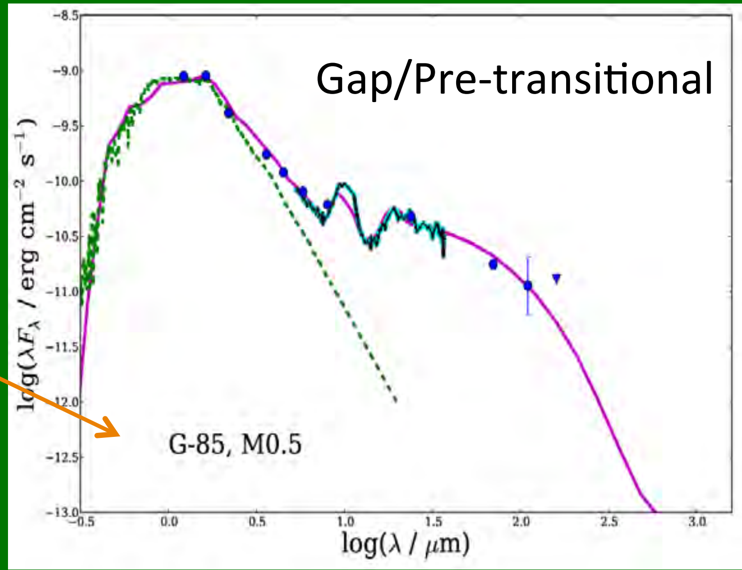


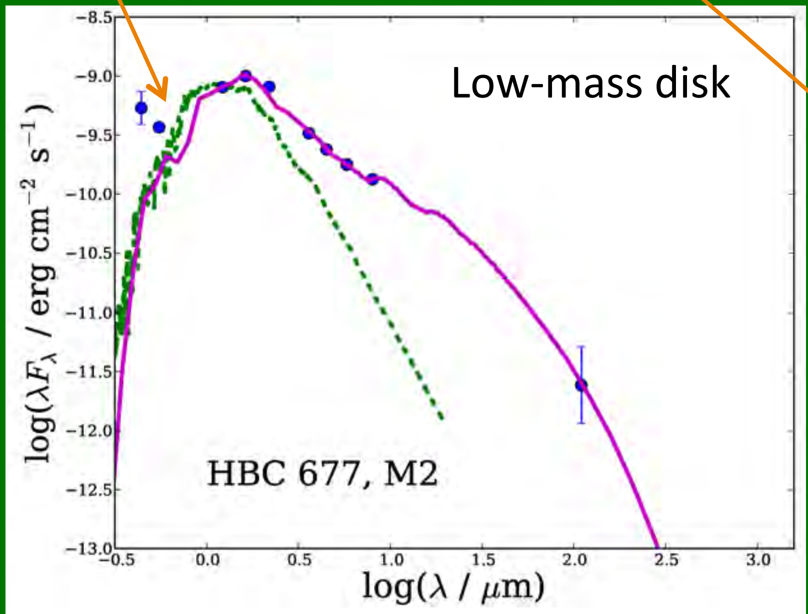
Disk models: RADMC (Dullemond & Dominik 04)

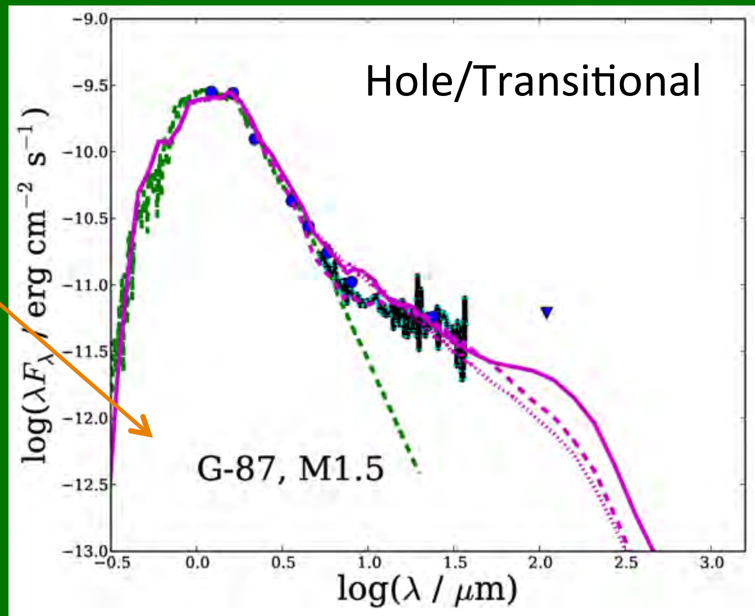
The low-mass stars with disks (I)

Multiwavelength data plus RADMC [Dullemond & Dominik 2004] models





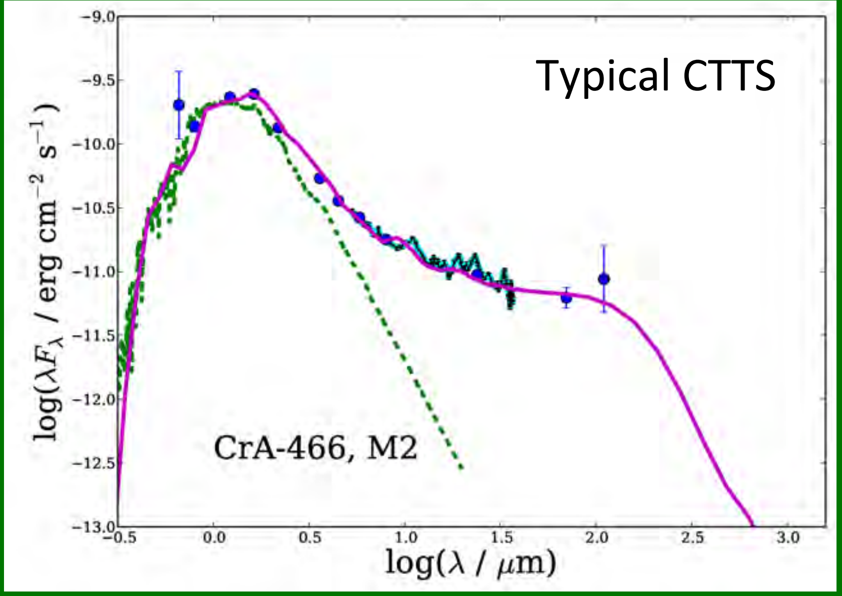


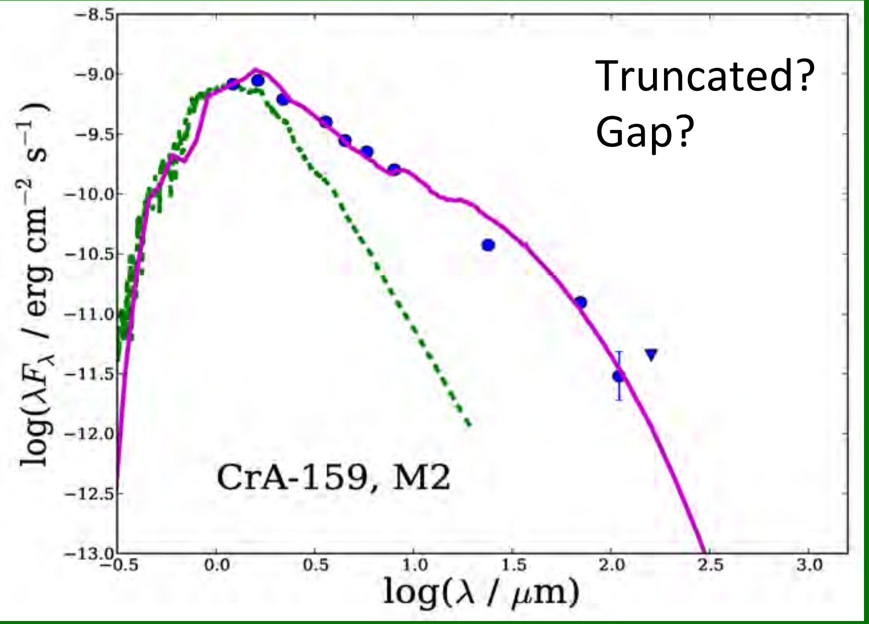


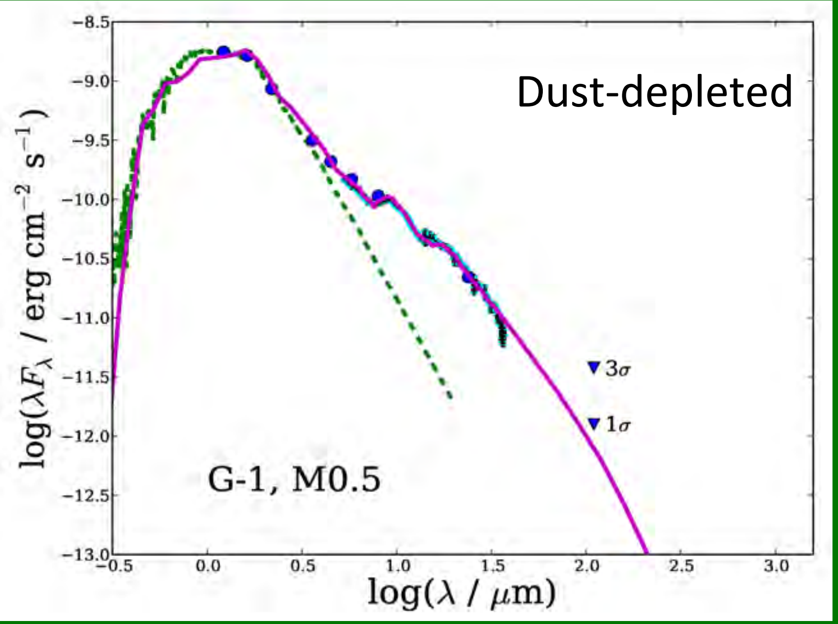
The low-mass stars with disks (II)

Strong disk evolution:

Processed grains, settled disks,
globally depleted disks,
inside-out evolution (gaps/holes),
maybe truncated disks?





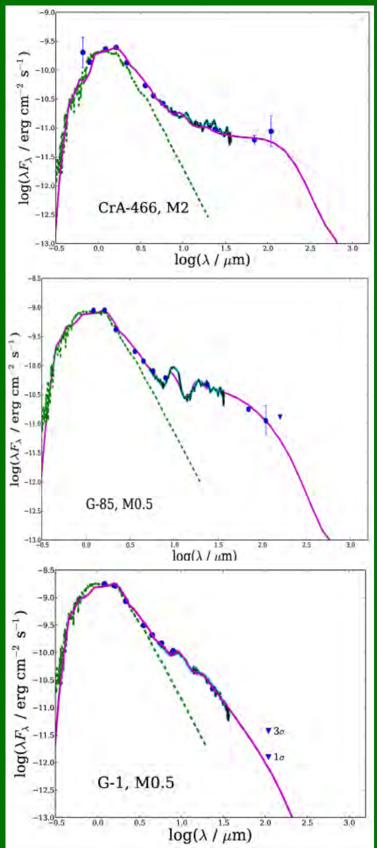


Disk masses, age, and evolution

The cluster is 1-2 Myr-old and 1.3pc accross, but we find:

- ❑ Ongoing star formation (intermediate and low-mass *)

- ❑ HAeBe and massive CTTS with various types of disks:



- Normal disks

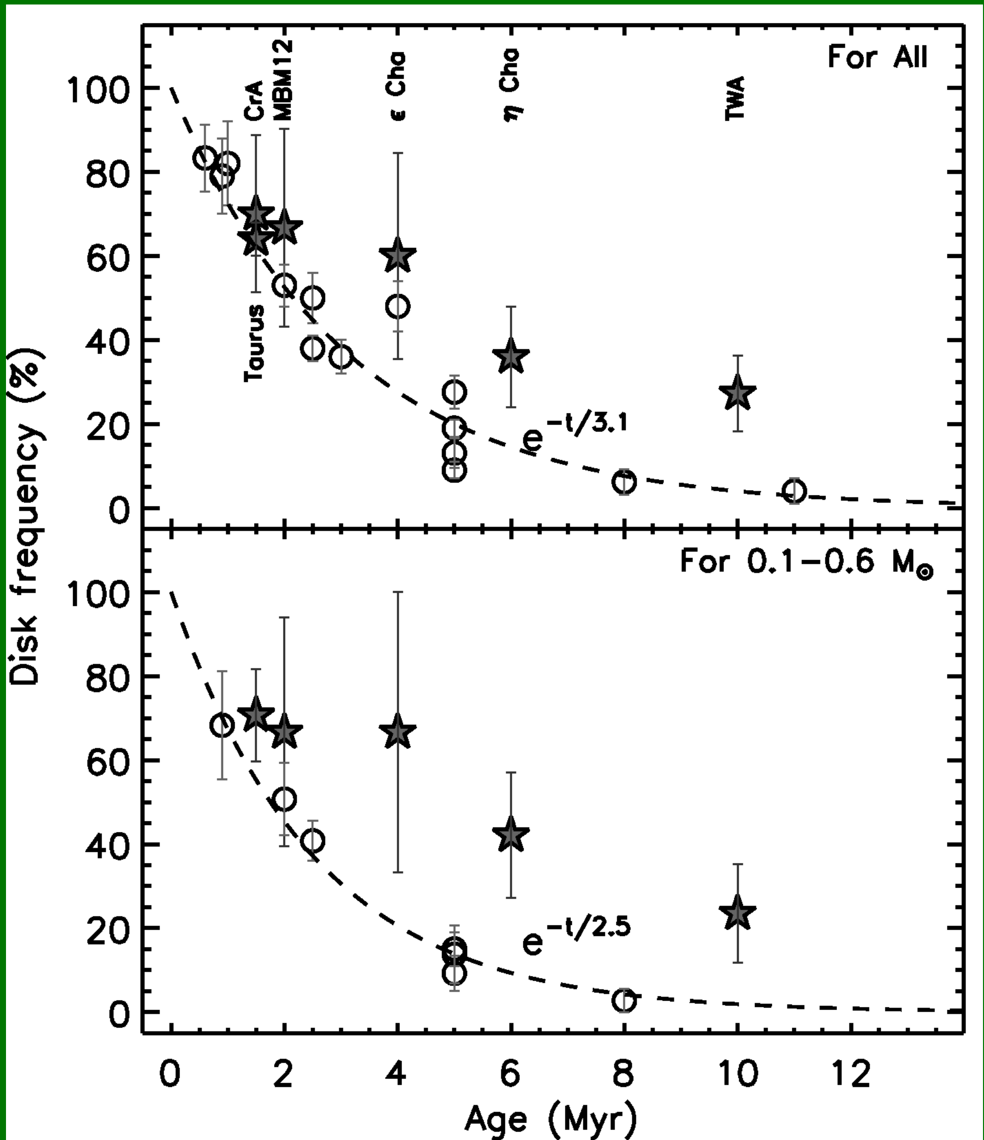
- Disks with inside-out evolution: holes, gaps

- Depleted and truncated disks

- Debris disks (not detected with Herschel)

- Most disks with very low masses (10^{-4} -10^{-6} M_{sun}), among the M-type CTTS

Does the environment play a role?



Sparse clusters:

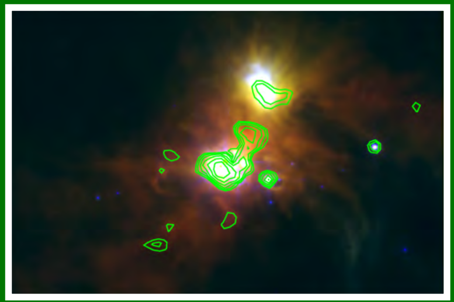
Evolutionary differences?

Formation differences?

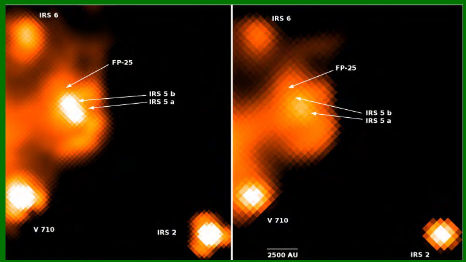
Low numbers/selection effects?

[Fang et al., A&A in press]

Summary

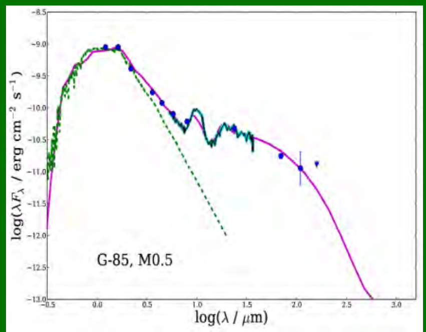


Multiwavelength study, now including Herschel

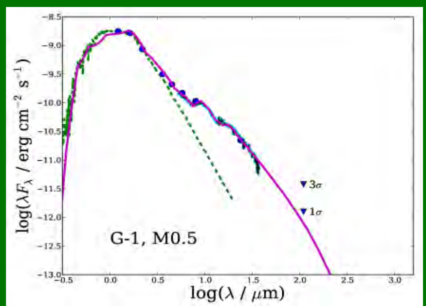


Coronet cluster /CrA region, 170 pc, 1-2 Myr

Ongoing star formation (binaries and singles)



Disk evolution seen among cluster members:
- Inside-out: holes, gaps
- Global dust depletion



Moderate disk fraction: typical of sparse regions?

Waiting for ALMA, JWST, ...