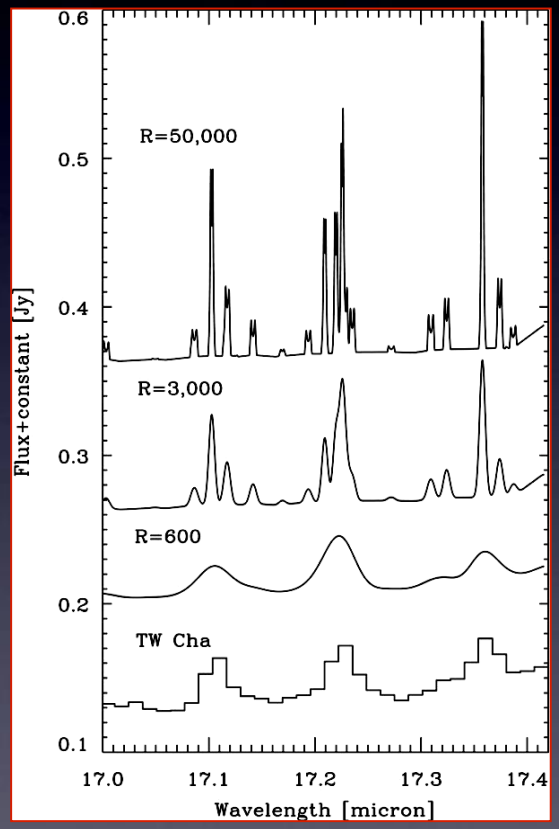
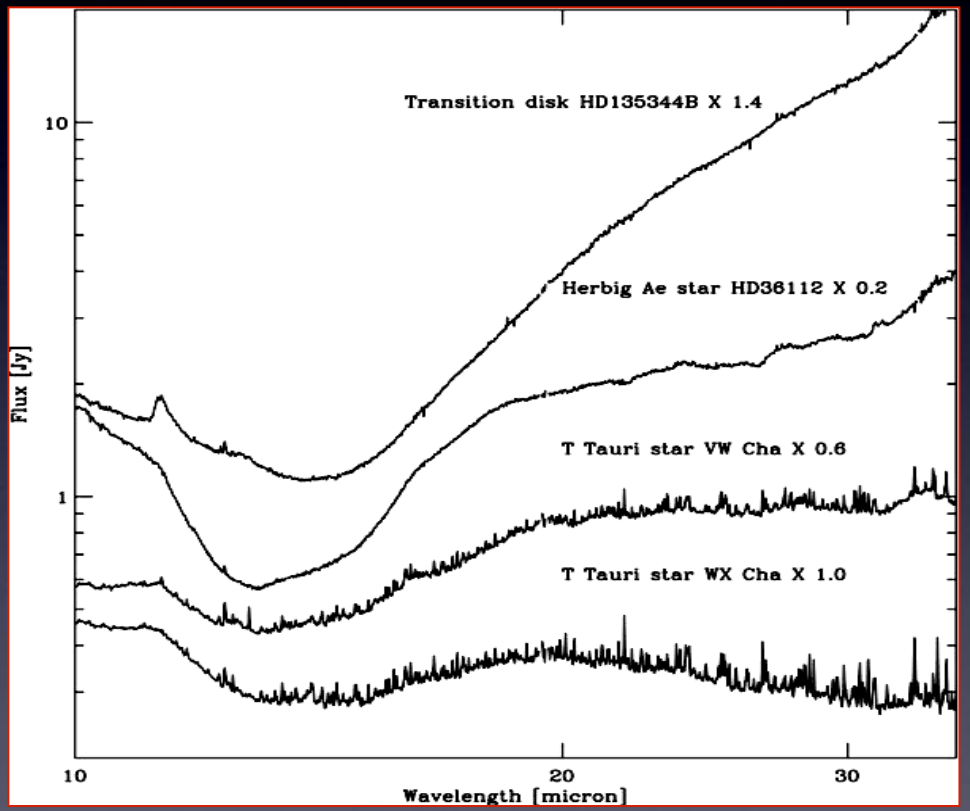
A variety of atomic and molecular emission with Spitzer

- [Ne II] , [Fe II], H_2, H_2O, OH, HCN, C_2H_2, & CO_2, PAHs

H_2O line complex at 17.22μm

Pontoppidan et al. (2010)





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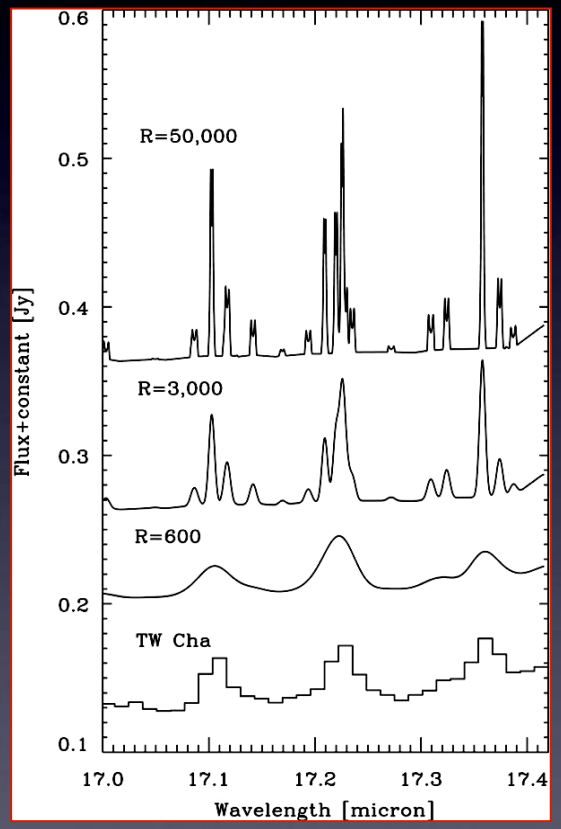

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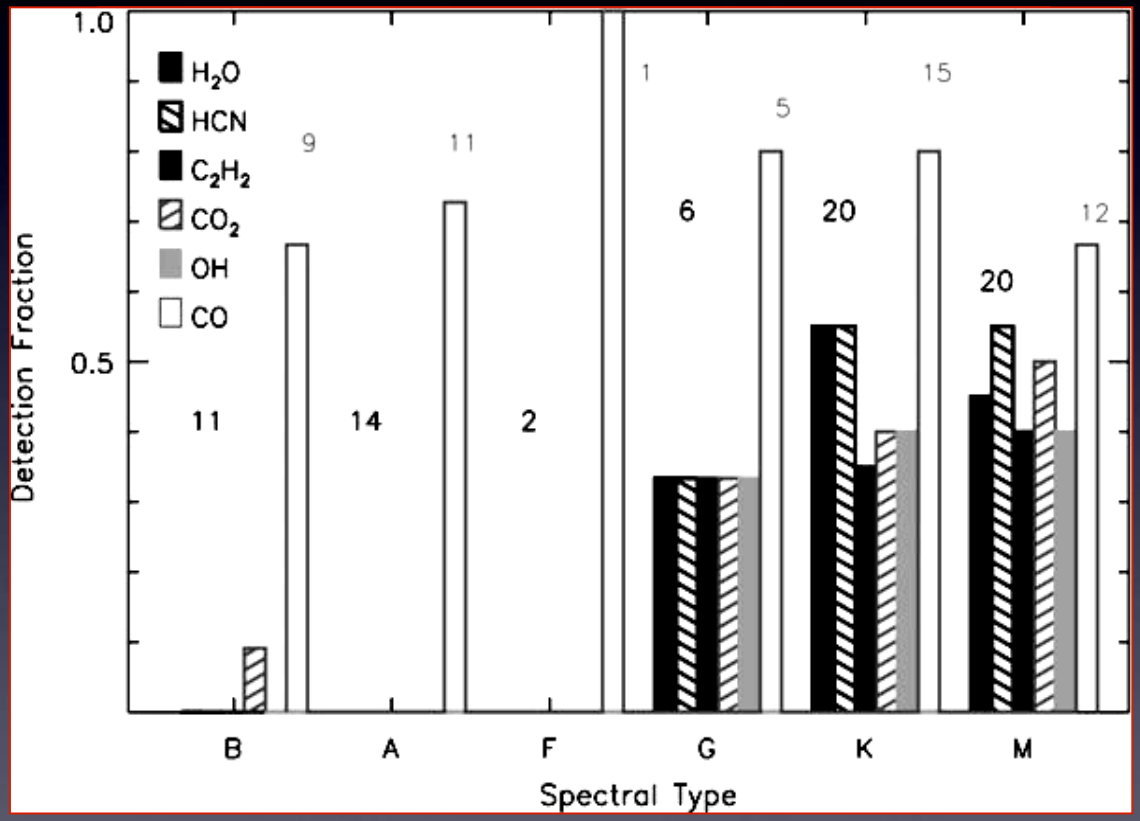

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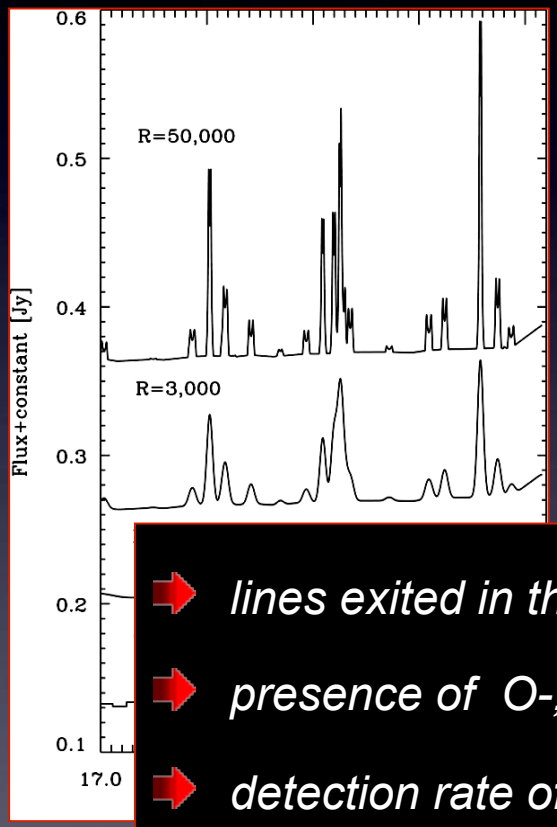
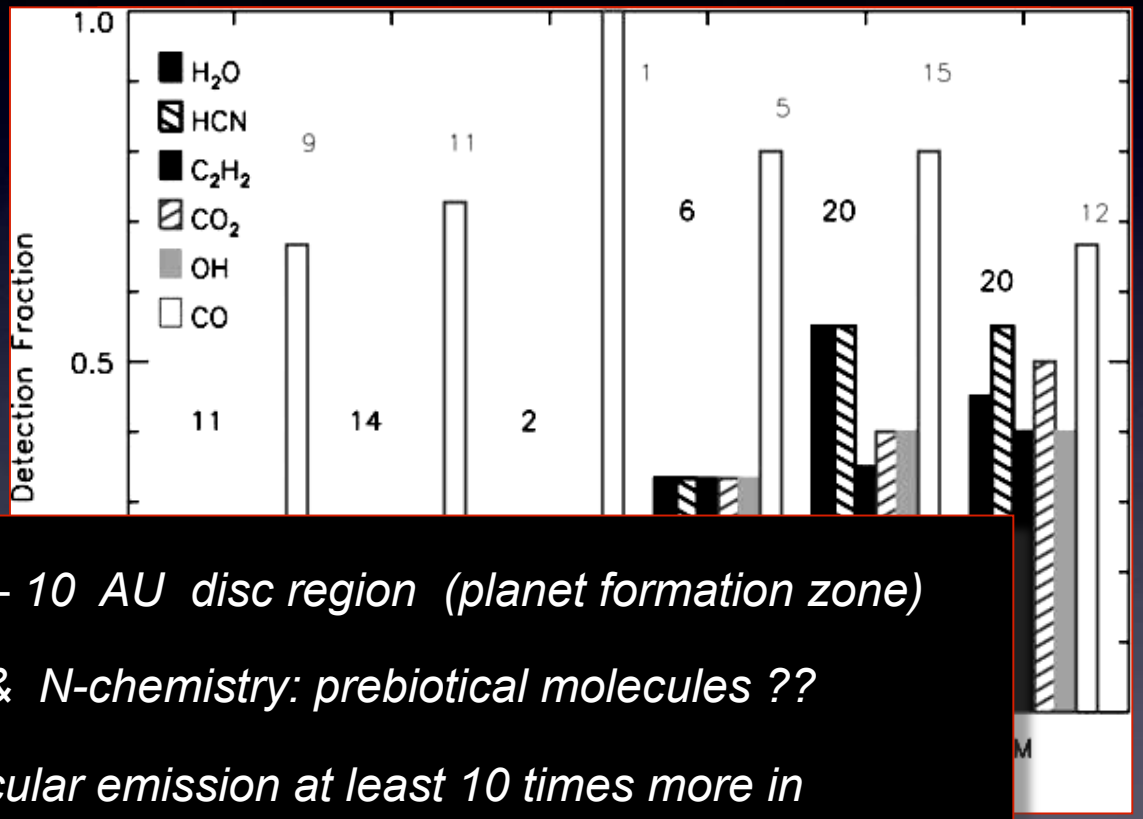
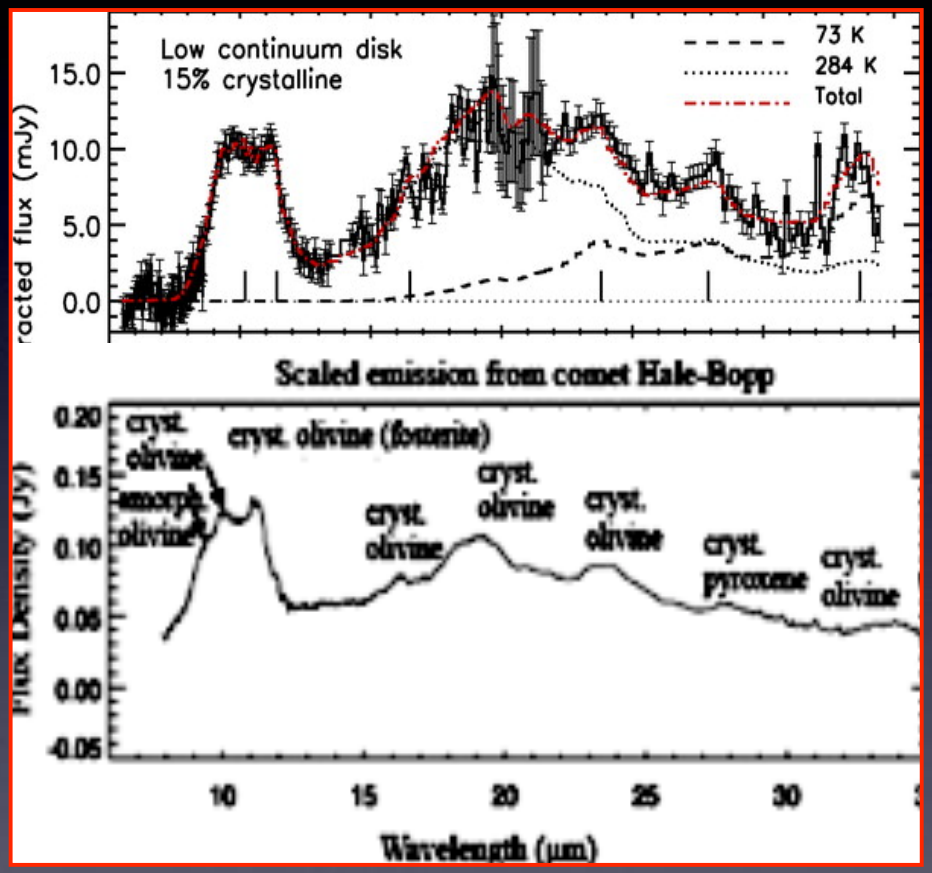




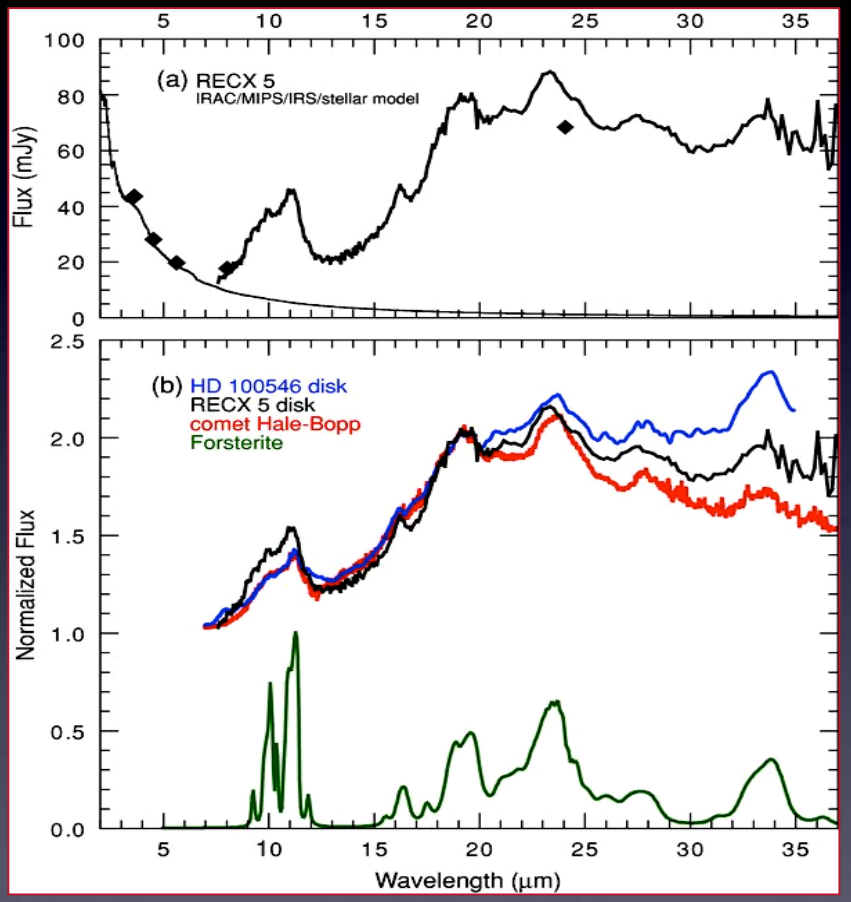
- *lines exited in the 0.1 – 10 AU disc region (planet formation zone)*
- *presence of O-, C- & N-chemistry: prebiotical molecules ??*
- *detection rate of molecular emission at least 10 times more in solar-type stars than in massive stars (photodestruction in AB stars?)*

Abundant crystalline silicates with Spitzer and planet formation

SST-Lup3-1 (Merin et al. 2007):
YSO discovered in the c2d
M = 0.1 $M_\odot$

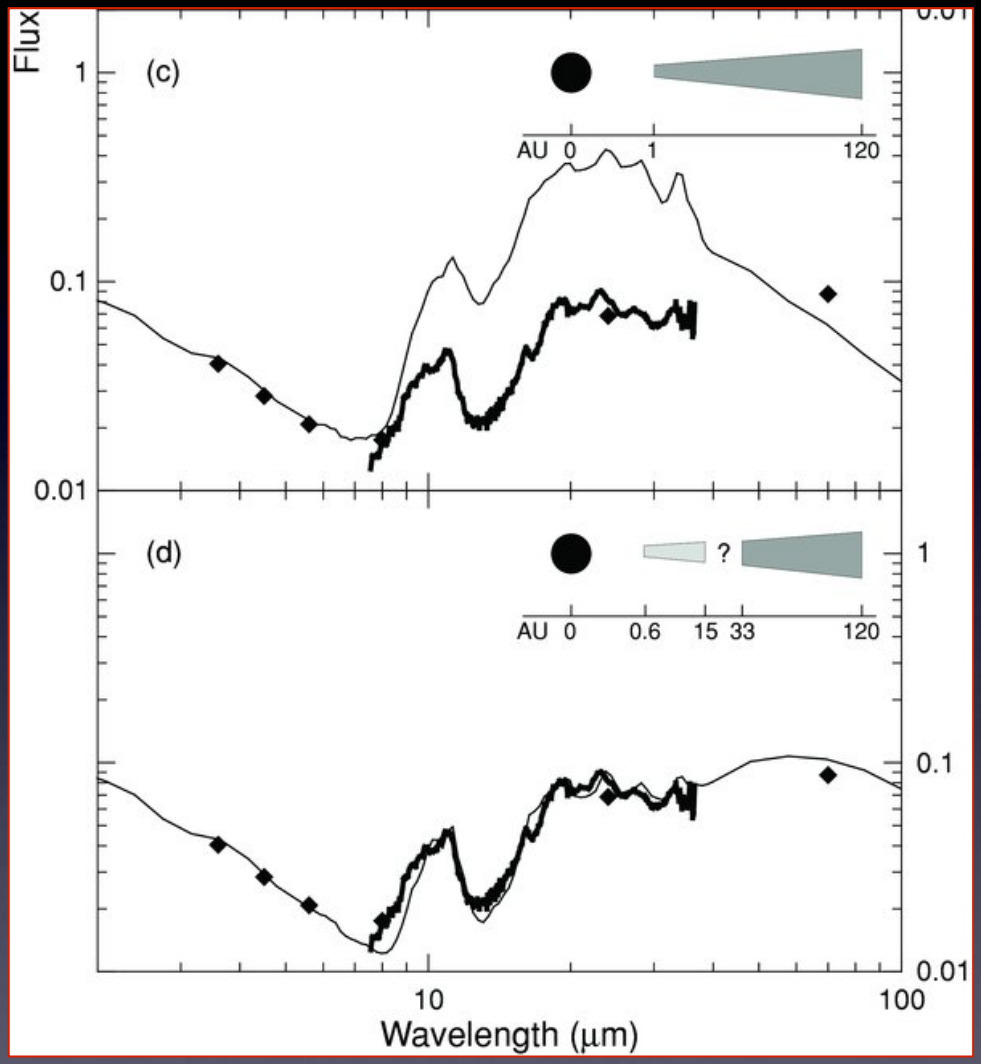


RECX 5 (Bouwman et al. 2010):
YSO in the η-Cha cluster
M = 0.26 $M_\odot$



- *giant planet at a distance of ≈ 0.6 AU*
- *Saturn-mass planet orbiting at ≈ 24 AU*

Abundant crystalline silicates with Spitzer and planet formation



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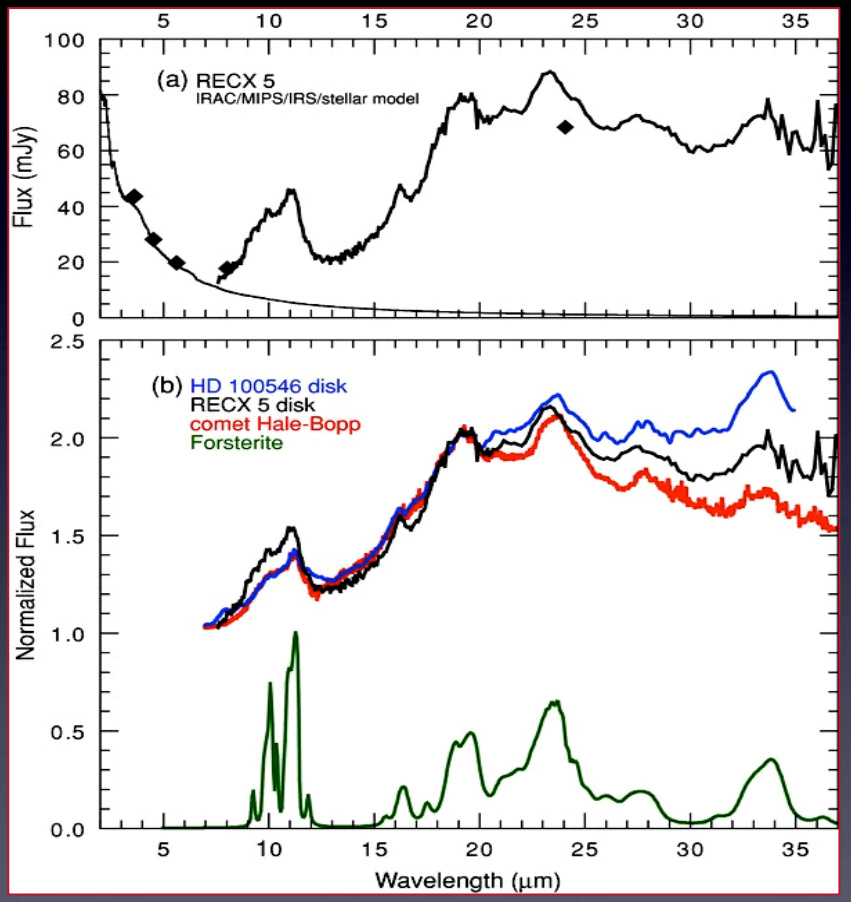

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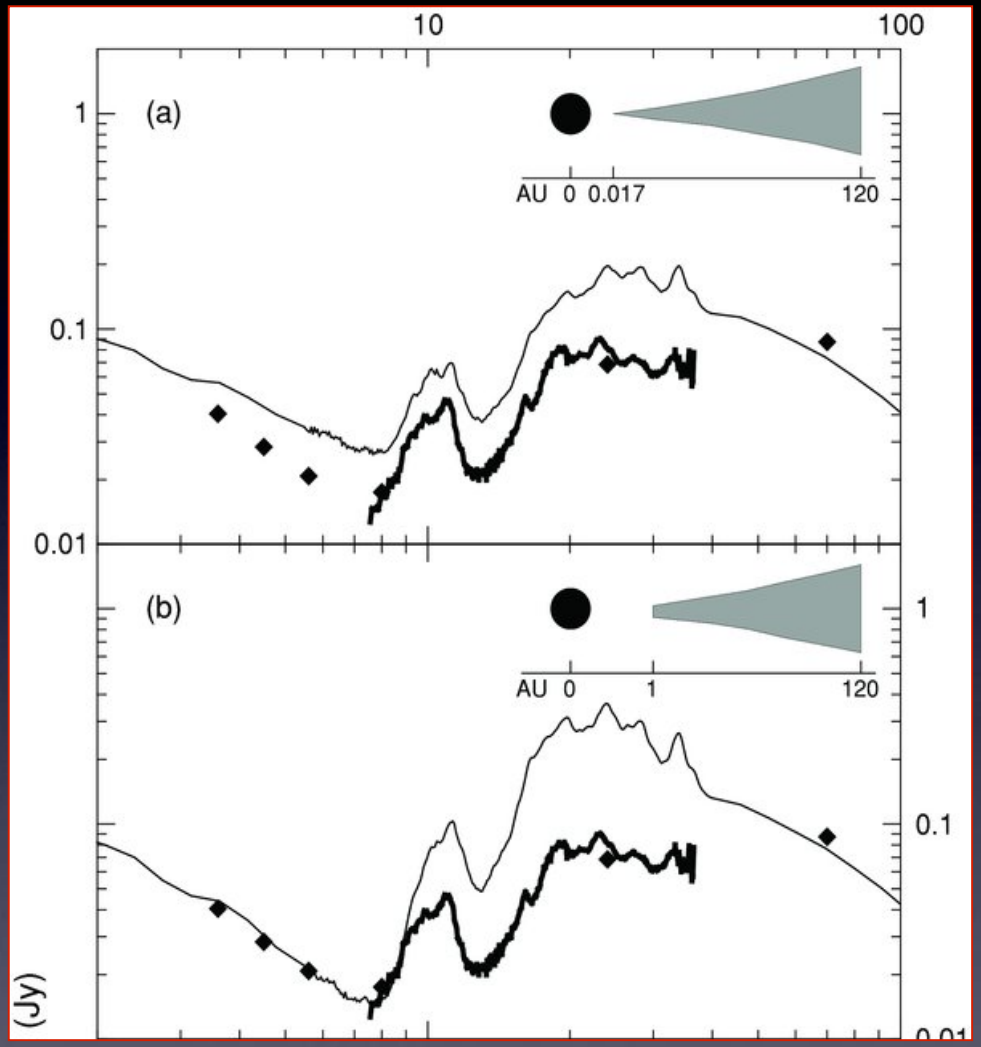

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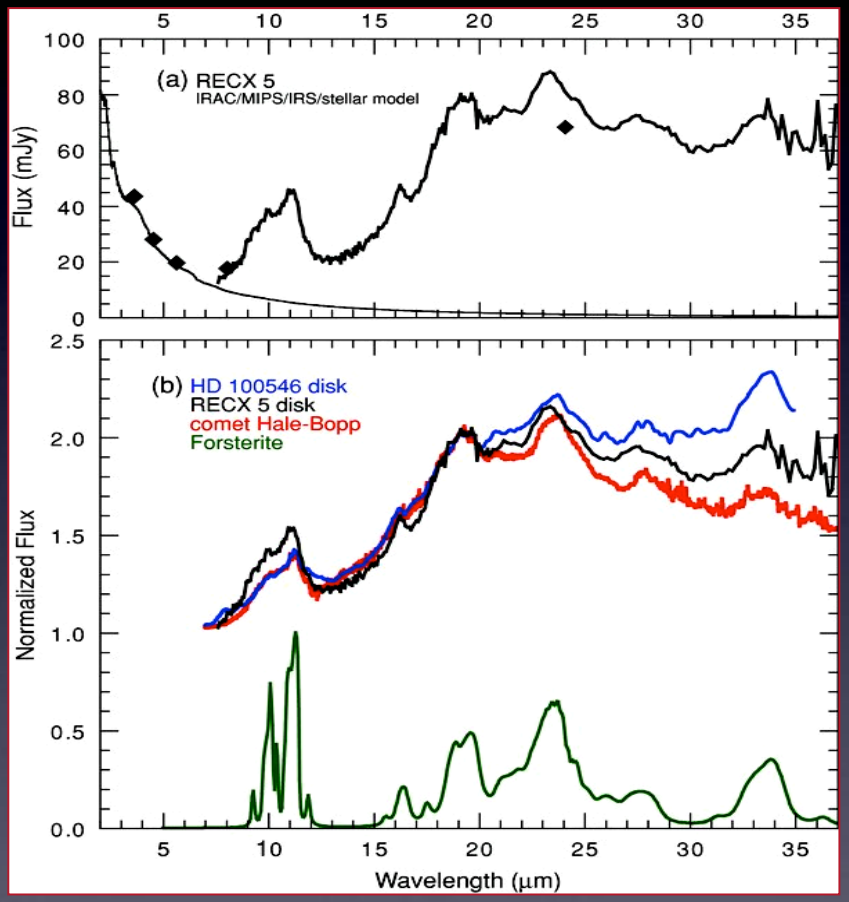

- *giant planet at a distance of ≈ 0.6 AU*
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What have we learned from Spitzer ?

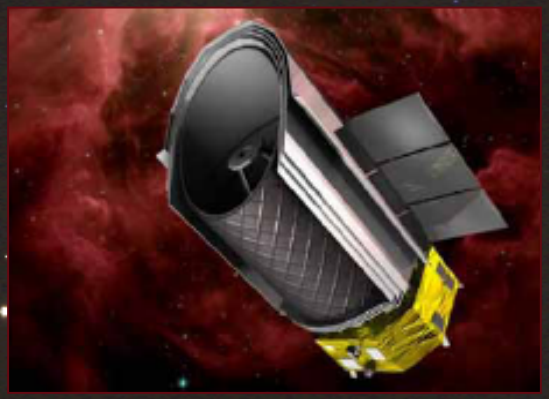
Photometry (IRAC & MIPS)

- diversity of SEDs
- different types of proto-planetary discs → disc evolution
- discs at all mass regimes, down to planetary mass objects
- SED modelling → disc parameters
- results on transitional discs: planet formation
- debris disk still to be explored

What have we learned from Spitzer ?

Spectroscopy (IRS)

- a large variety of atomic and molecular emission in thick discs
- differences between high and low-mass regimes ?
- little emission in transitional discs, but very low statistics
- abundant crystalline silicates down to the DB domain
- structure and composition of transitional discs not yet explored
- debris discs still unexplored



What can we learn from SPICA ?

What can we learn from SPICA ?

I. Young optically thick discs

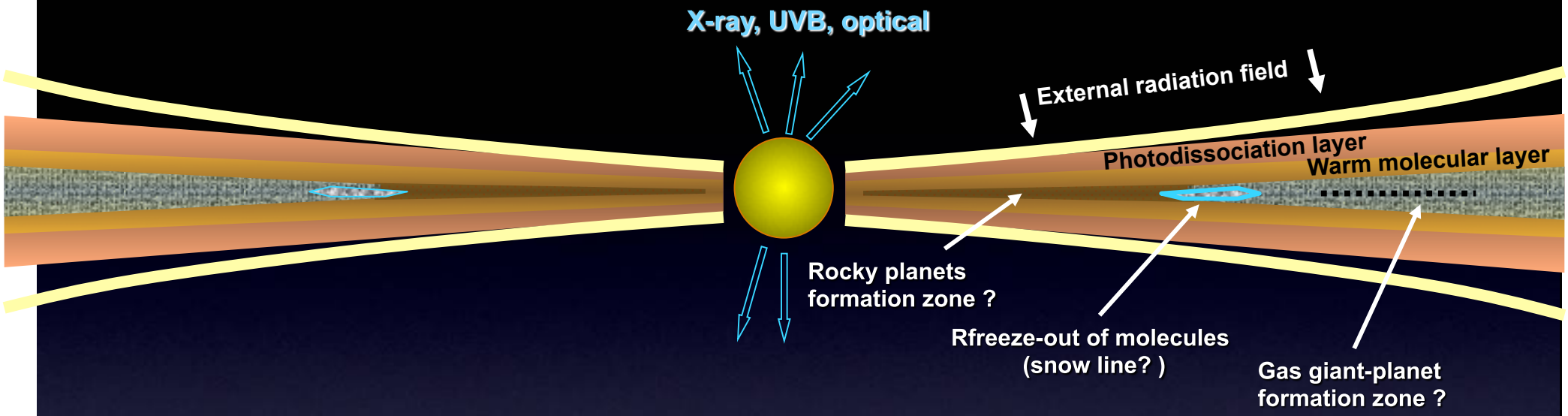
II. Transitional discs

III. Debris discs

Optically thick discs with SPICA

- more precise SED modeling, down to planetary-mass YSOs
- better estimates of disc/envelope parameters and link with star physical parameters down to BD-mass regime
- chemistry of proto-planetary discs: effects of UVB radiation
- study of pre-biotical species: NH_3, CH_4, H_2O
- outflows throughout the mass spectrum (Nisini's talk)
- studies at low metallicity environment
- more in talks by Nisini & Podio

Planet formation in transitional discs



- accretion of gas onto rocky / icy cores of few M_{earth}
- grav. instability: overdense clumps → quick gas dissipation (< 10Myr)

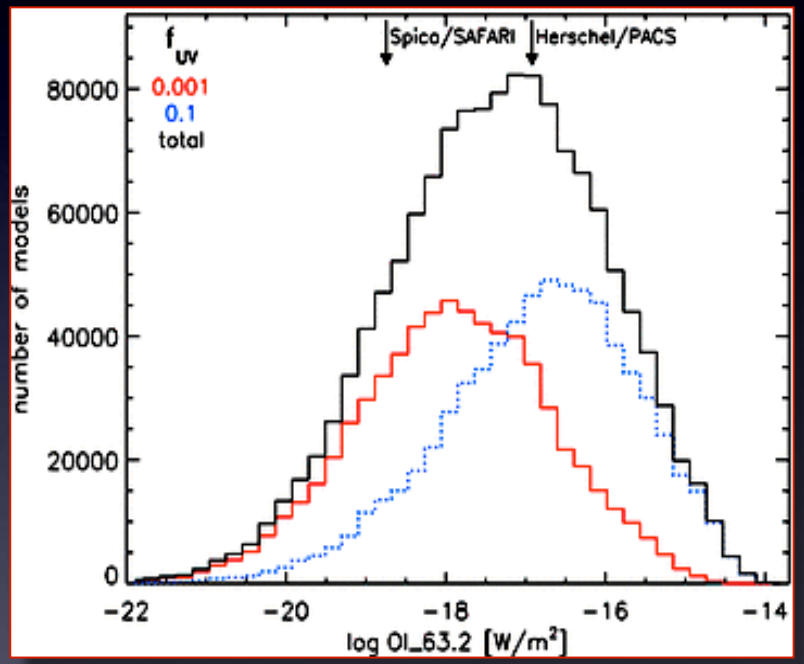
→ Amount of gas in TDs ?

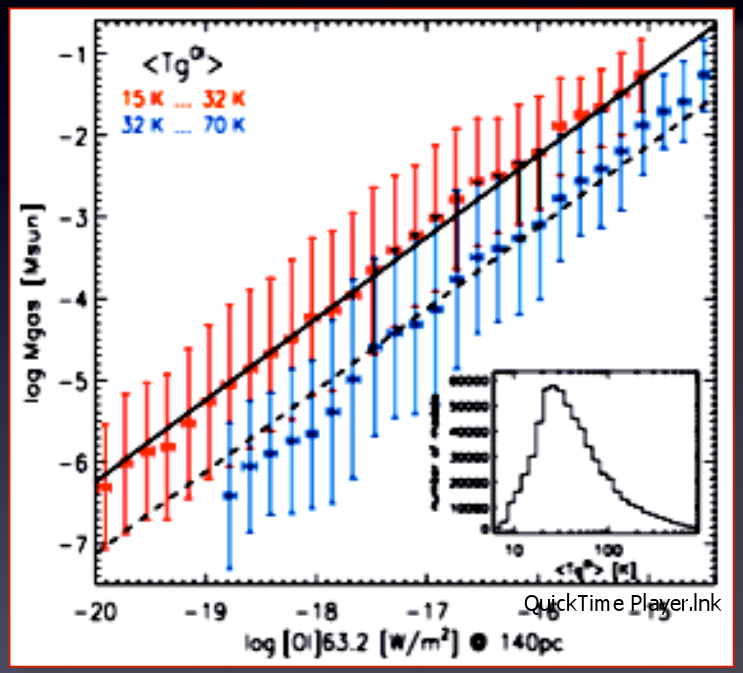
Continuum and line modelling of discs

Woitke et al. (2010, MNRAS 405, L26): Radiative transfer in transition discs

- **300,000 models**
- **disc mass, flaring & dust and gas parameters**
- **[OI] (63μm), [OI] (145μm), [SI] (56μm) , H_2O, OH, CO**

@ 140 pc





- strong dependence on UVB radiation field and disc flaring
- less flaring → less UVB irradiation → fainter lines
- strong dependence on disc mass