

INVESTIGATION OF THE INITIAL MASS FUNCTION AT LOW-MASS END: IS IT UNIFORM?

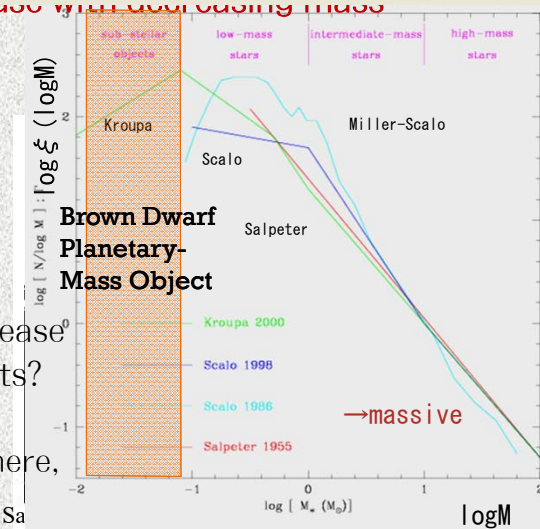
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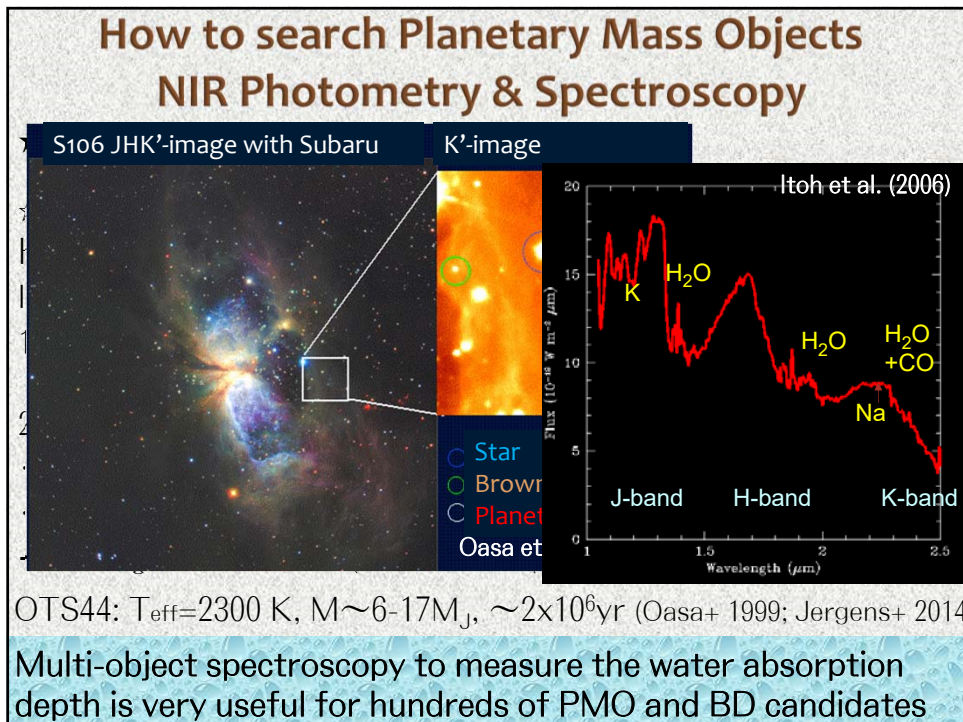
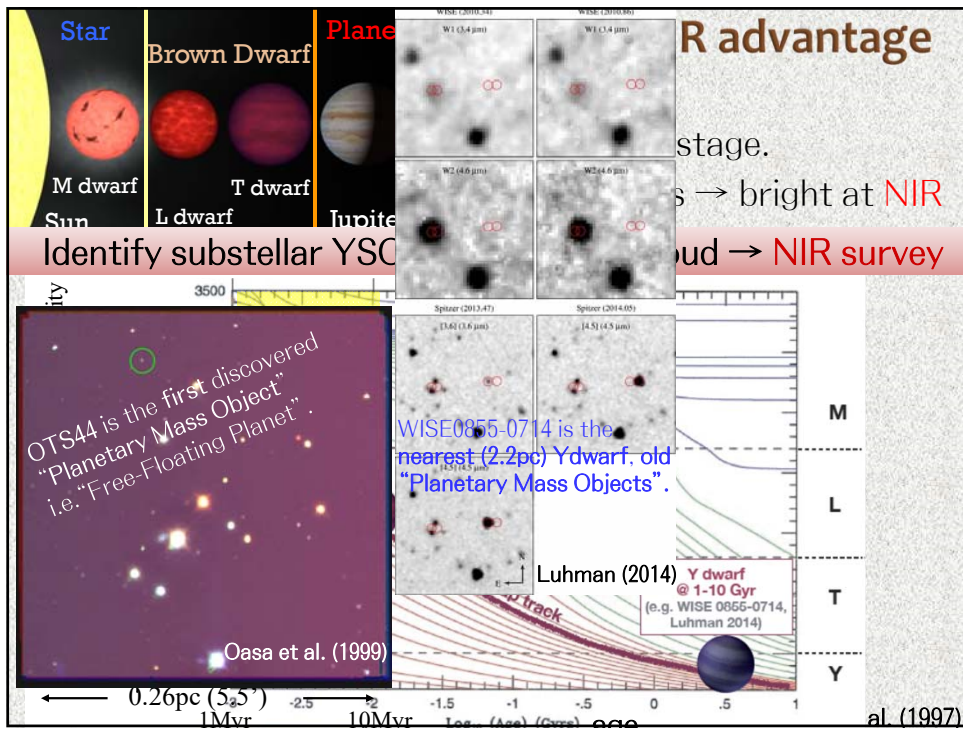


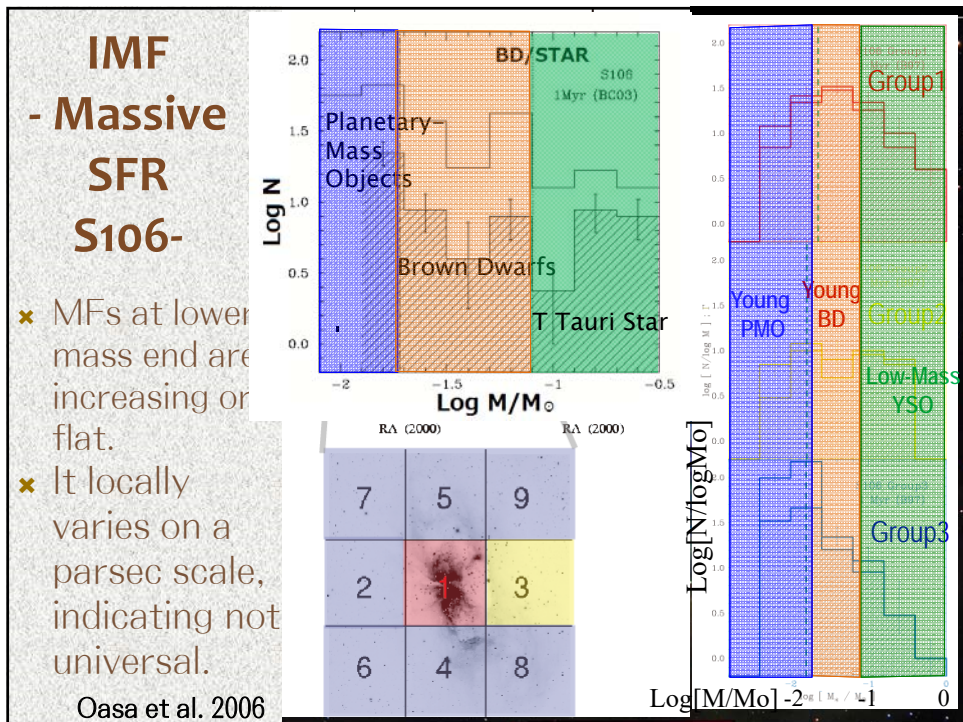
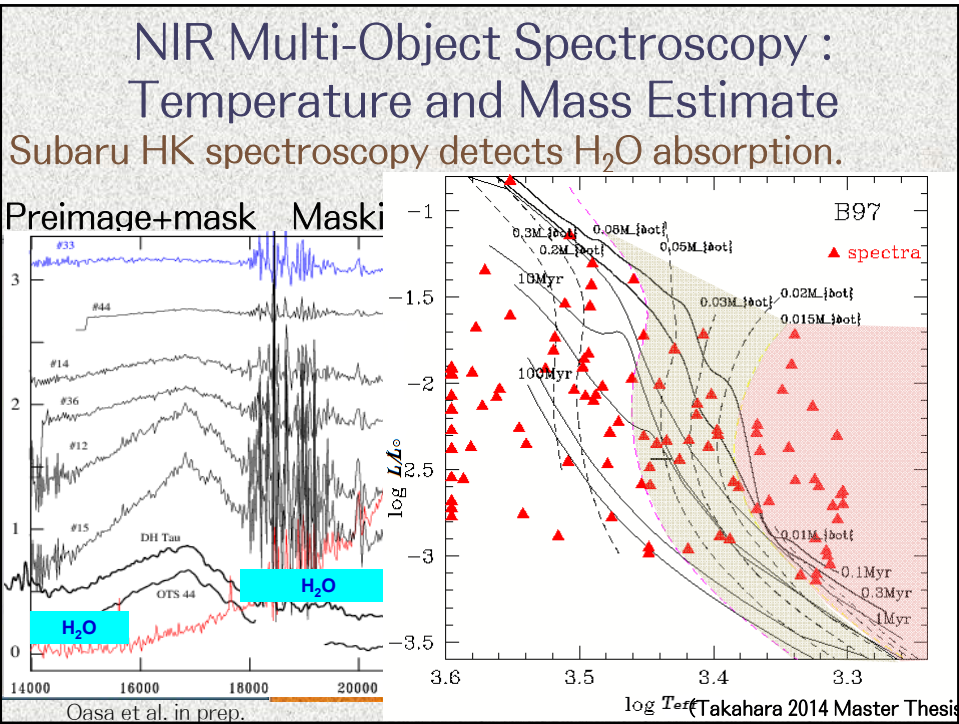
Objects whose mass are giant planet have been discovered in isolation. They are “Planetary Mass Objects (PMOs)”, what you call, “Free-Floating Planets” (Cha; Oasa et al. 1999, σ Ori; Zapatero-Osorio et al. 2000, Trapezium; Lucas & Roche 2000).

the number of stars increase with decreasing mass

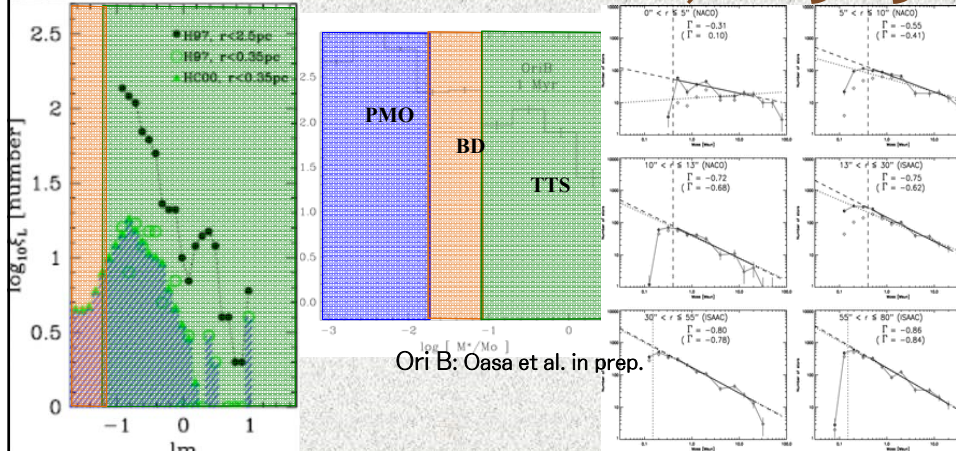
- ✗ Salpeter’s law
 - + Increase monotonously
- ✗ Scalo’s law
 - + Peak around 0.3 Mo
 - + But, data incompleteness
- ✗ Kroupa’s law
 - + Peak around 0.1 Mo?
 - + But, data incompleteness
- Do IMFs decrease or increase for much lower-mass objects?
- Is the IMF universal anywhere, at very low-mass side?







IMF – Massive SFRs Orion, NGC3603 -



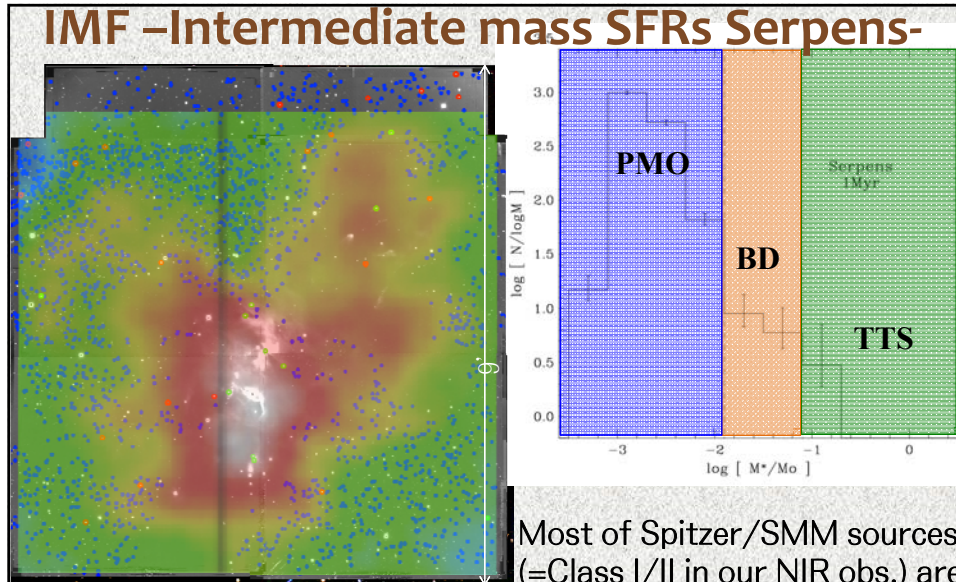
Ori B: Oasa et al. in prep.

Trapezium (OriA): Hillenbrand 1997,2000

NGC3603 Harayama et al. (2008)

- IMF in the inner Trapezium (Ori A) appears to turn over, while IMF in Ori B increase toward substellar mass.
- IMFs between the inner and outer Trapezium and NGC3603 are different, similar to one in S106.

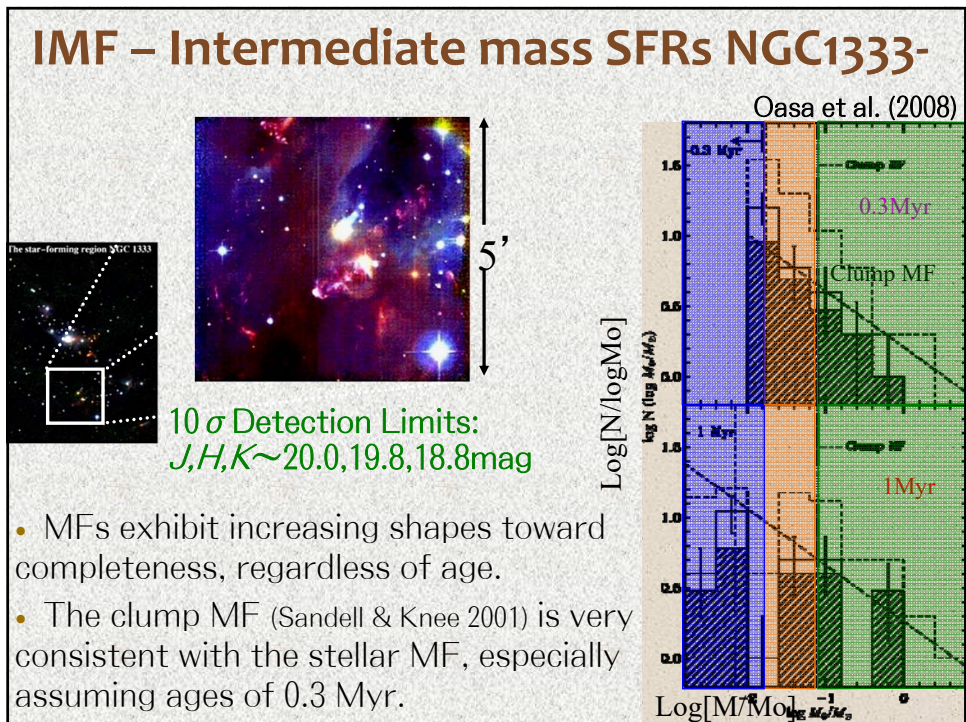
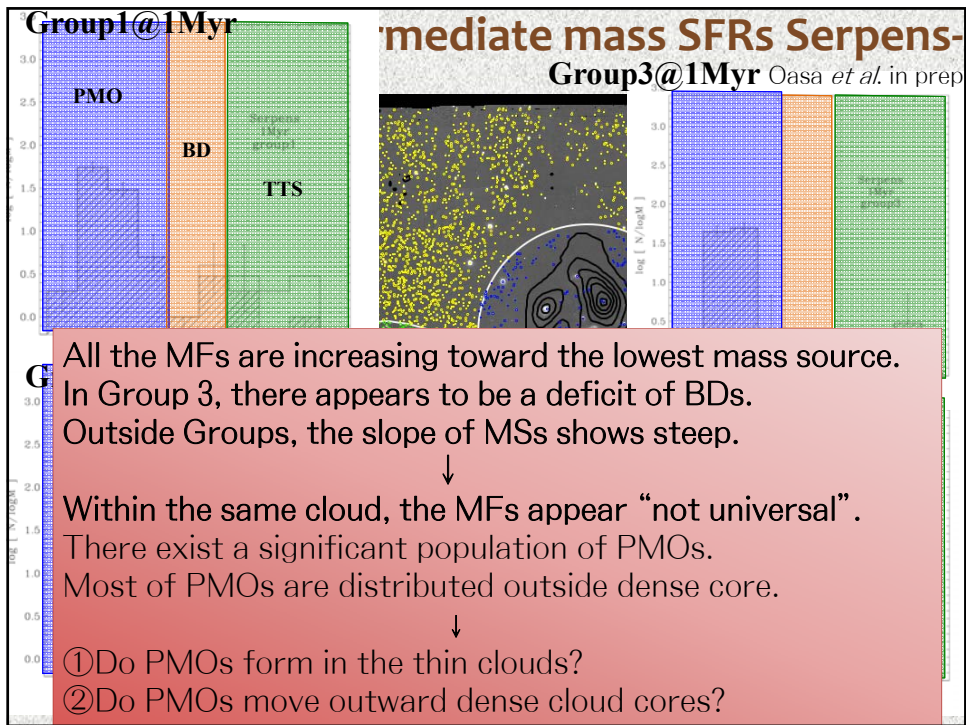
IMF – Intermediate mass SFRs Serpens-

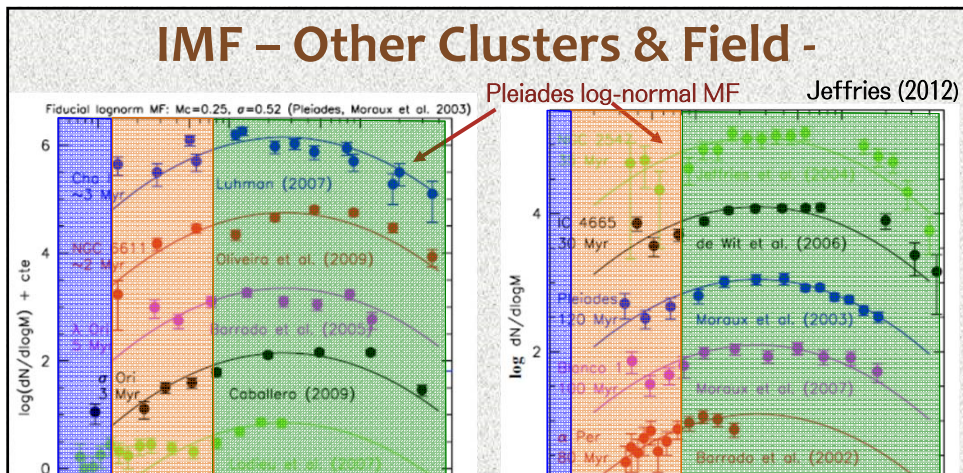
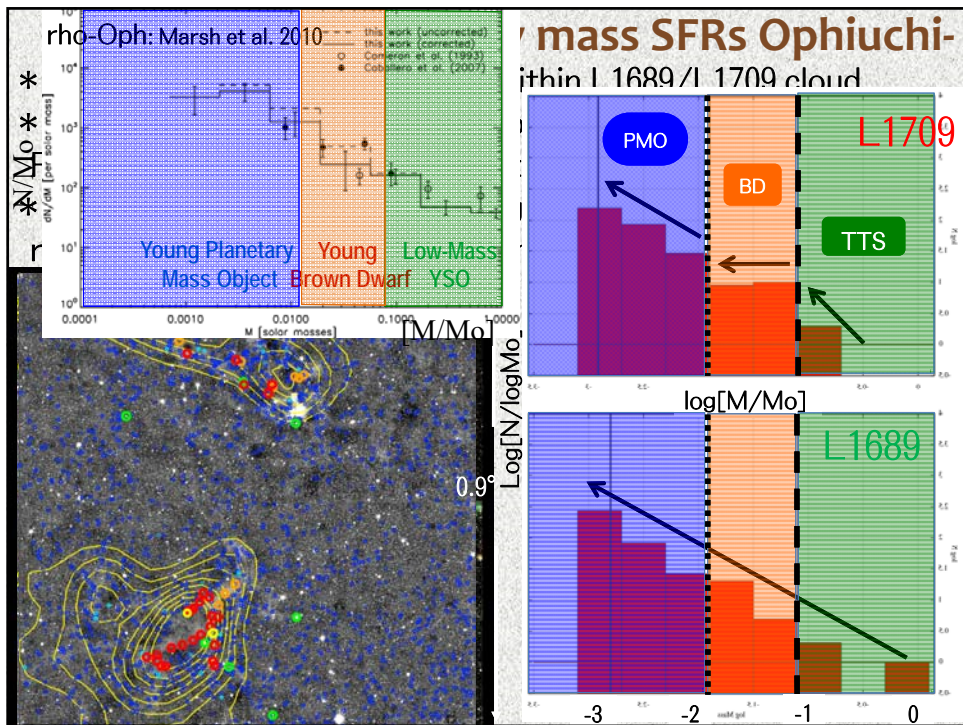


Most of Spitzer/SMM sources (=Class I/II in our NIR obs.) are

Total MF appears to rise steadily toward PMOs.

Spatial Distribution (left) and Total MF (right) of very low-mass YSOs (Blue:PMO, Red:BD, Green:TTS) Oasa et al. in prep.





All the results are limited within <1kpc.

Thus, there are still many open questions...

★ Depends on environments, such as cloud conditions, UV radiation and metallicity?

★ Taking into account of ambiguous binarity, ... ?

Proposal: Planetary-mass objects form everywhere?

The Obscured Star-Forming Complex W51



Very deep NIR imaging enough to detect young BDs and PMOs

To detect embedded PMOs @ NGC7538 (~2.7kpc; $A_V > 15$)

JHK phot.(J=25) with ULTIMATE

→ massive PMOs with $A_V = 15$ @1Myr

W51 (~7.5kpc; $A_V > 25$)

JHK phot.(J=27) with TMT

→ massive BDs with $A_V = 25$ @1Myr

For comparison...M31 (~780kpc)

J=30 photometry with TMT

→ 0.8 M_{\odot} with $A_V = 10$ @1Myr

Are PMOs common everywhere? How abundant?

Investigation of low-mass IMF with various environments

Recent works for low-mass young stellar populations with deep NIR observations for various SFRs provide possible evidence for IMF variations

Questions on ULTIMATE for SF studies

1. What do you think is the "KEY" science/observations for ULTIMATE?

If only using the wide-field imager, it is survey for both very low-mass and massive YSOs, binarity frequency and inspection of IMF.

2. Which instrument (WFC/MOS/IFU) do you think is 1st priority for ULTIMATE?

WFC is best. Survey at 1st step, then multi-spectroscopy at 2nd step is preferred. Wider is better! About 0.1"/pixel appears good.

3. Do you have good science cases to be done with GLAO+MOIRCS?

Yes, we have experienced studies using MOIRCS.

Wide NIR survey with good image quality thanks to GLAO will discover numerous, lower-mass PMOs and YBDs in farther SFRs.

4. Which survey design sounds best for you?

I agree that WFC is 1st step and MOS is 2nd step. Most PMOs are too faint to be followed-up spectroscopy with TMT, if possible.