BEAST

Do big stars make big planets?

Rubén Asensio-Torres
and the BEAST team

Subaru 20th Anniversary Hawaii Nov 2019

Max-Planck-Institut für Astronomie Heidelberg
Max Planck Institute for Astronomy Heidelberg

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European Research Council
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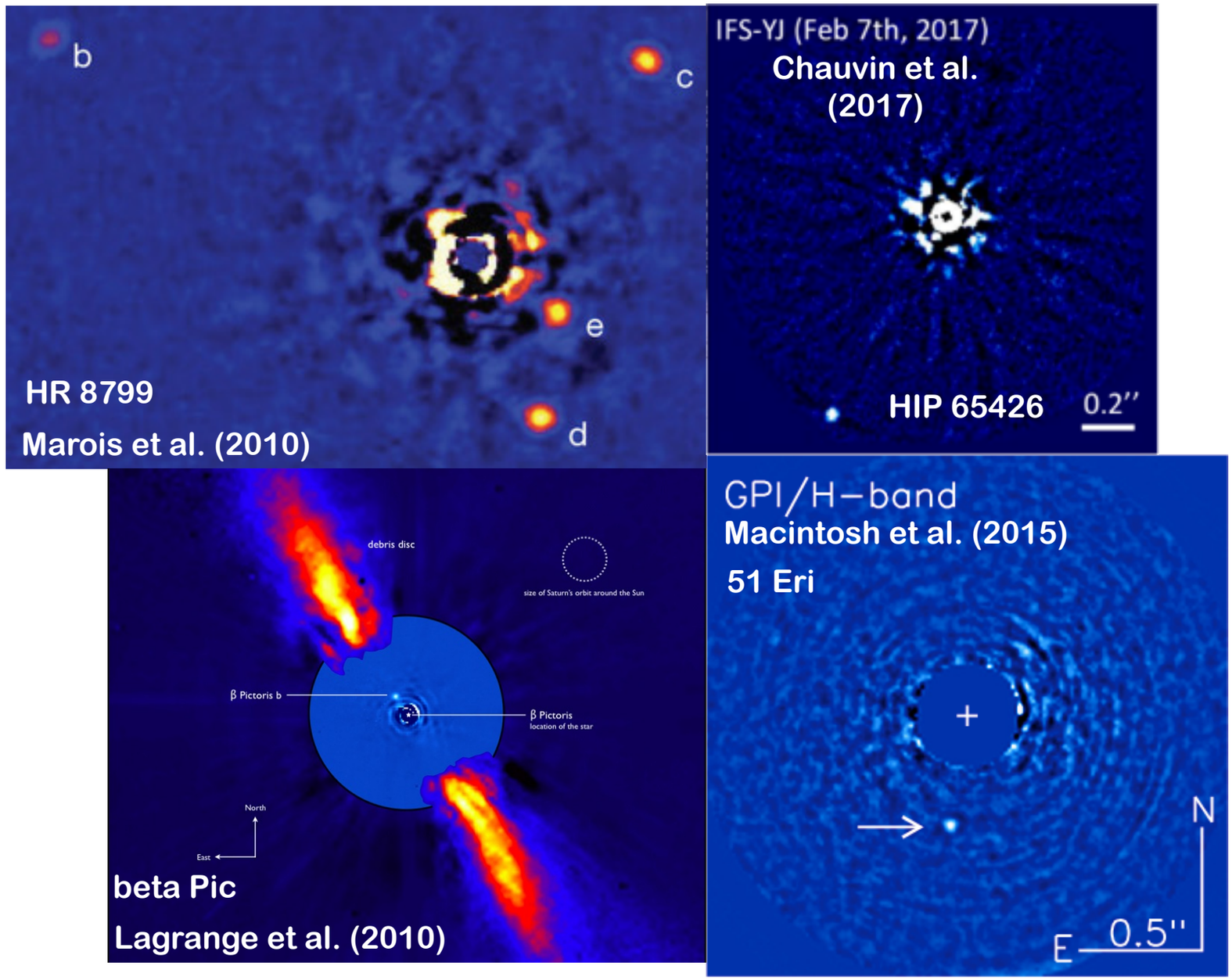
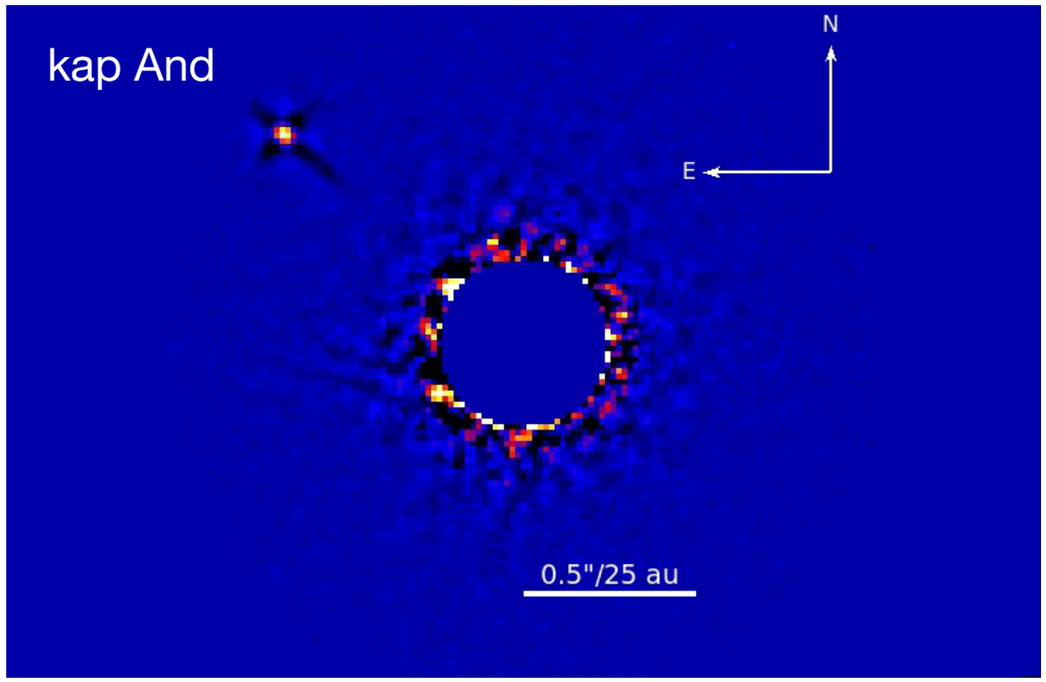
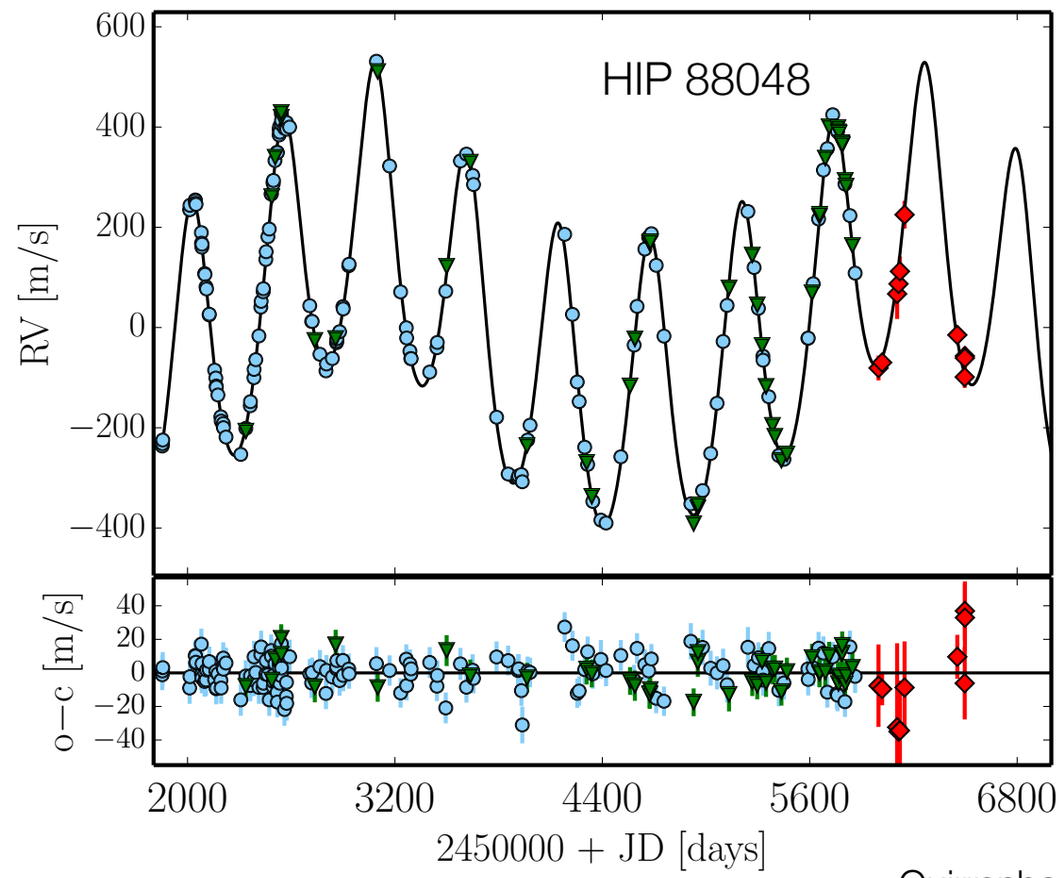
Some directly imaged planets



Super-jovian companions to massive stars



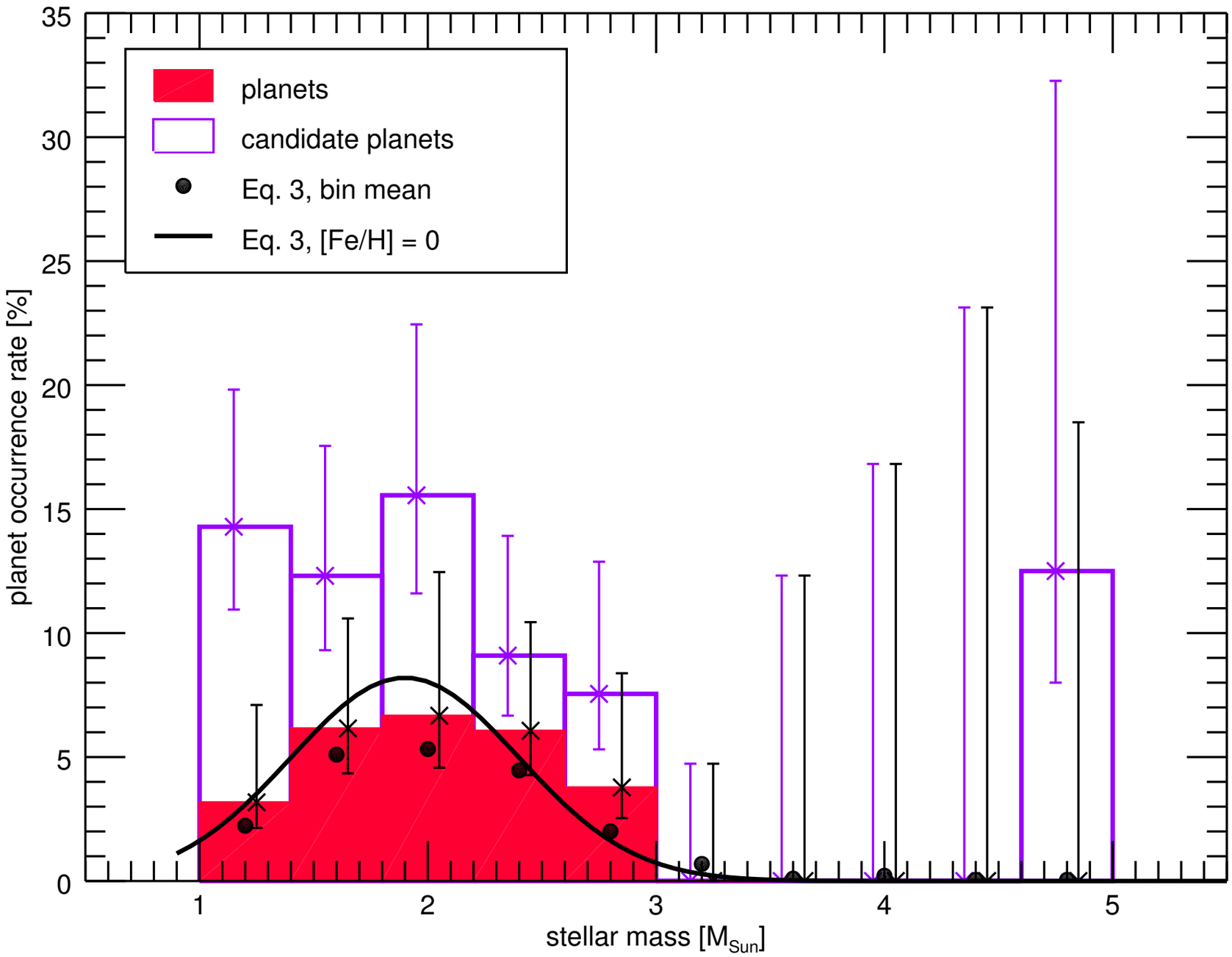
Currie+2018



Quirrenbach+2019

- 15—25 Mjup companions to 2.5—3 Msun stars
- Masses above the deuterium burning limit
- Mass ratios below 1%

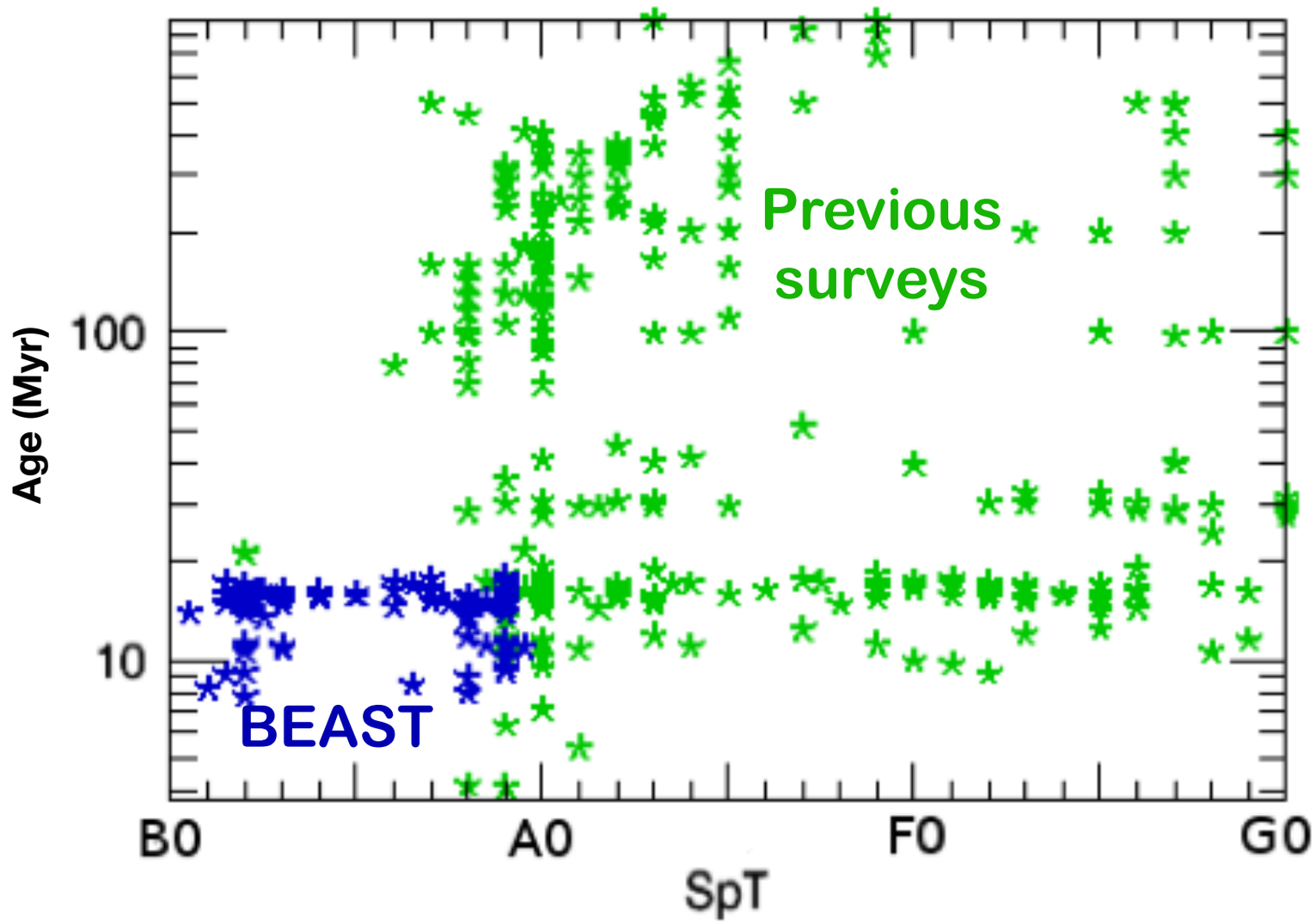
An upper limit of planet formation



Reffert+2015

BEAST: The B-star Exoplanet Abundance STudy

- Direct imaging survey with SPHERE in IRDIFS-EXT mode
- 83 B-type stars in Sco-Cen
- 10—20 Myr, 120—150 pc
- Homegenous sample in age, metallicity
- Complementary to previous surveys

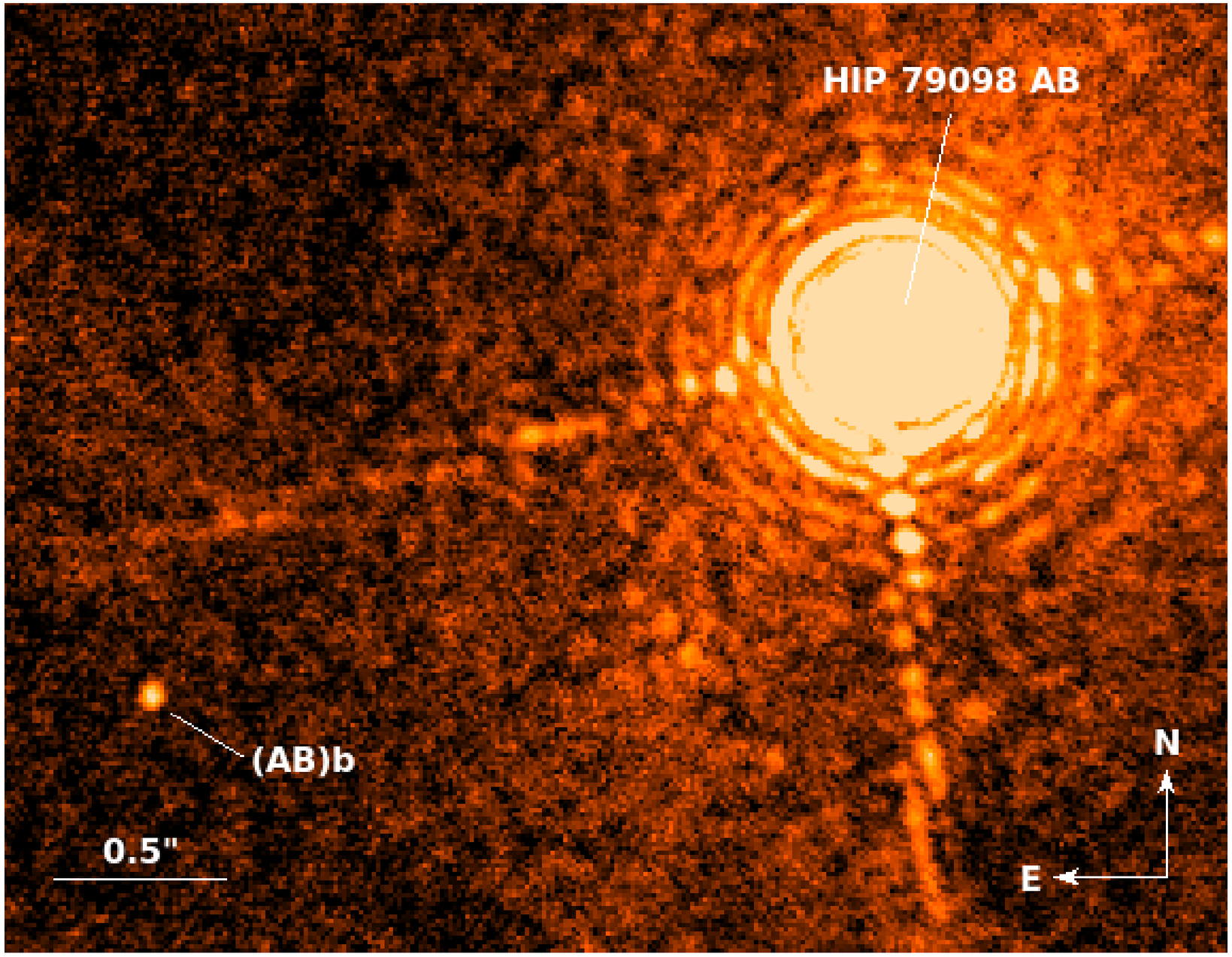


BEAST: Current operational status

- Originally scheduled for P101-P104, now extended to P105 due to P101 carry-overs into P103
- 66 targets observed in 1st epoch, 17 still to be done
- 4 targets observed in 2nd epoch, about 80% of all targets are expected to require follow-up
- ~40 people in BEAST (PI: M.Janson, Stockholm University), ~15 people in the DRT cycle
- Monthly cycles with data reduction: CC identification & characterization, CC classification, and validation

BEAST prelude discovery

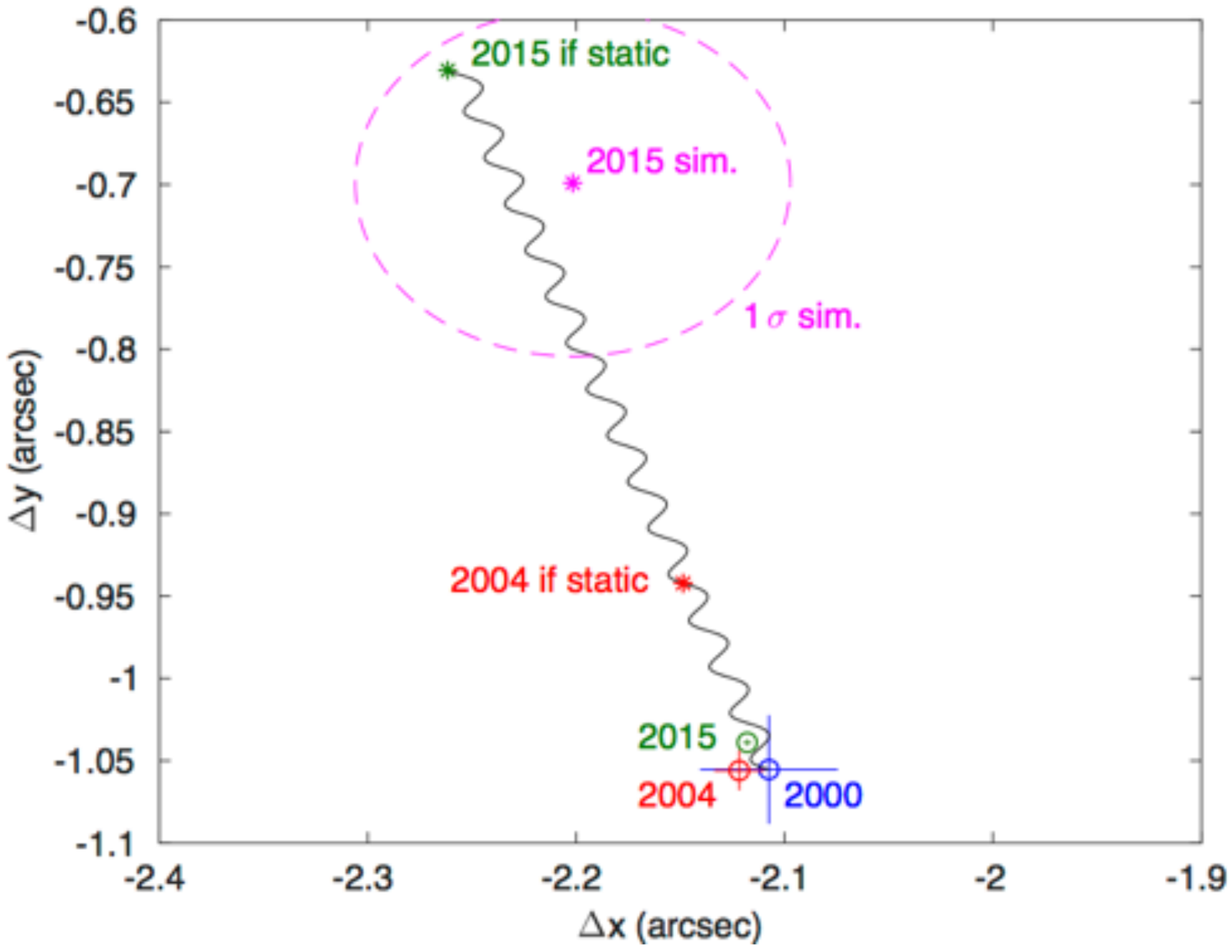
- The HIP 79098 (AB)b companion as seen by SPHERE



Janson, Asensio-Torres+2019
Asensio-Torres, Janson+ in prep.

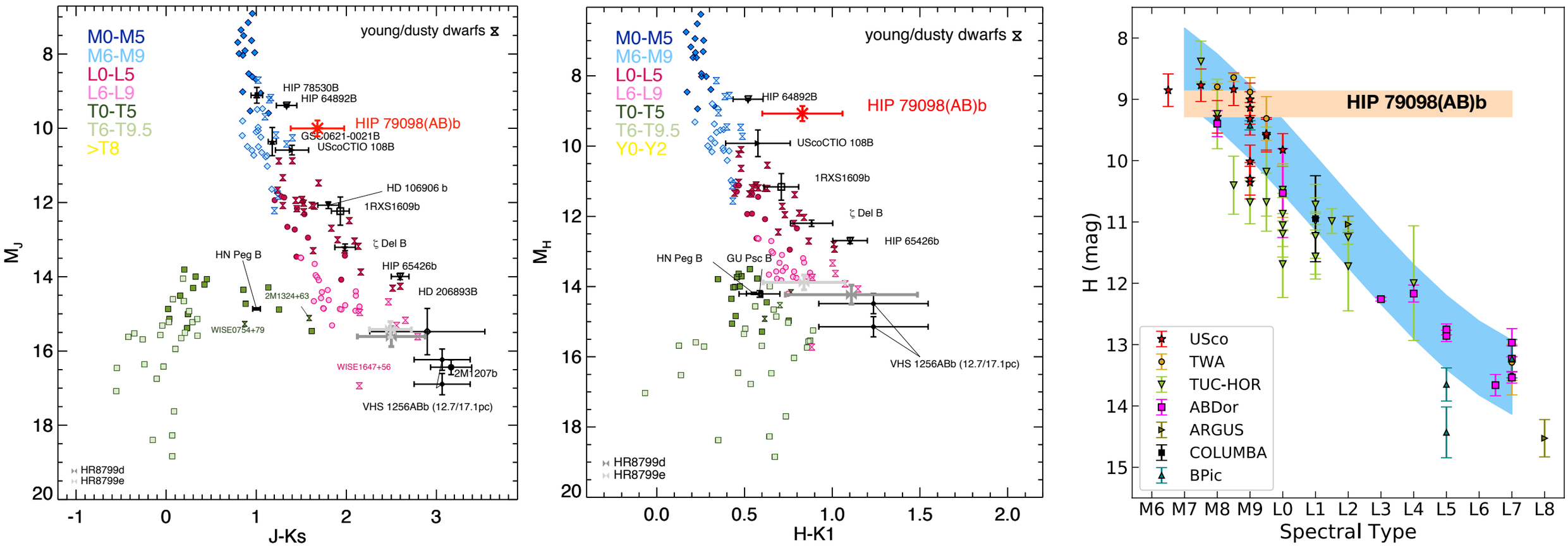
HIP 79098 (AB)b

- Circumbinary substellar companion around a B-type stellar pair (triple?)



Janson, Asensio-Torres+2019
Asensio-Torres, Janson+ in prep.

HIP 79098 (AB)b

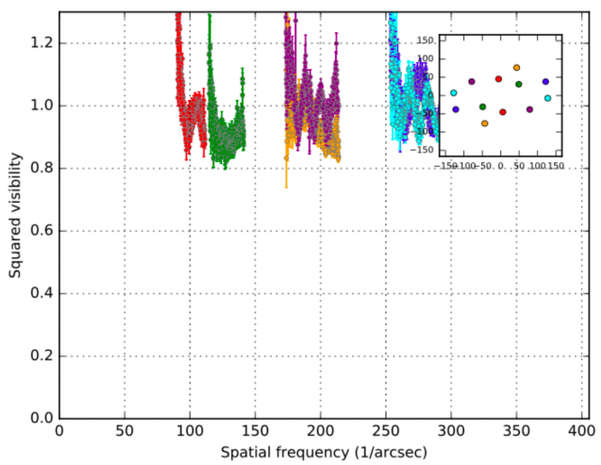


- Very red color, characteristic of young low-gravity objects
- Mass between 16—23 Mjup

Janson, Asensio-Torres+2019
Asensio-Torres, Janson+ in prep.

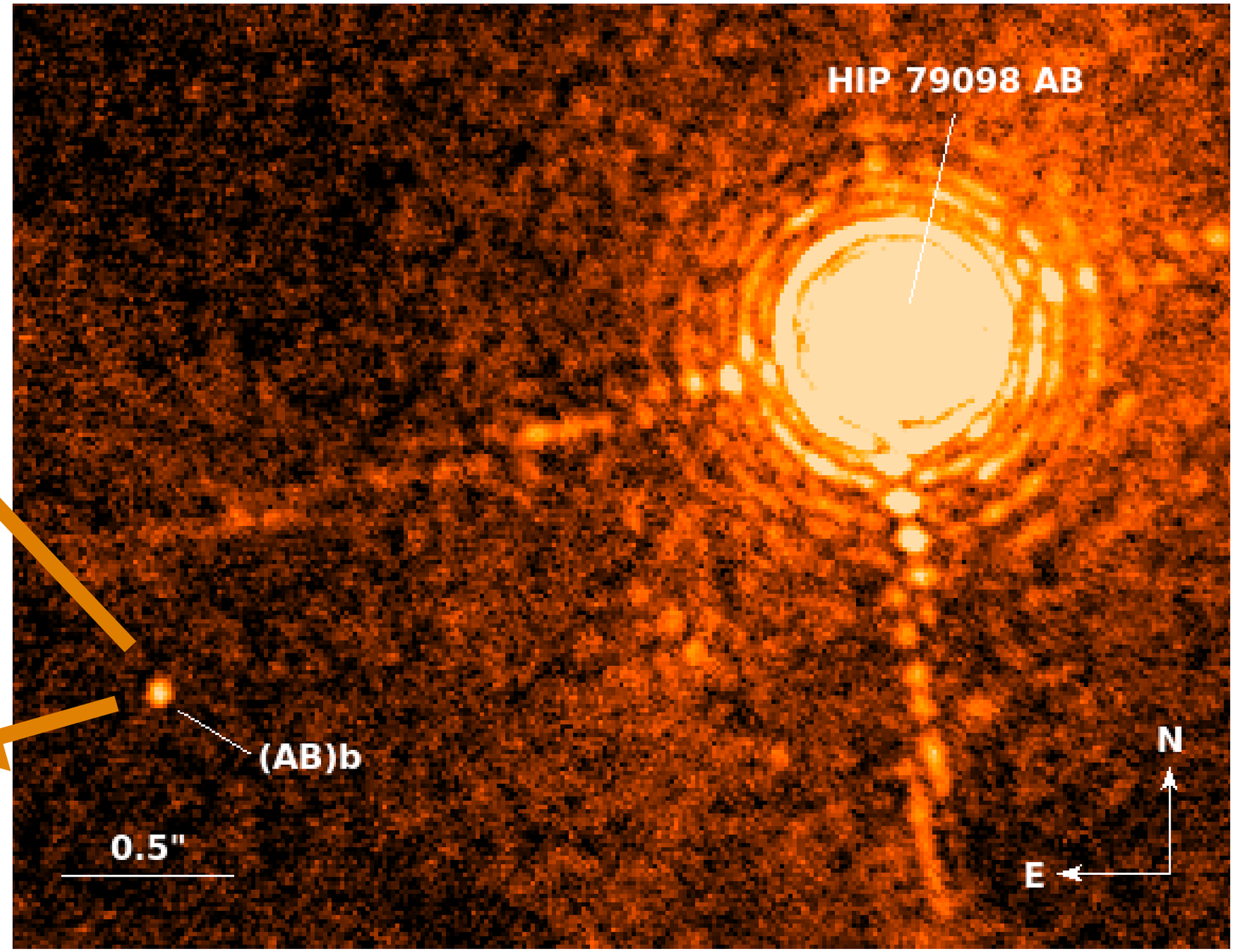
BEAST prelude discovery

- The HIP 79098 (AB)b companion as seen by SPHERE: ongoing work



Karl+2018

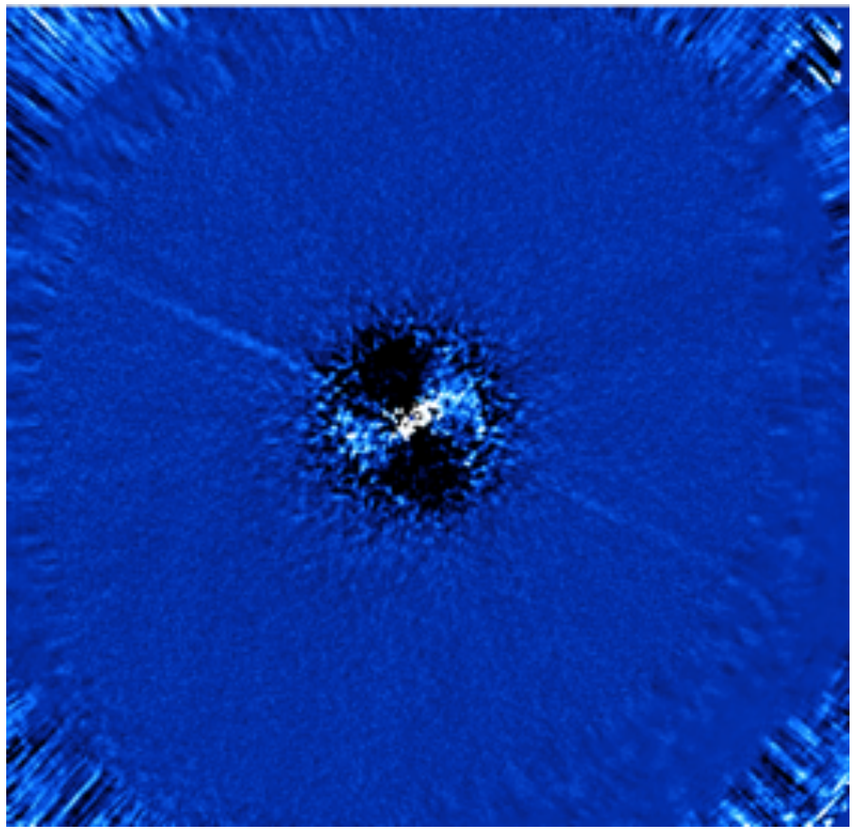
Asensio-Torres+ in prep.

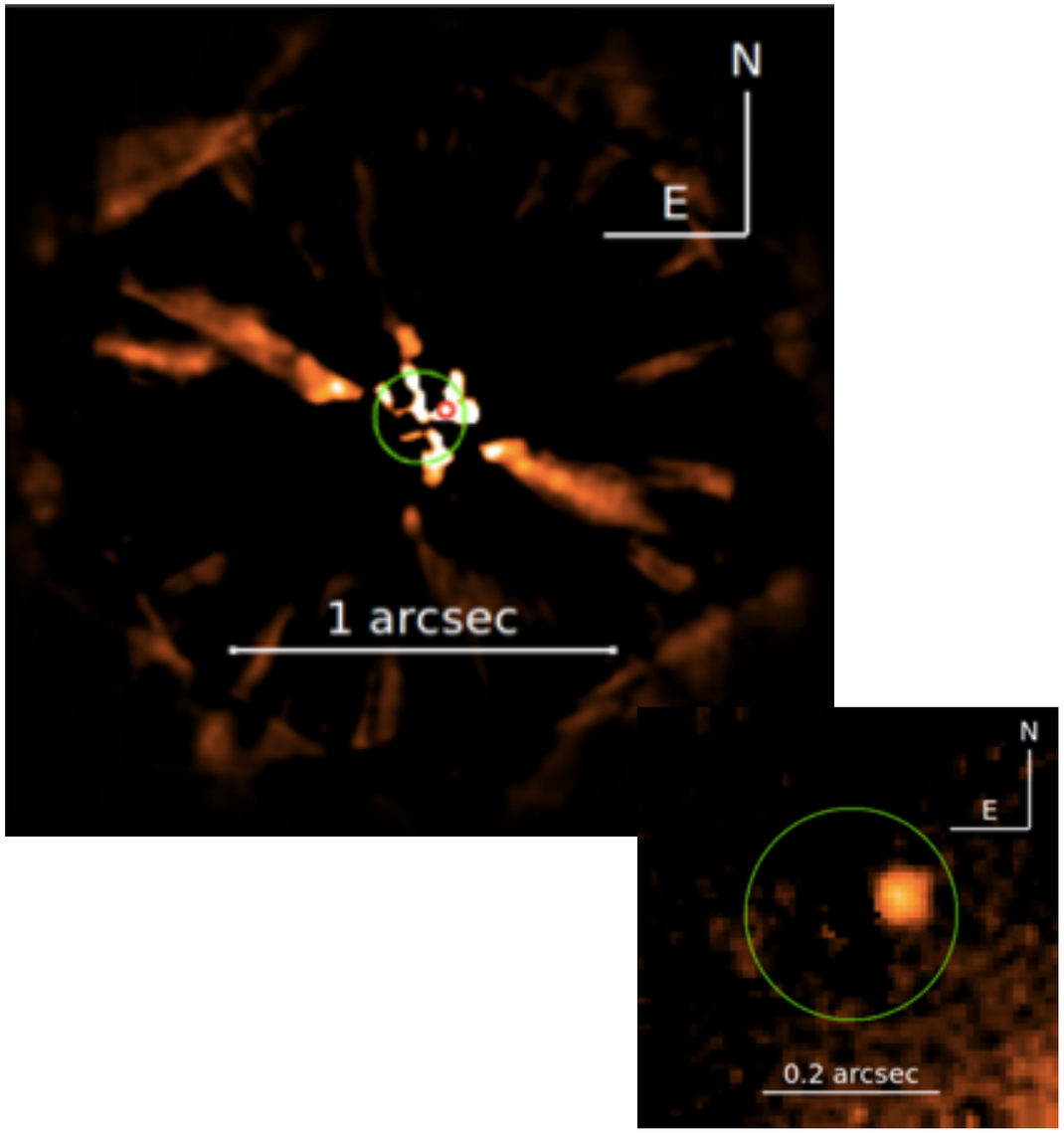


Janson, Asensio-Torres+2019
Asensio-Torres, Janson+ in prep.

BEAST: Preliminary results

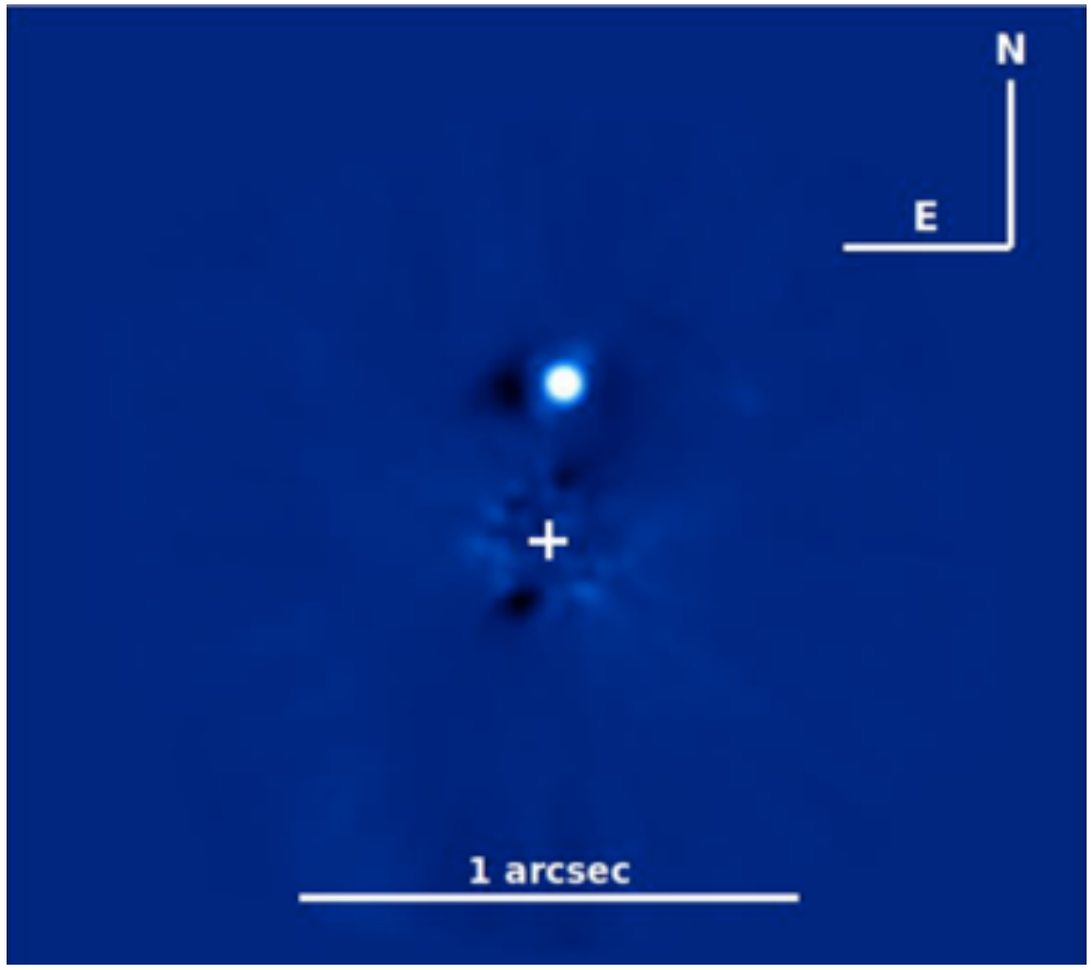
- A debris disk candidate extending out to 400—500 AU around a triple stellar system

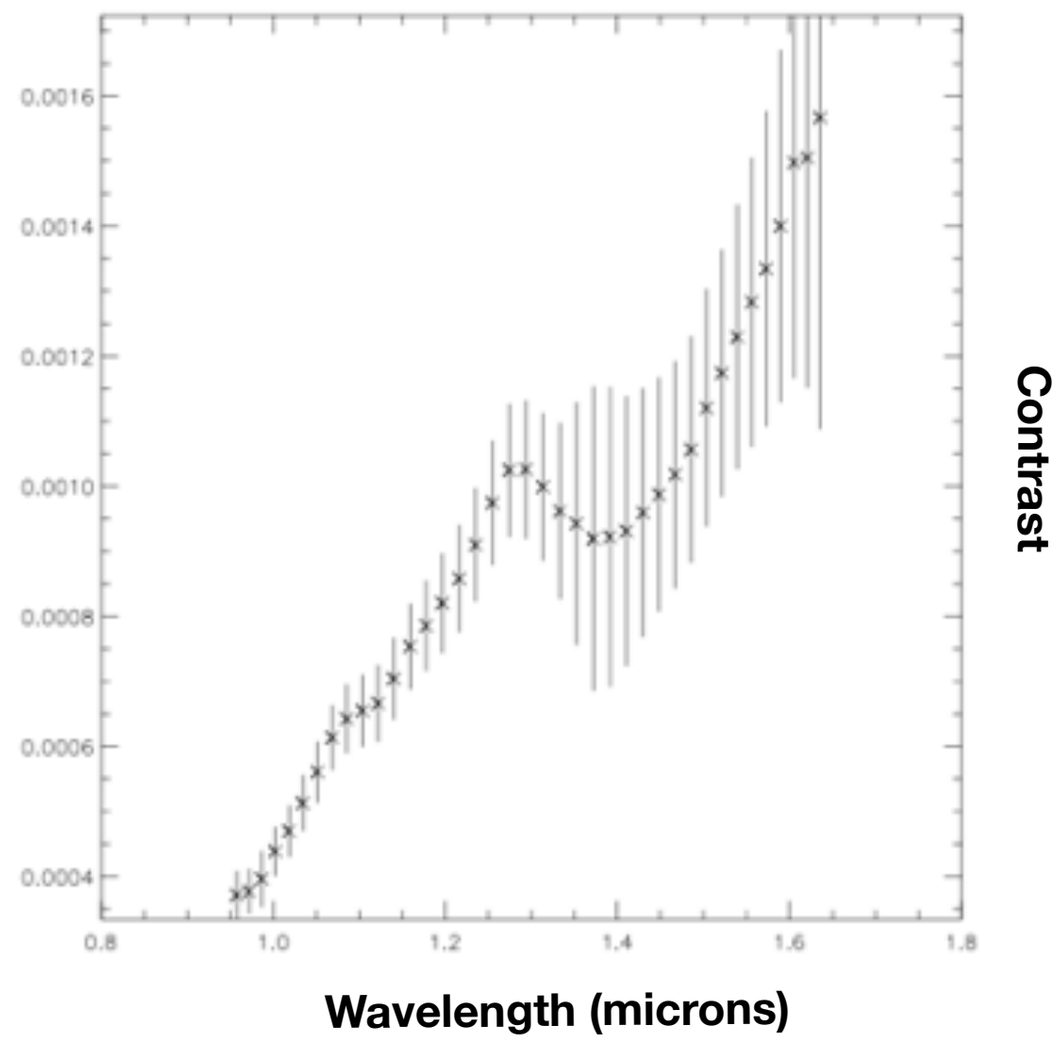




BEAST: Preliminary results

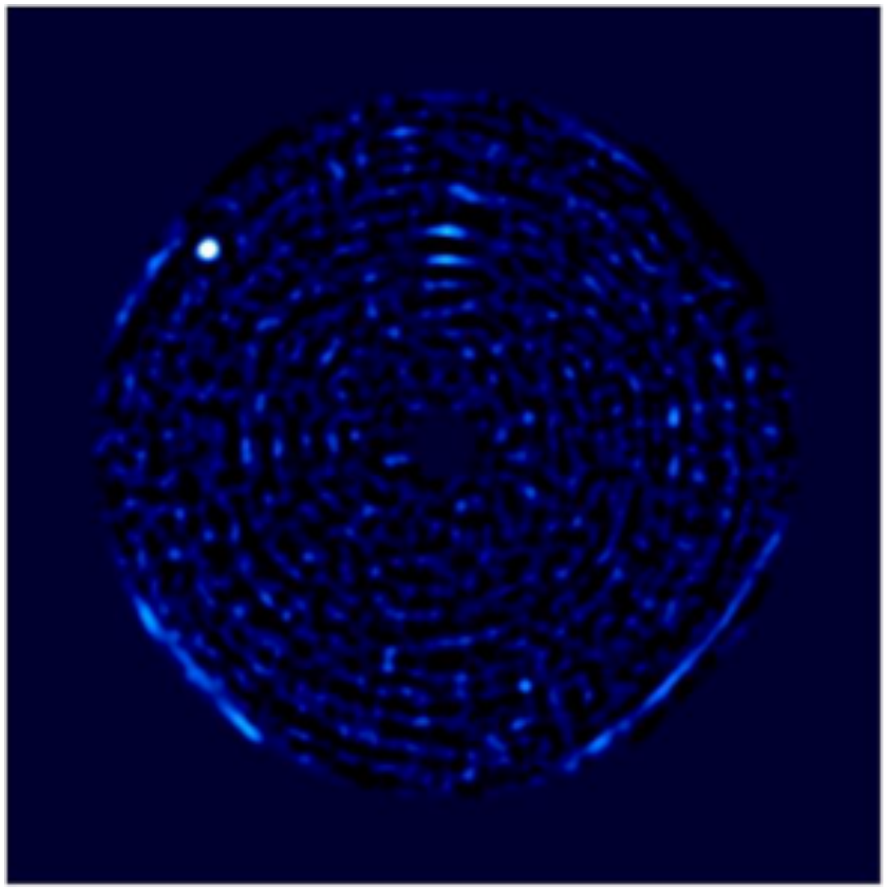
- New brown dwarf
- ~60 Mjup object at 48 AU: proximity, brightness and spectrum all imply a physical companion

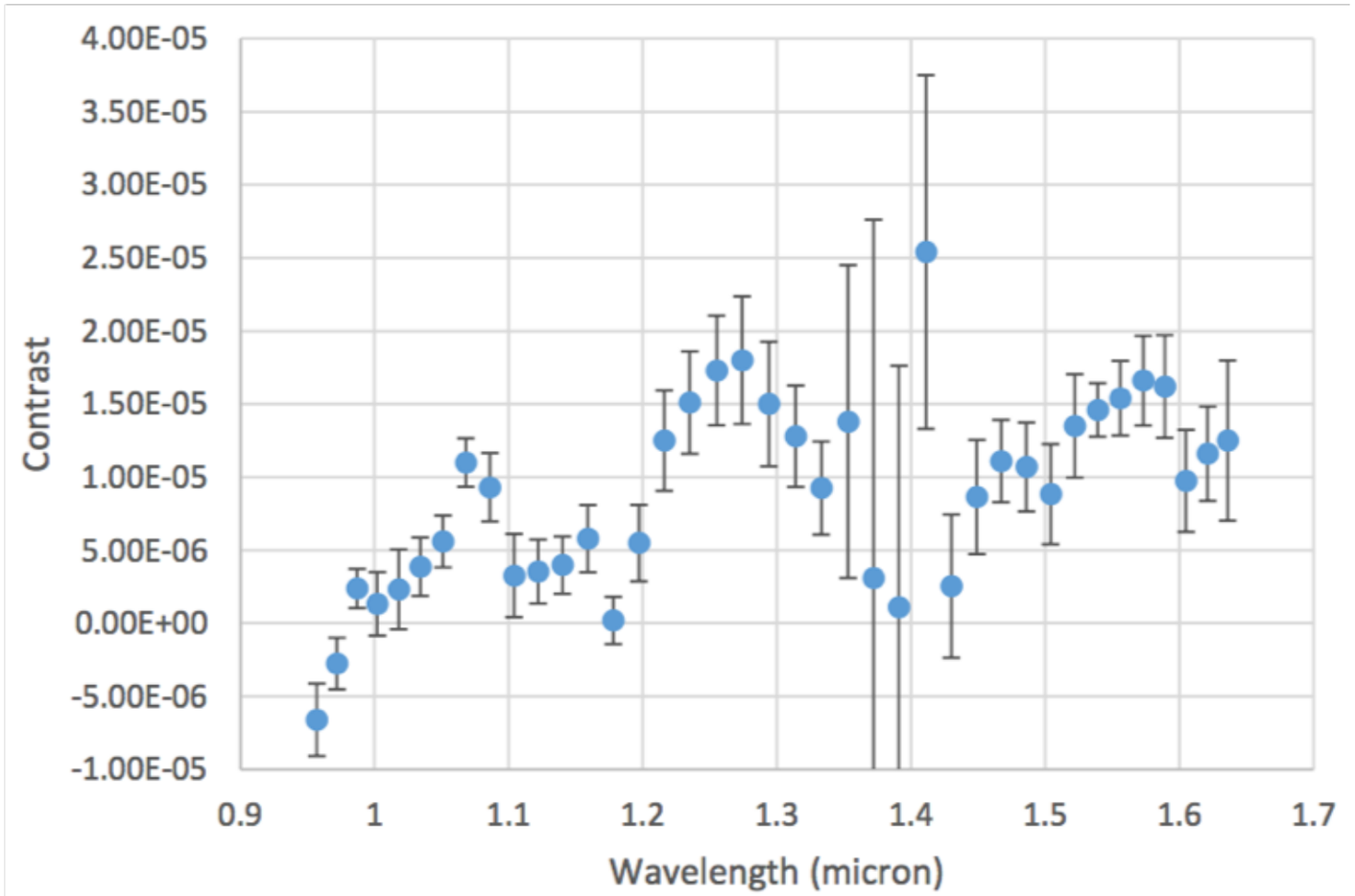




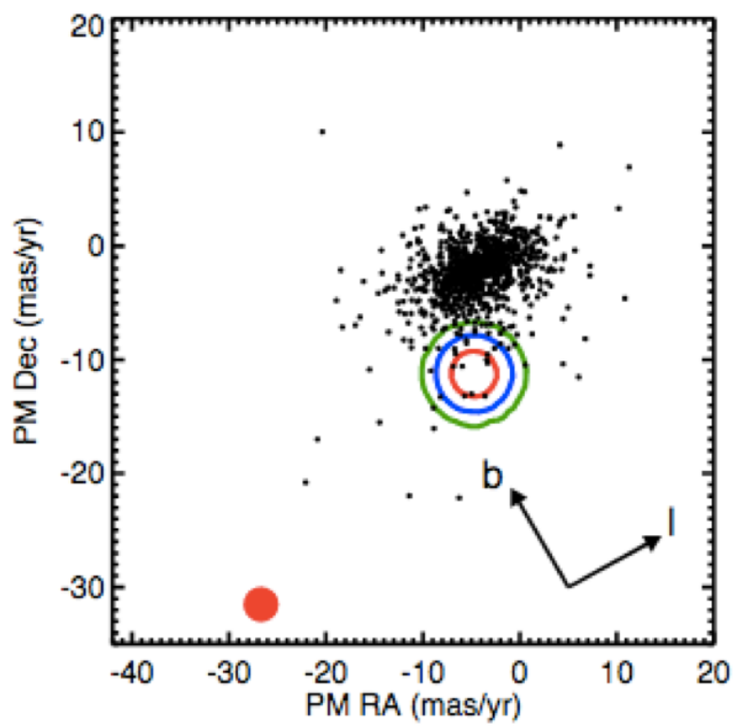
BEAST: Planetary-mass candidates

Several CCs (also in the IFS FOV), some of which show signs of molecular absorption / interesting colors

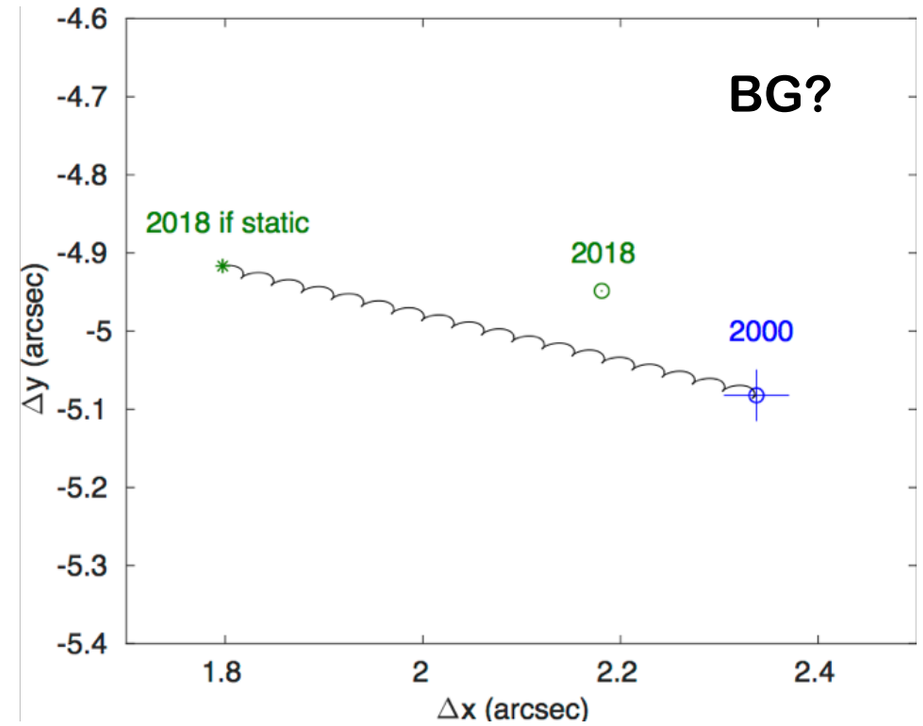


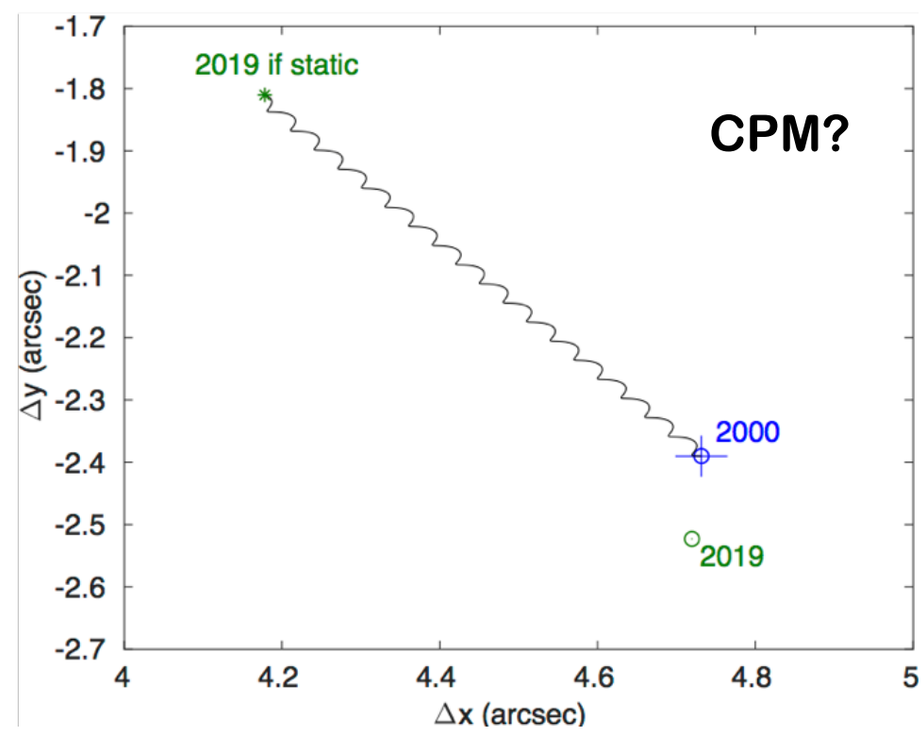


Background motion vs CPM in Sco-Cen



Nielsen+ 2017





Conclusions

The B-star Exoplanet Abundance Study (BEAST) is evaluating planet formation on wide orbits around massive stars with SPHERE

- 83 B-type stars in Sco-Cen
- First result: a ~20 Mjup companion with mass ratio <1% (Janson+2019, Asensio-Torres+in prep.)
- A debris disk extending out to 400 AU
- Several interesting candidates in the IFS FoV
- Second epochs and a statistical analysis will complete the survey