プレアデス星団における惑星候補の視線速度観測

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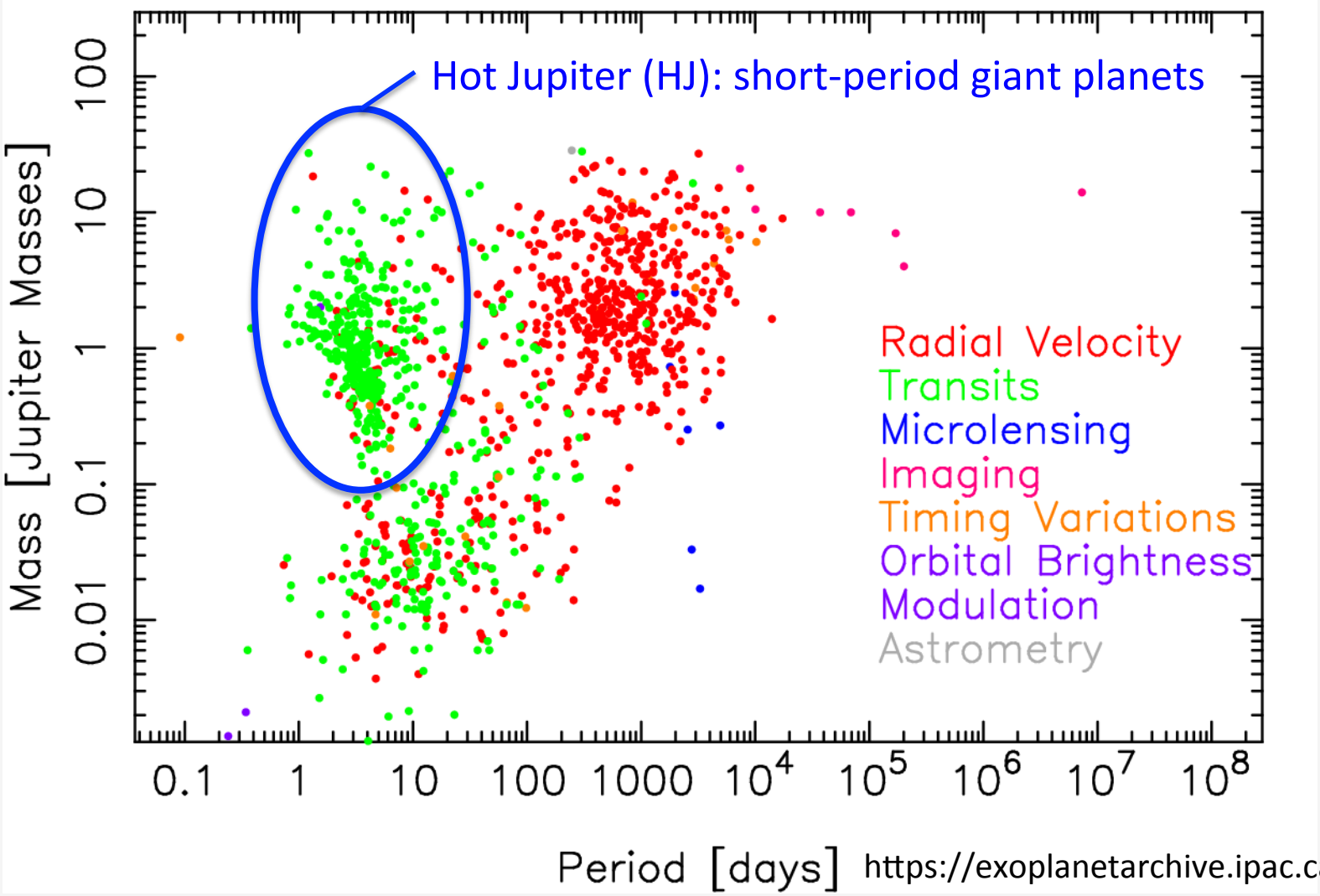
Takuya Takarada (Tokyo tech)
Masashi Omiya (NAOJ)
Yasunori Hori (NAOJ)
Bunei Sato (Tokyo tech)
Michiko Fujii (Univ. of Tokyo)

Planets detected so far

- What is HJs formation scenario?



https://exoplanetarchive.ipac.caltech.edu

HJs formation scenario

1. Type II migration (e.g. Trilling 1998, 2002)

- Planets migrate inward with the gap in the protoplanetary disk.
- Timescale < 10 Myr (=within disk lifetime)

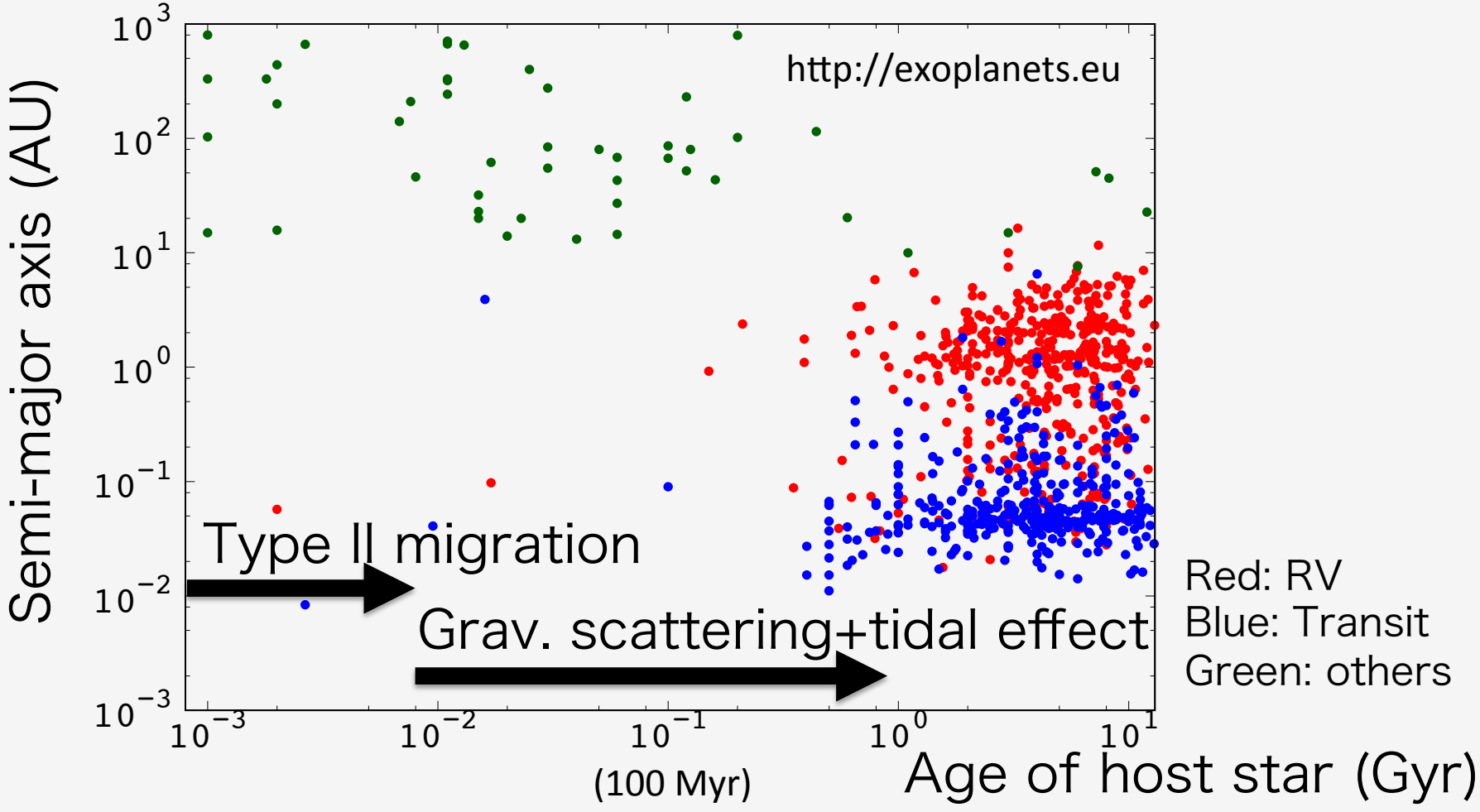
2. Gravitational scattering + tidal migration (e.g. Rasio & Fords 1996)

- Planets are scattered by the gravitational interaction and evolved into short-period circular orbit by tidal interaction with the central star.
- Timescale ~hundreds Myr

Age of planet host star

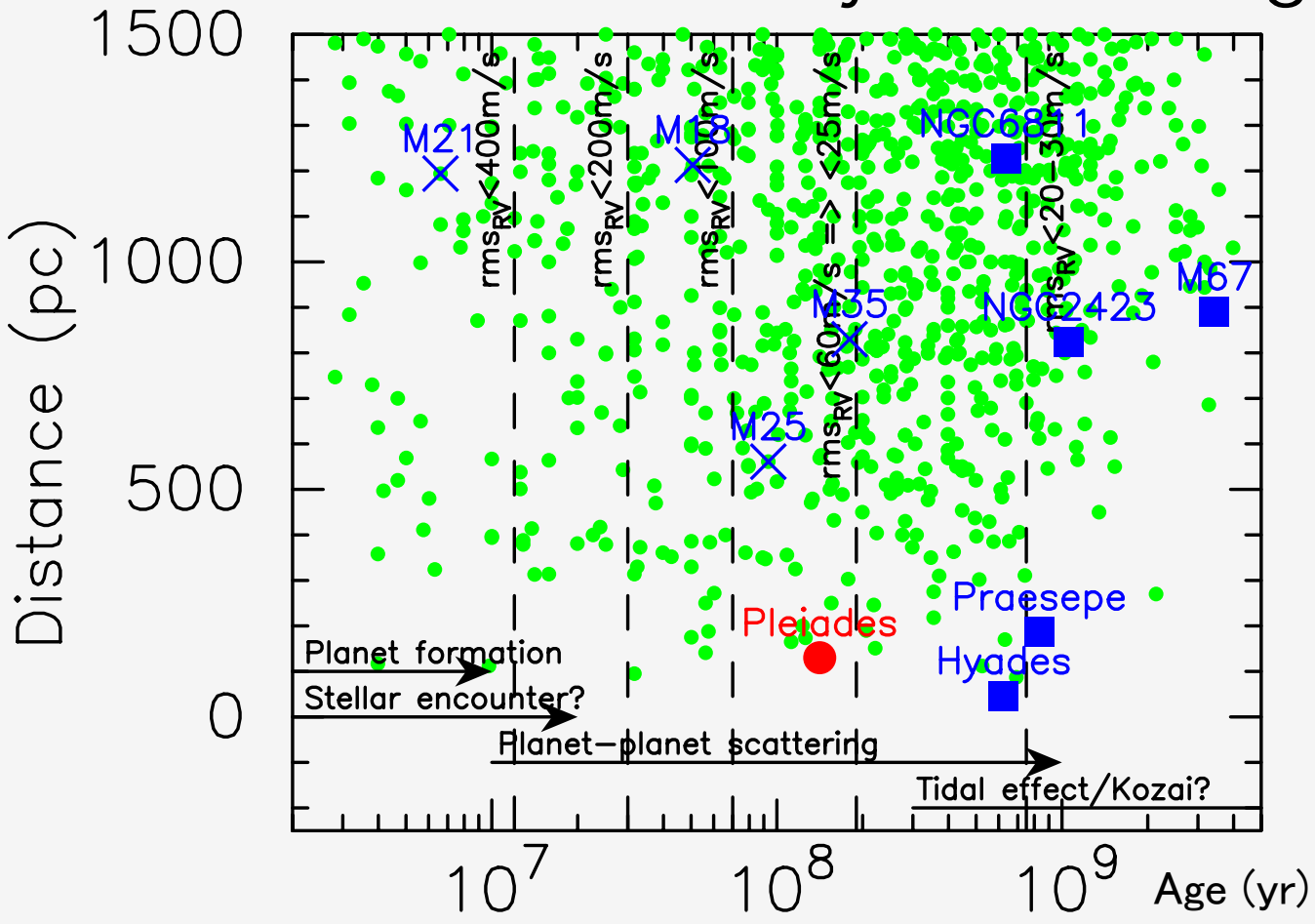
- Mostly older than 1 Gyr

➢ Hard to distinguish two scenarios.



HJs survey in the Pleiades

- Age: Distinguishable b/w the two formation scenario.
- Distance: Close to solar system -> bright.



Objectives

- The formation scenario of HJs has still remained to be cleared.
- To clear it, we start HJs survey (50 sample) in the Pleiades and determine frequency of HJs. (2017B)
- 2017A: Follow-up observation

- If Type II migration is major scenario.
  - ➢ HJs have been already exist at the age of Pleiades.
  - ➢ Frequency of HJs in the Pleiades should be same as that of field stars (<2%)

- If Grav. Scattering + Tidal migration is major.
  - ➢ HJs are not exist in the Pleiades.
  - ➢ Multiple giant planets should be detected.

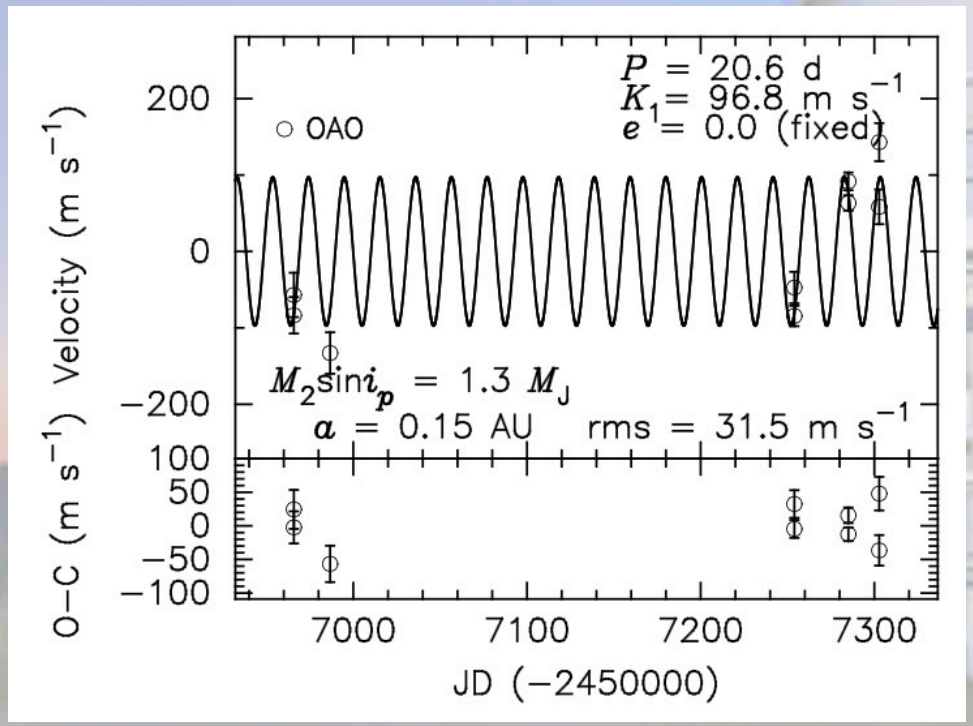
Observation @APF

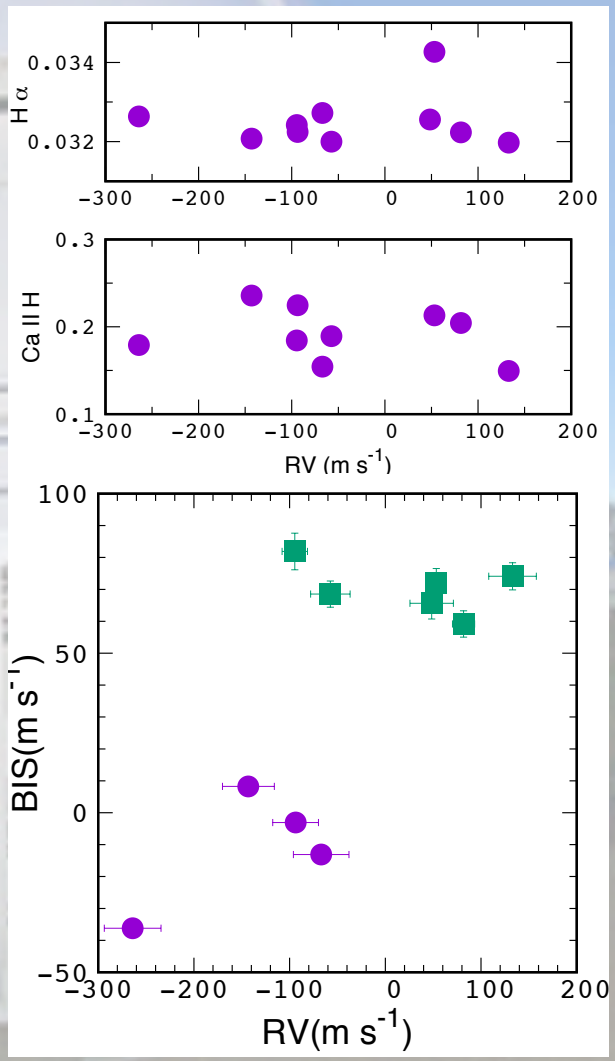
- About 20 stars in Pleiades (from 2014.Sep to 2015.Oct)
- APF(Auto Planet Finder)2.4m tel. @Lick obs.

✓ Wavelength coverage: 370 nm - 970 nm

✓ Resolution: R~70,000

✓ Wavelength reference: I2 Cell





Observation @OAO

- We observe the star in 2017 Jan and Feb (1.5 nights)

✓ V_{mag}: ~9.7

✓ N_{data}: 12 (10 @APF)

✓ Typical S/N ~70 & σ_{RV} ~40m/s with 30 min exposure

- Instrument

✓ HIDES-F, 1.88m tel. with I2Cell

✓ Wavelength coverage: 370 nm - 750 nm

✓ Resolution: R~55,000

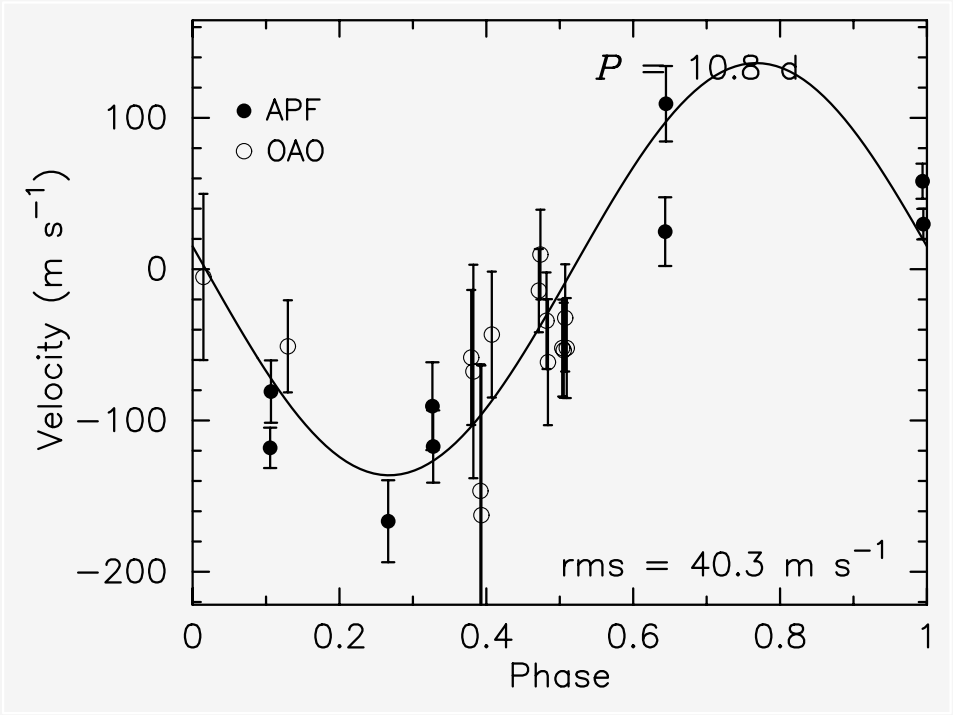
- Analysis

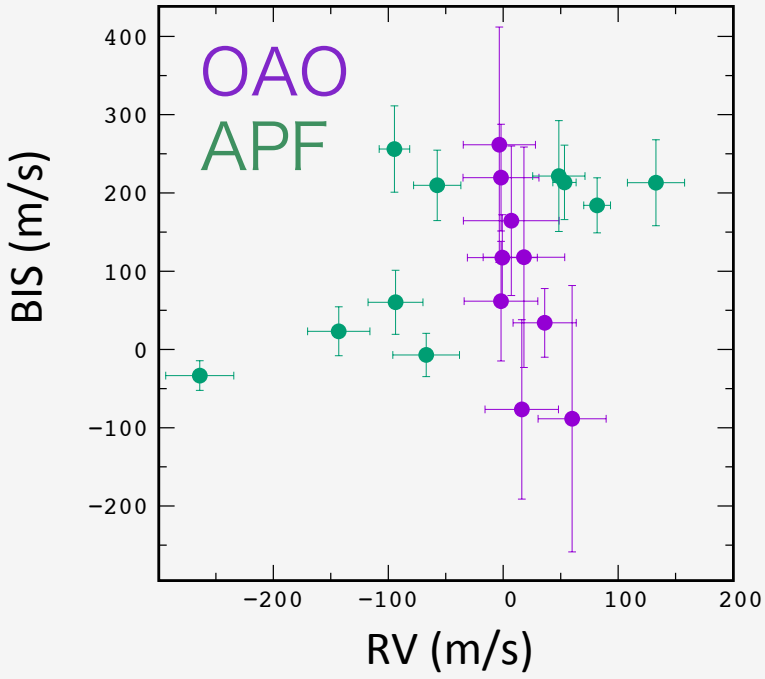
✓ RV measurement

✓ Line profile analysis for Cross-correlation function

Result

- We detect RV signal with 10 days periodicity.
- ➢ No correlation b/w RV and BIS.
- Membership prob. may be low?
- ➢ Need for spectral analysis and additional data.





Summary

- To reveal the formation mechanism of HJs, we start HJs survey in the Pleiades.
- In 2017A, we perform follow-up observation.

➢ RV variation should be caused by orbital motion.

➢ We have to check membership probability.

- In this semester, we will observe 50 Pleiades member stars (17 nights).
- Problems to be solved
  - High rotational velocity
  - Estimate stellar surface activity
  - Correct stellar RV jitter