

An old star very close to the Galactic supermassive BH

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Special Thanks to: T. Do, R. Bentley (UCLA)

Summary

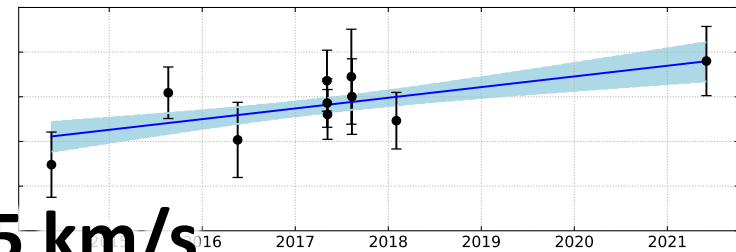


S0-6/S10 ... one of the closest late-type S-stars to the Galactic SMBH Sgr A*

- NIR Spectroscopic monitoring observations (IRCS/AO188)

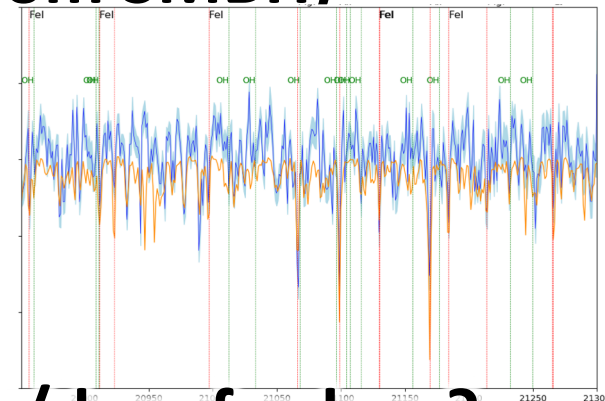
Radial velocity (RV) measurements

- Mean total uncertainty $\delta RV \approx 1.5$ km/s
- Acceleration: 0.48 ± 0.20 km/s/yr
- Located at the very center (< 0.2 pc from SMBH)



Model fitting of combined spectra

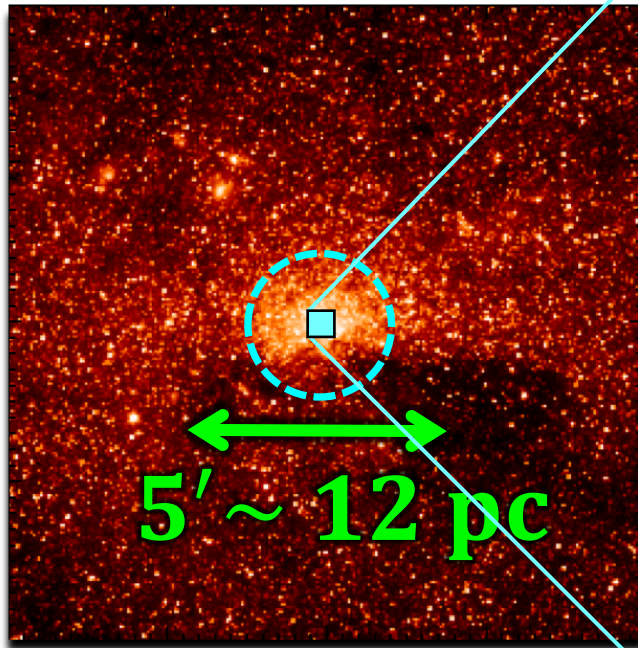
- $T_{\text{eff}} \approx 3750$ K, $[M/H] \approx -0.66$
- Sub-solar population?
- A member of infalling globular cluster/dwarf galaxy?



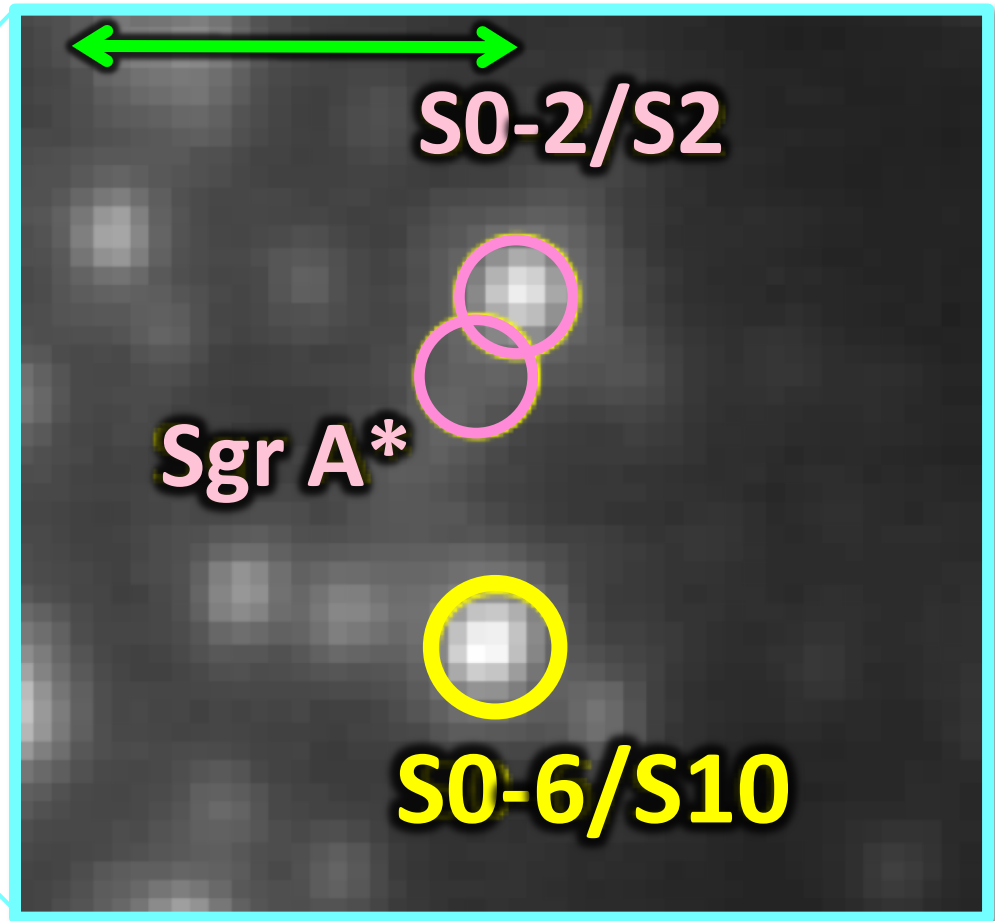
S0-6/S10

$0.5'' \sim 0.02 \text{ pc} = 2000 \text{ AU}$

Nuclear star
cluster (NSC)



(4.5 μm , Schodel+ 14)

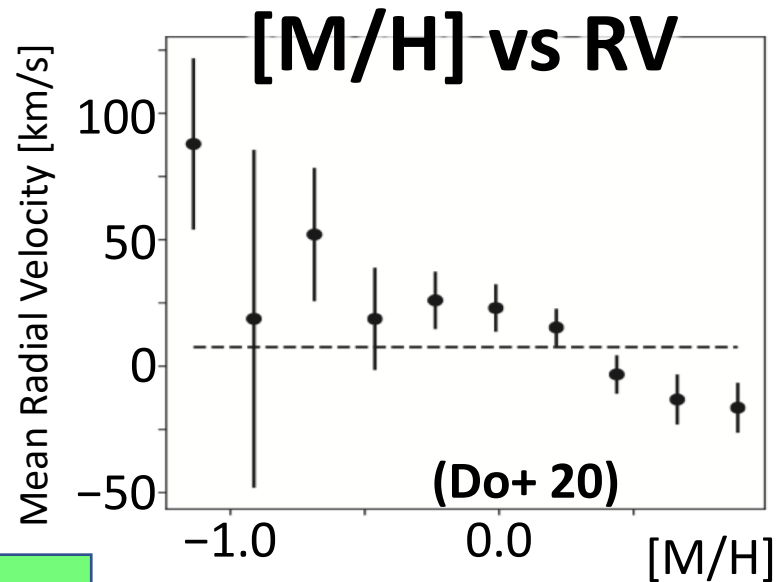
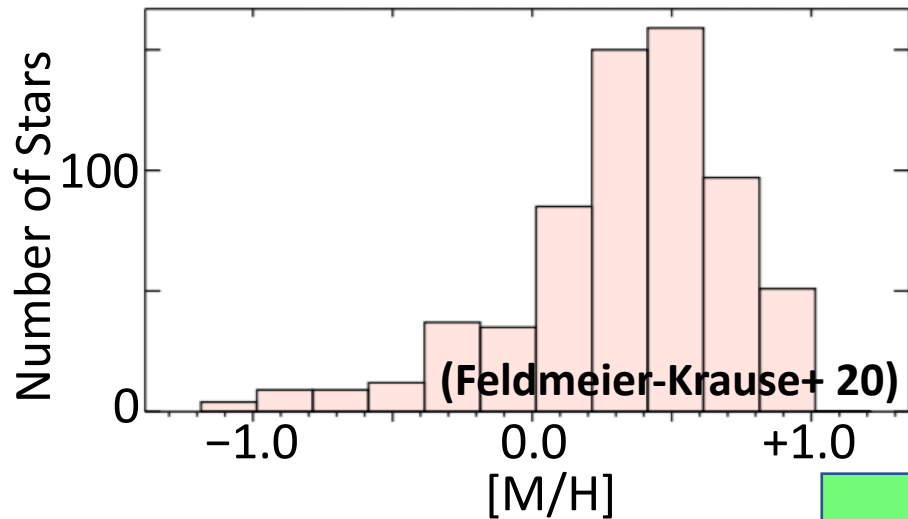


S0-6: one of the closest *late*-type S-stars

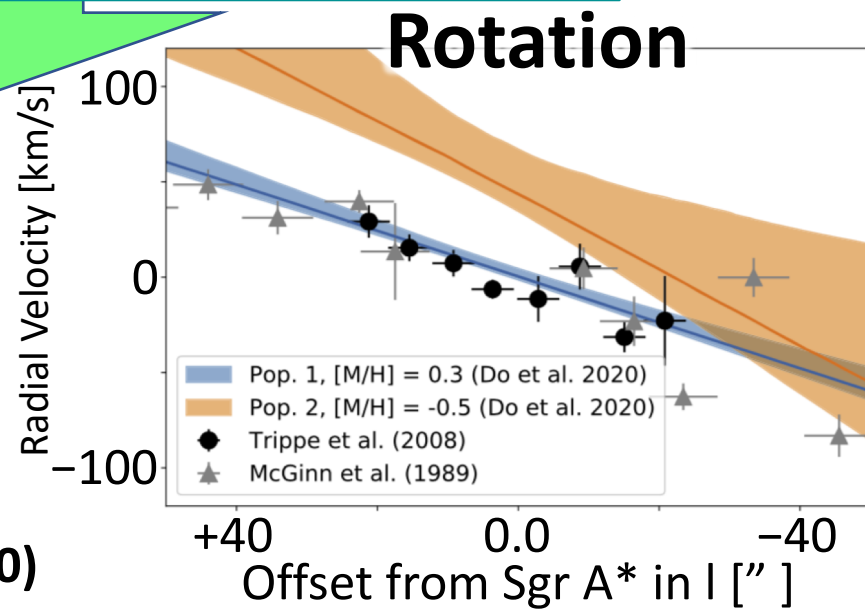
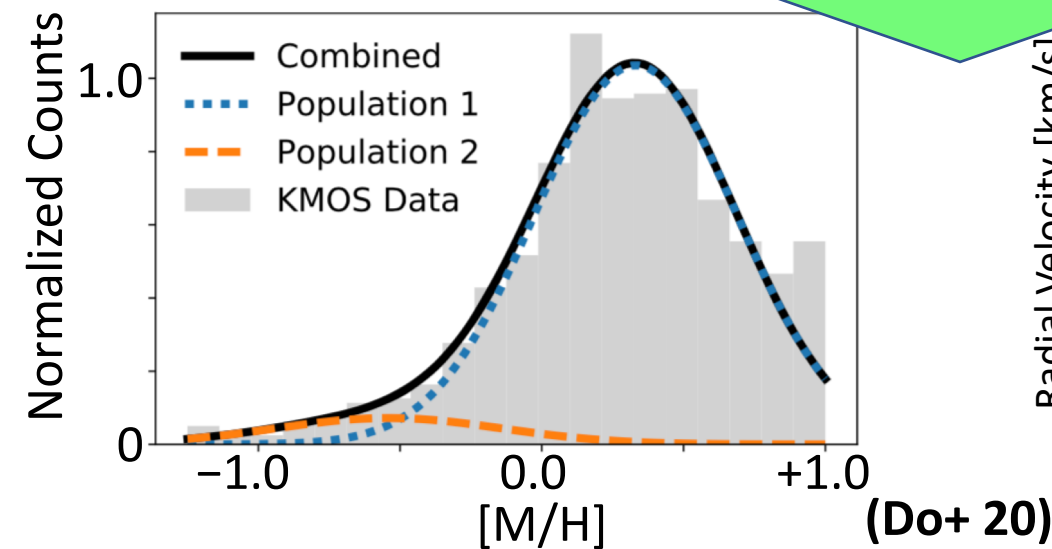
Nuclear Star Cluster

4/14

Metal distribution



chemo-dynamical modeling (Do+ 20)



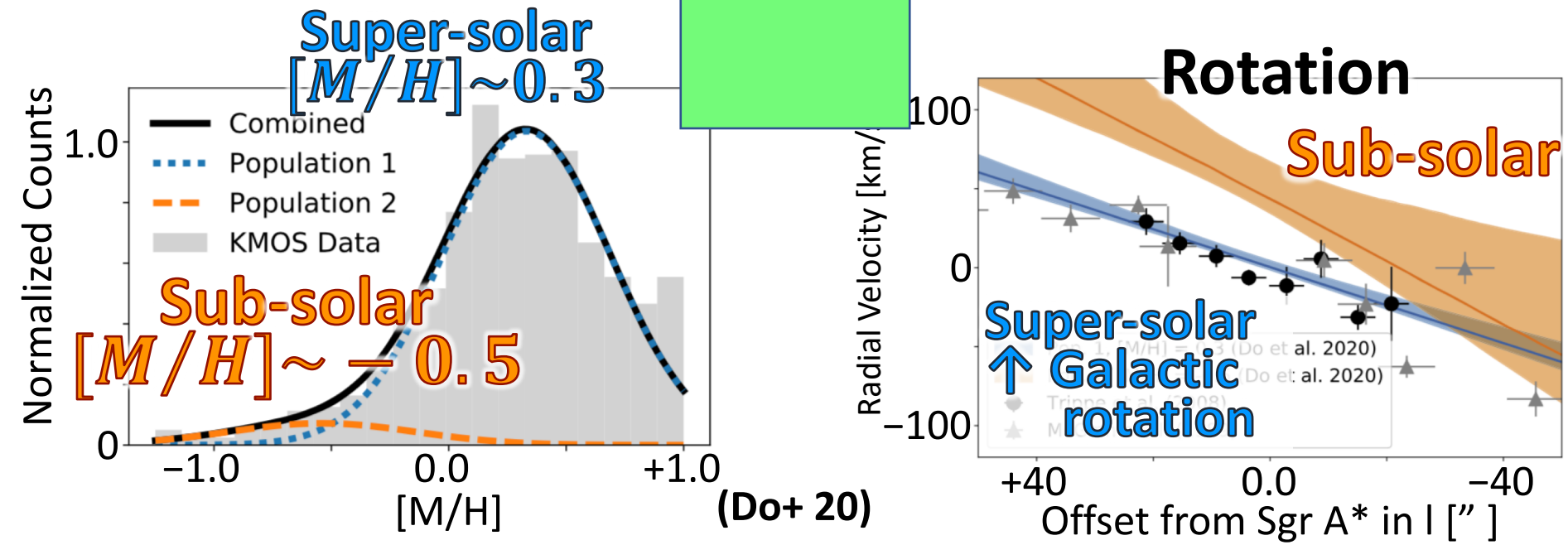
Nuclear Star Cluster

Super-solar ($[M/H] \sim 0.3$) metallicity stars

- Rotating in the same direction with MW disk stars
- Formed in situ by infalling metal-enriched gas?

Sub-solar ($[M/H] \sim -0.5$) metallicity stars

- Distinct from super-solar population
- infalling globular cluster or dwarf galaxy core?



S0-6 Observations with Subaru^{6/14}

Year	Mon	Day	AO
2014	5	18	LGS
2015	8	20	NGS
2016	5	17	LGS
2017	5	4	LGS
	5	5	LGS
	5	6	LGS
	8	8	NGS
	8	10	LGS
2018	3	28	NGS
2021	6	02	NGS

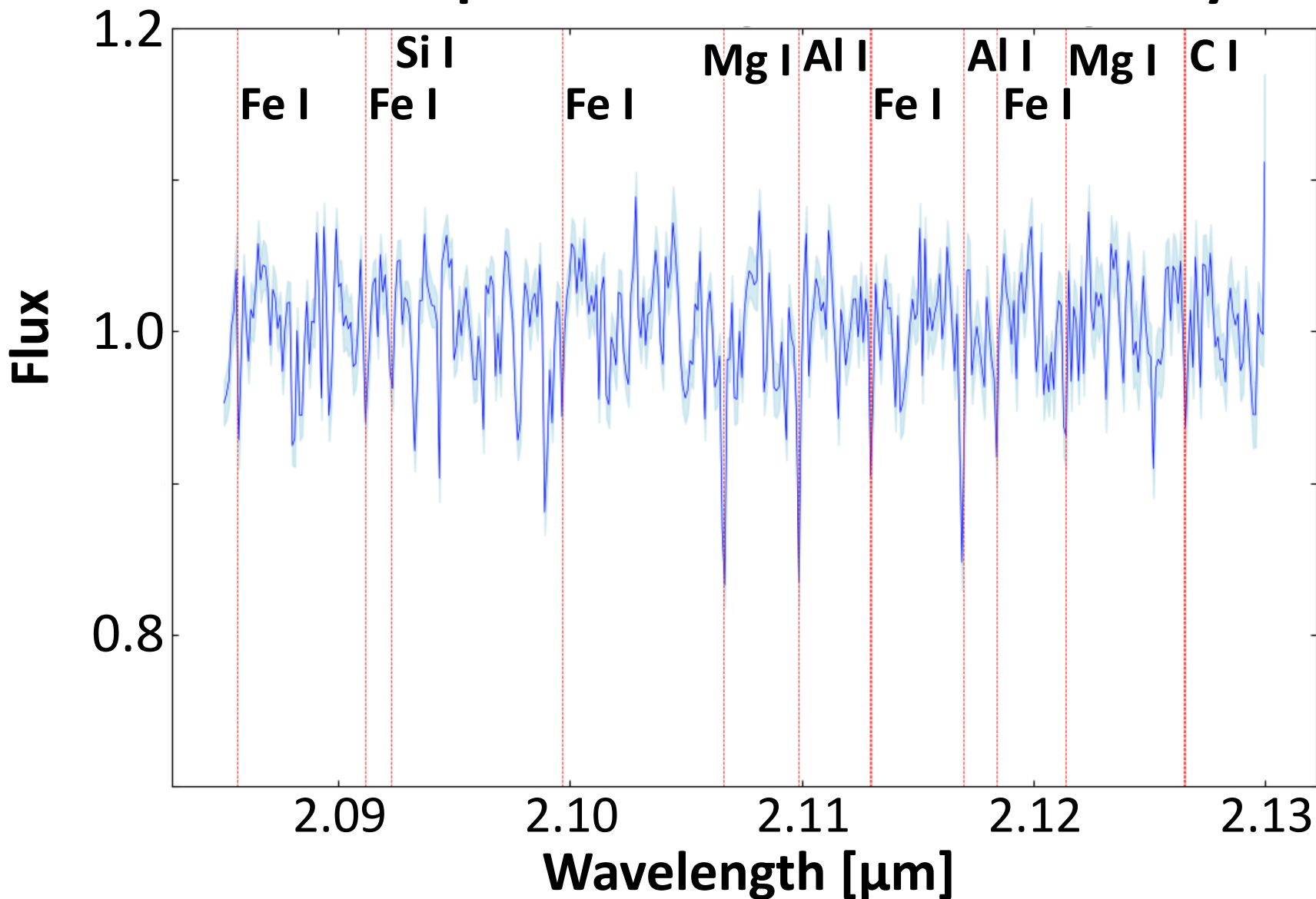


Credit: Sean Goebel/NAOJ



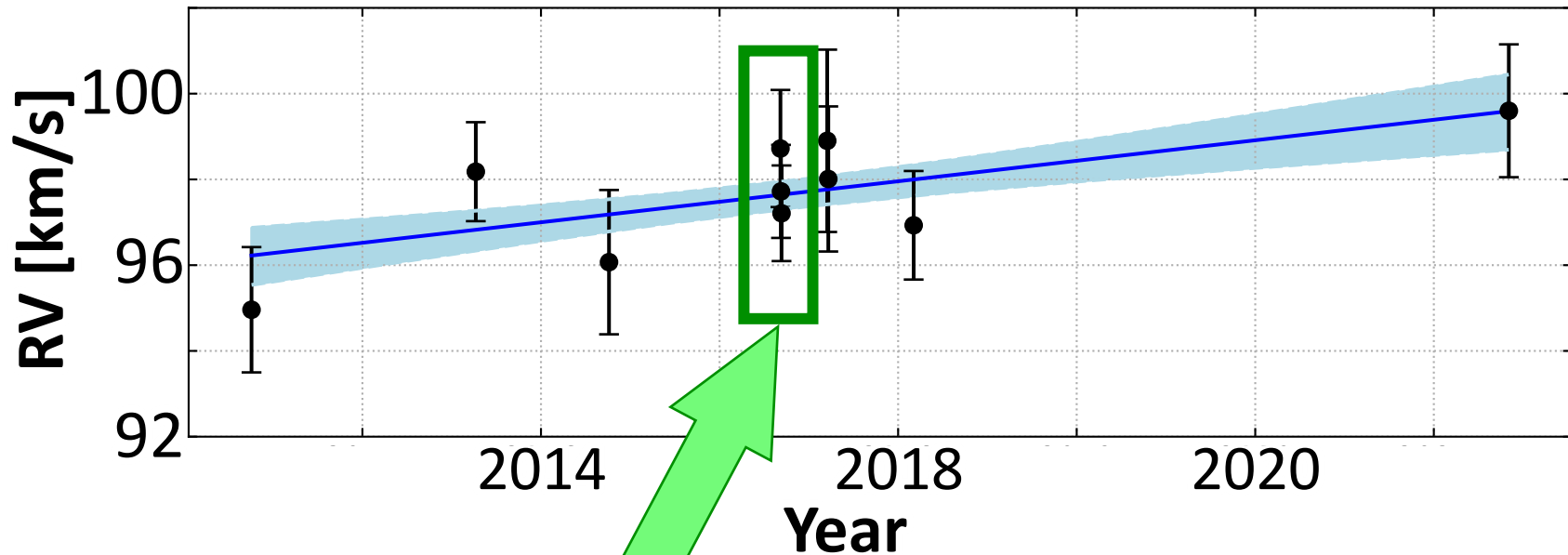
Radial Velocity Measurements ^{7/14}

Fit absorption lines → Radial velocity



Radial Velocity Measurements ^{8/14}

RV variation of S0-6/S10

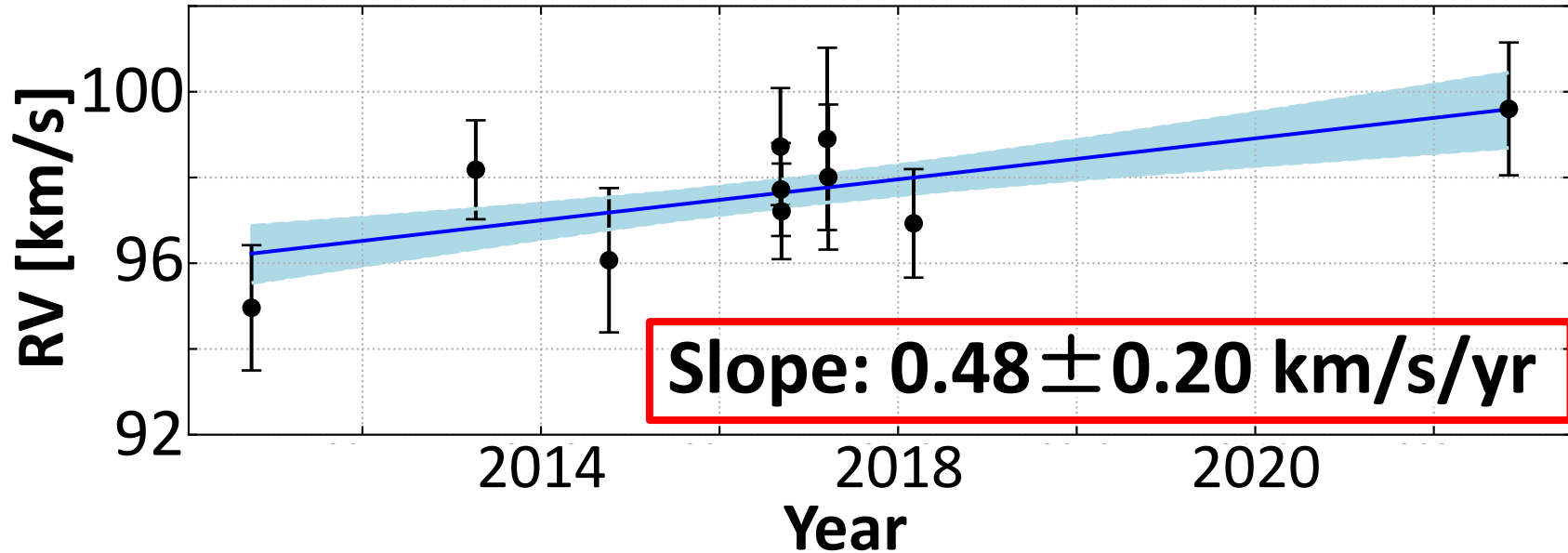


**3 measurements
on 4 - 6/May 2017
Assume no variation
↓
Precision of 0.77 km/s**

**Stat. error: 1.25 km/s
Stability: 0.72 km/s
Precision: 0.77 km/s
Total Error: ≈ 1.5 km/s**

Radial Velocity Measurements^{10/14}

RV variation of S0-6/S10



$$ma_z < ma_{3D} = \frac{GMm}{r_{3D}^2}$$

$$r_{3D} < \sqrt{\frac{GM}{a_z}} \approx 0.2 \text{ pc}$$

Stat. error: 1.25 km/s

Stability: 0.72 km/s

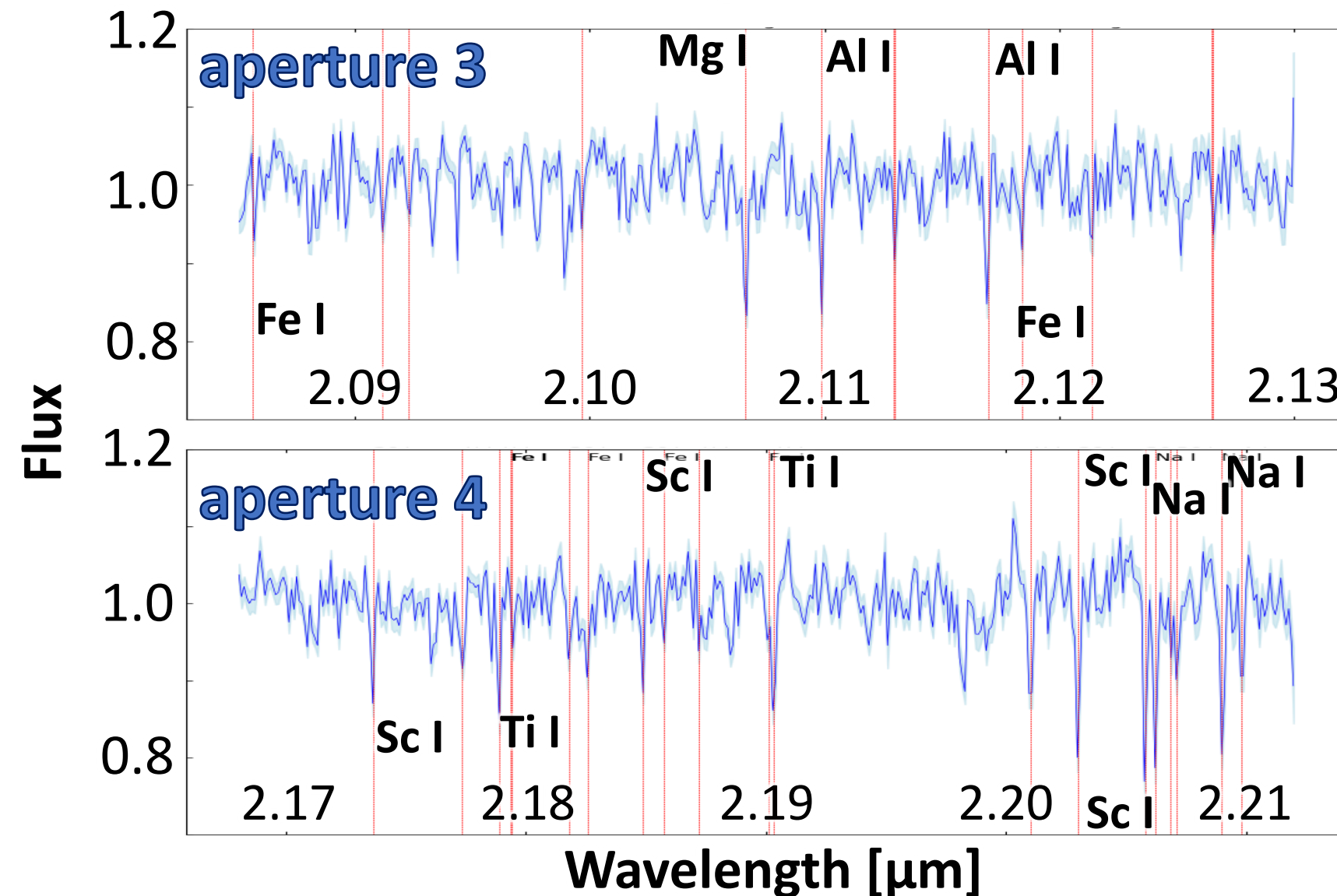
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Stellar parameters of S0-6

11/14

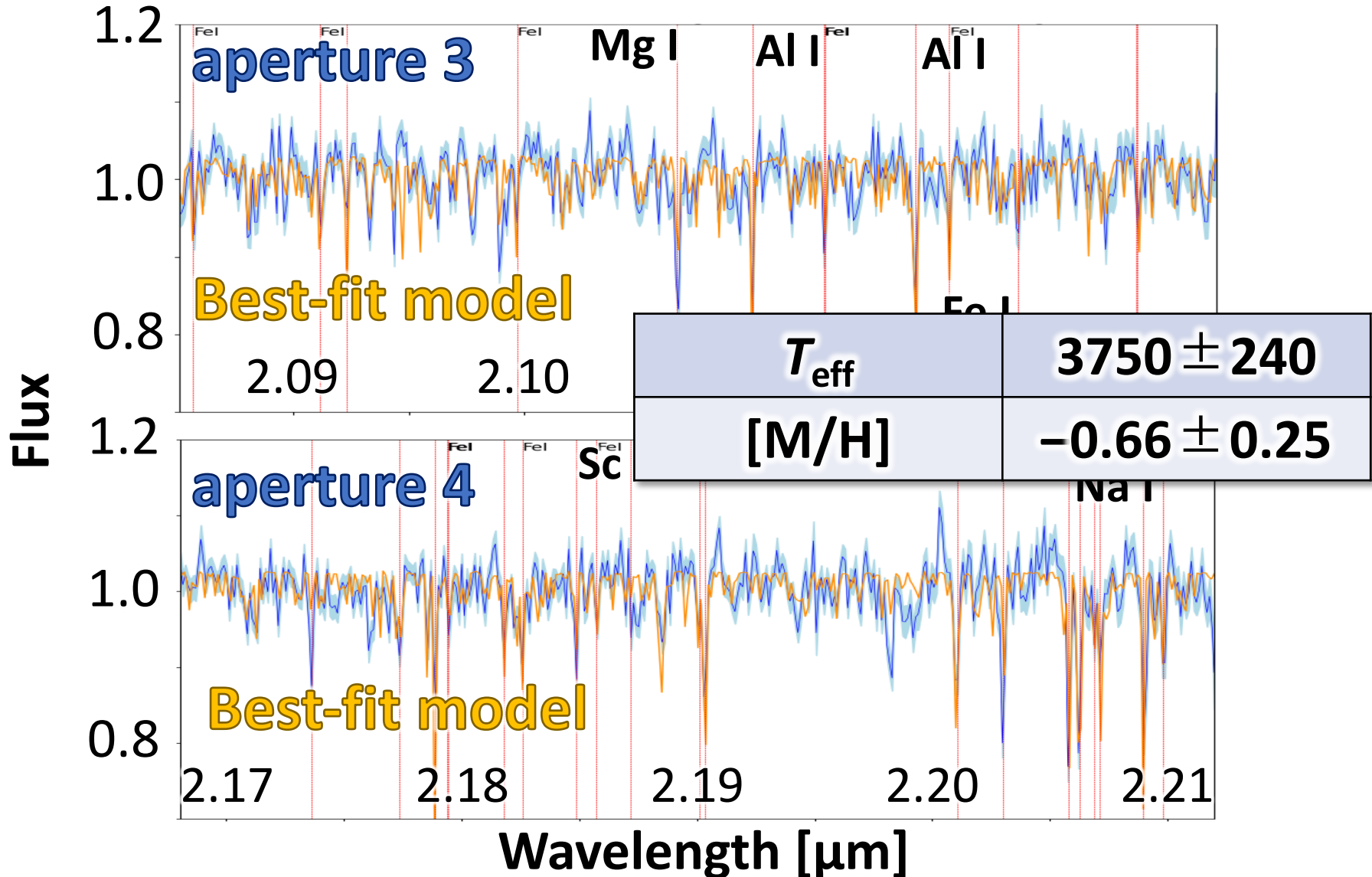
Combined spectra of S0-6



Stellar parameters of S0-6

12/14

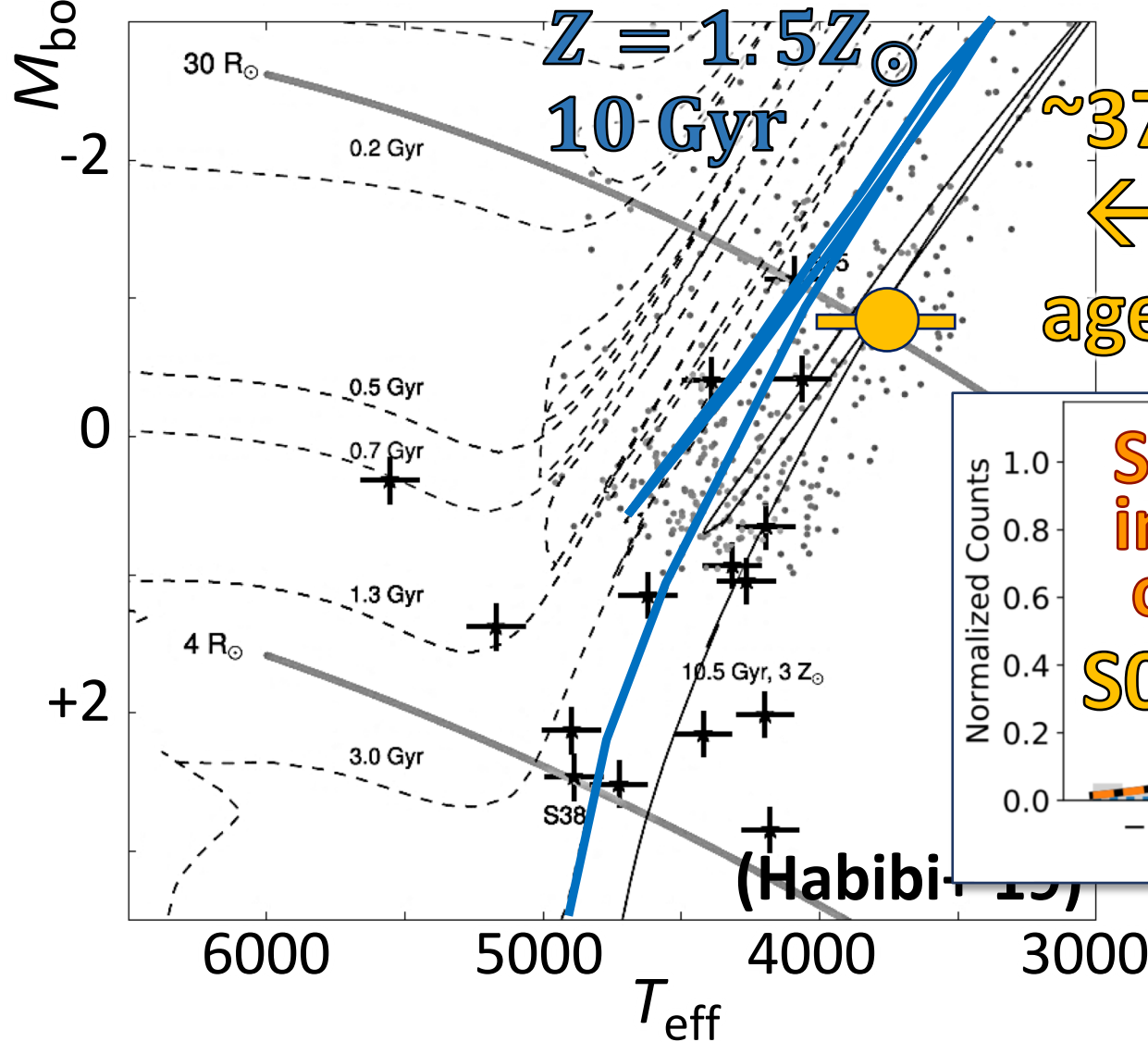
Model fit w/ starkit (Kerzendorf & Do 15)



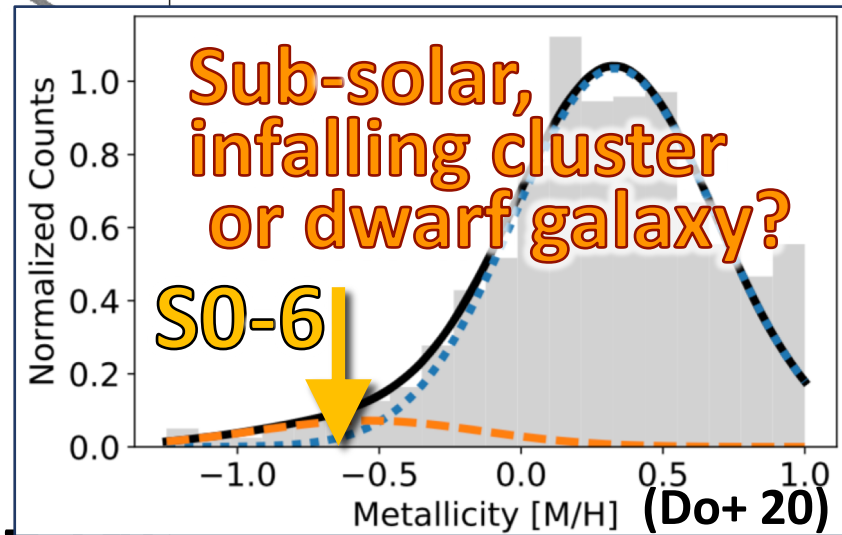
Stellar parameters of S0-6

13/14

HR diagram & previous study



~ 3750 [K]
← late-M III
age $\gtrsim 10$ Gyr



Summary

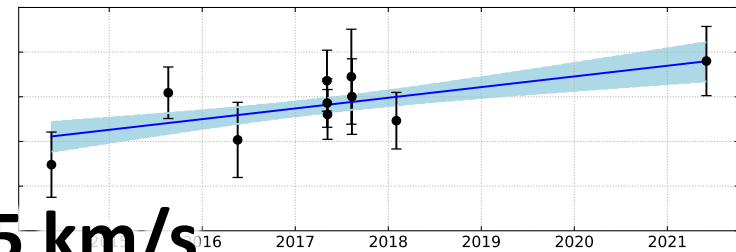


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