

IGRINS/Gemini-S view of the newly discovered bulge globular clusters VVV-CL160, Patchick 126 and Patchick 99

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Context

New star clusters have recently been discovered in the Galactic bulge and disk [1][2][3]. They were photometrically analyzed using the optical *Gaia* EDR3 [4] and the near-IR VVV/VVVX [5,6] datasets. They do not have any previous kinematic and chemical information available.

Our main goals are to spectroscopically confirm the cluster nature of Patchick 99 [1], Patchick 126 [2], and VVV-CL160 [3,7], and to measure their physical and orbital parameters.

Dataset

The observations of carefully selected candidate stars were gathered in *H*- and *K*-band with the Immersion GRating INfrared Spectrometer (IGRINS) spectrograph, at Gemini-South observatory, during the Program (PI:Garro E.R.):

- *GS-2022A-Q-132* : 12 RGB stars in **VVV-CL160**
- *GS-2022A-Q-238* : 4 RGB stars in **Patchick 126**
- *GS-2021B-Q-130* : 11 RGB stars in **Patchick 99**

We performed the data reduction as detailed by Afşar et al. 2016,2018 and Garro et al. (2022, in prep.).

Main Results

We calculated by cross-correlation the radial velocity (RV) for each star, as shown in Fig.1, deriving the mean cluster RV. We computed their orbits for the first time (Fig.2), using the GravPot16 model [*].

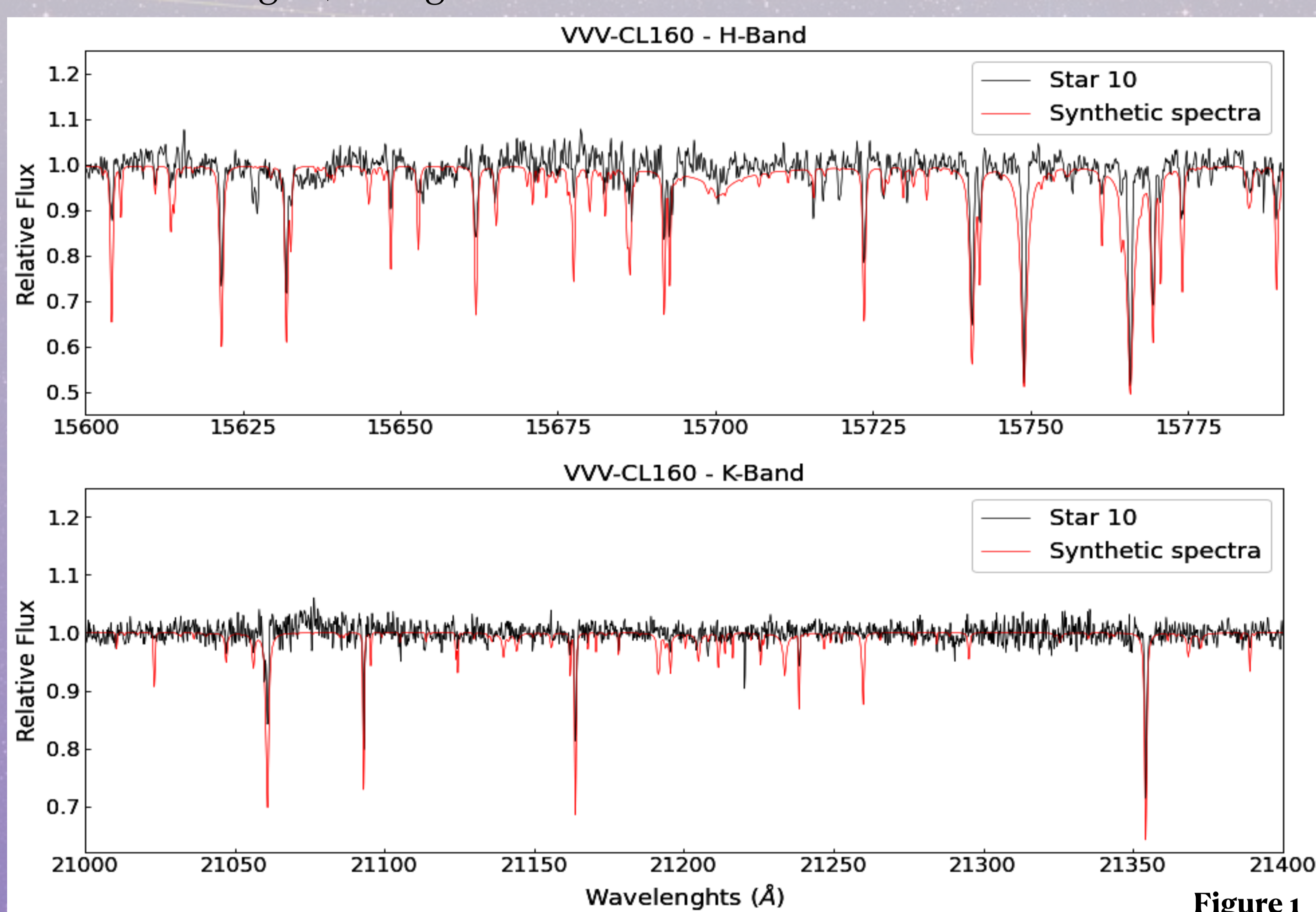


Figure 1

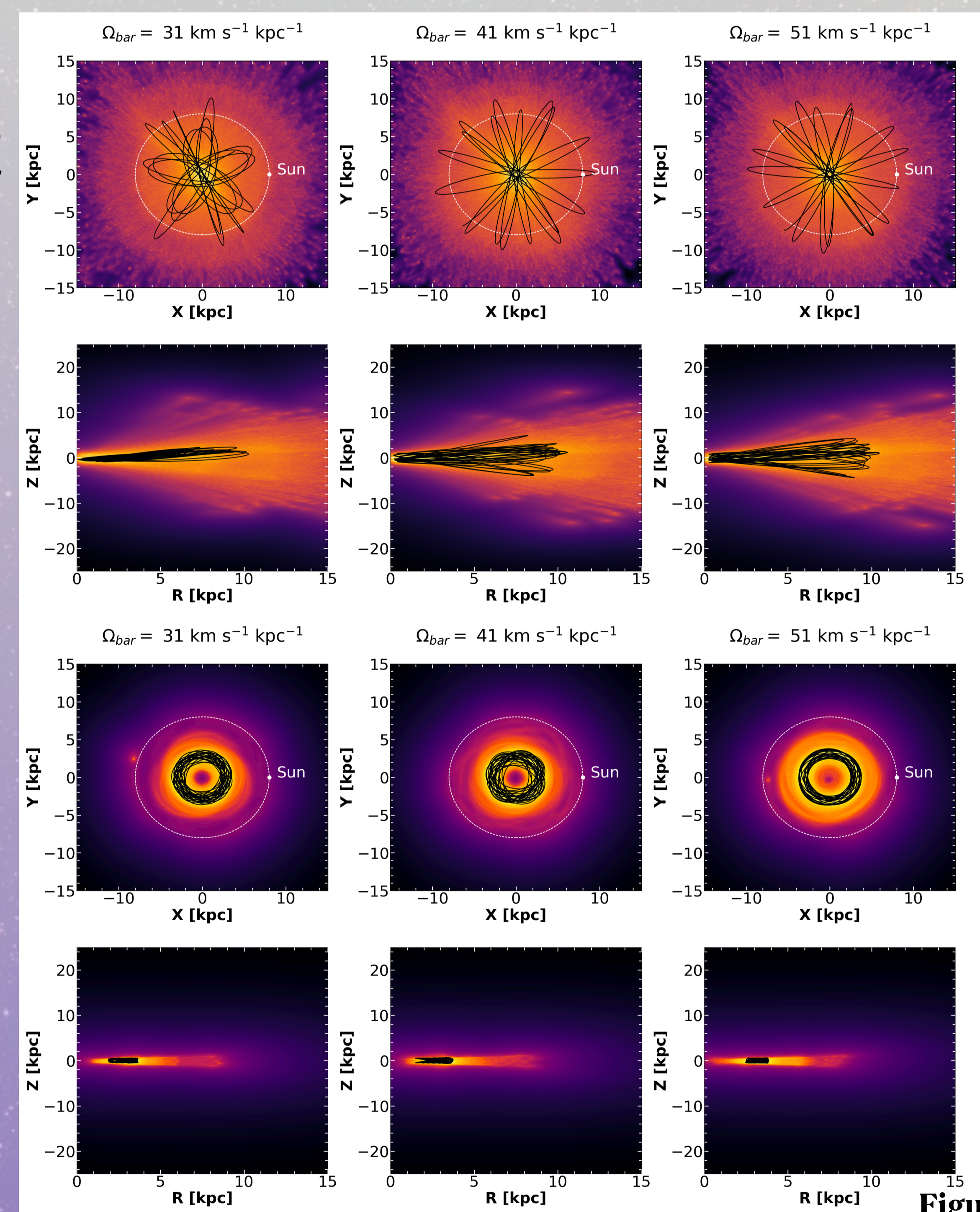


Figure 2

Conclusions

Preliminary conclusions from the orbital analysis:

- 1) **Patchick 126** is a bulge globular cluster, with $RV_{H,K} \approx -121.8 \pm 0.3$, indicating a low-mass cluster that survived with prograde orbit.
- 2) **VVV-CL160** moves away of the Sun at a very large speed of $RV_H \approx 245.6 \pm 0.6$ km/s and $RV_K \approx 245.0 \pm 0.6$ km/s, with very high eccentricity ($e \sim 0.9$), reaching very large distance from the Galactic centre. *Is it a Galactic or an accreted extragalactic star cluster?*
- 3) **Patchick 99** star sample can be split into different RV groups. At the moment, we do not exclude its cluster nature, because other 9 stars are being observed during the Program GS-2022A-Q-325.

References

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- [*] <https://gravpot.utinam.cnrs.fr/>

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