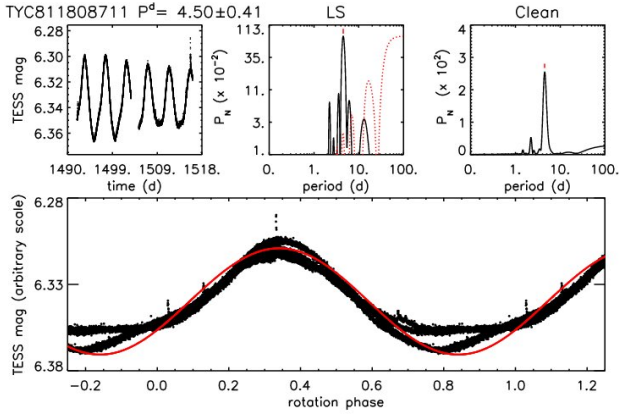
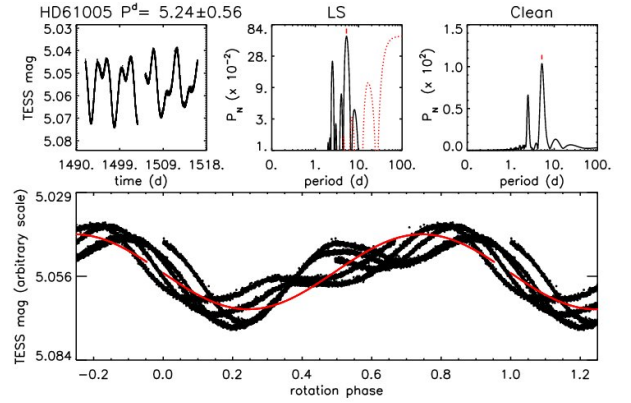




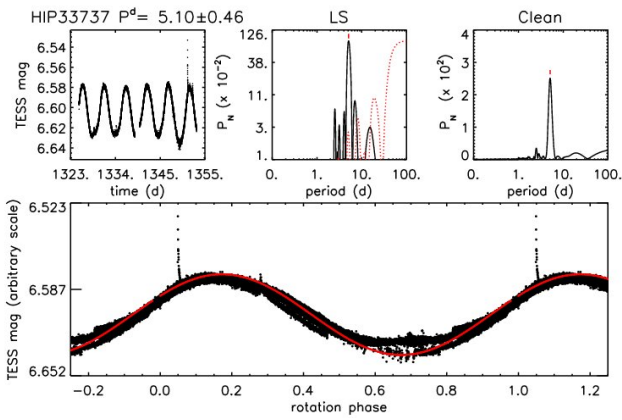
|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| <b>Publication Year</b>          | 2021                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Acceptance in OA</b>          | 2022-03-16T16:56:40Z                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Title</b>                     | The SPHERE infrared survey for exoplanets (SHINE). I. Sample definition and target characterization                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Authors</b>                   | DESIDERA, Silvano, Chauvin, G., Bonavita, M., MESSINA, Sergio, LeCoroller, H., SCHMIDT, TOBIAS MARIUS, GRATTON, Raffaele, Lazzoni, C., Meyer, M., Schlieder, J., Cheetham, A., Hagelberg, J., Bonnefoy, M., Feldt, M., Lagrange, A. -M., Langlois, M., Vigan, A., Tan, T. G., Hamsch, F. -J., Millward, M., ALCALA', JUAN MANUEL, BENATTI, SERENA, Brandner, W., Carson, J., COVINO, Elvira, Delorme, P., D'ORAZI, VALENTINA, Janson, M., RIGLIACO, ELISABETTA, Beuzit, J. -L., Biller, B., Boccaletti, A., Dominik, C., Cantalloube, F., Fontanive, C., Galicher, R., Henning, Th., Lagarde, E., LIGI, ROXANNE, Maire, A. -L., Menard, F., MESA, DINO, Müller, A., Samland, M., Schmid, H. M., Sissa, E., TURATTO, Massimo, Udry, S., Zurlo, A., Asensio-Torres, R., Kopytova, T., Rickman, E., Abe, L., Antichi, J., BARUFFOLO, Andrea, Baudoz, P., Baudrand, J., Blanchard, P., Bazzon, A., Buey, T., Carbillet, M., Carle, M., Charton, J., CASCONI, Enrico, CLAUDI, Riccardo, Costille, A., Deboulb , A., DE CAPRIO, VINCENZO, Dohlen, K., FANTINEL, Daniela, Feautrier, P., Fusco, T., Gigan, P., GIRO, Enrico, Gisler, D., Gluck, L., Hubin, N., Hugot, E., Jaquet, M., Kasper, M., Madec, F., Magnard, Y., Martinez, P., Maurel, D., Le Mignant, D., M ller-Nilsson, O., Llored, M., Moulin, T., Orign , A., Pavlov, A., Perret, D., Petit, C., Pragt, J., Puget, P., Rabou, P., Ramos, J., Rigal, F., Rochat, S., Roelfsema, R., Rousset, G., Roux, A., SALASNICH, Bernardo, Sauvage, J. -F., Sevin, A., Soenke, C., Stadler, E., Suarez, M., Weber, L., Wildi, F. |
| <b>Publisher's version (DOI)</b> | 10.1051/0004-6361/202038806                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Handle</b>                    | <a href="http://hdl.handle.net/20.500.12386/31639">http://hdl.handle.net/20.500.12386/31639</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Journal</b>                   | ASTRONOMY & ASTROPHYSICS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Volume</b>                    | 651                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |



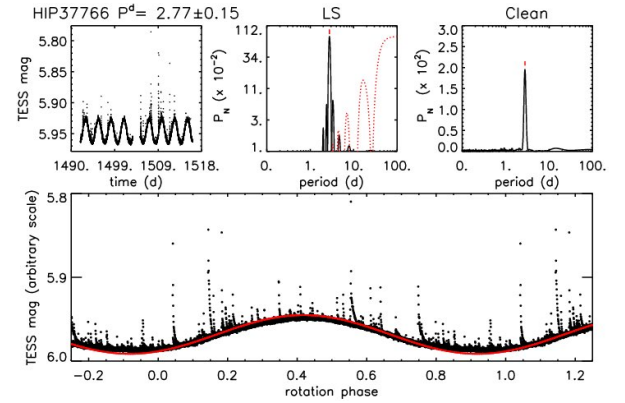
**Fig. A.38.** Photometric time sequence and periodogram for TYC 8118-0871-1.



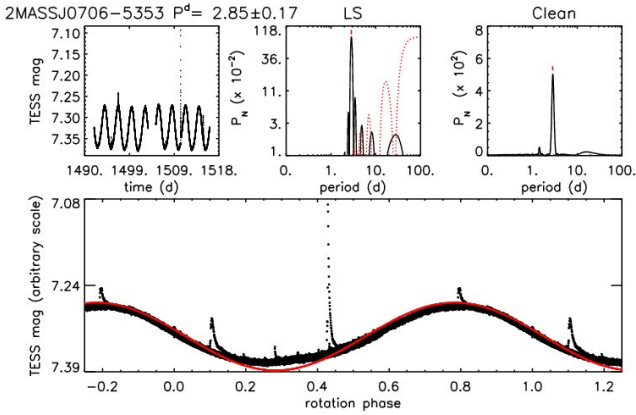
**Fig. A.41.** Photometric time sequence and periodogram for HIP 36948 (HD 61005).



**Fig. A.39.** Photometric time sequence and periodogram for HIP 33737.



**Fig. A.42.** Photometric time sequence and periodogram for YZ CMi = HIP 37766.



**Fig. A.40.** Photometric time sequence and periodogram for 2MASSJ0706-5353.

Argus member by [Torres et al. \(2008\)](#), which has been confirmed in several works. Independently of the controversy over the existence of the Argus association, the very strong Li line confirms a young age. It is flagged as a possible SB in [Desidera et al. \(2015\)](#) based on the marginal RV difference between the two measurements. The recent RV determination by [Zuckerman \(2019\)](#), intermediate between the two previous measurements, does not support the presence of large RV variability. There is a marginal proper motion difference ( $\sim 2\sigma$ ) between *Gaia* DR2 and *Tycho*2, while the *Gaia* DR1 and DR2

proper motions do not differ significantly. We kept the star in the sample, and we adopted the Argus membership and age.

**HIP 36948 = HD 61005.** Star with spatially resolved debris disk (e.g., [Hines et al. 2007](#); [Olofsson et al. 2016](#)). The photometric rotation period first measured by [Desidera et al. \(2011\)](#) is confirmed by our analysis of the TESS data (Fig. A.41).

**YZ CMi = HIP 37766 = GJ 285.** The star is identified as a possible  $\beta$  Pic MG member in [Montes et al. \(2001\)](#), although it is not considered for membership in most of the studies on the group. The updated kinematic analysis using BANYAN  $\Sigma$  yields 0% membership probability. Considering it as a field object and taking the available results of age indicators into account, we adopted an age of 100 Myr with lower limit at 20 Myr and upper limit at 200 Myr. The photometric rotation period first measured by [Chugainov \(1974\)](#) is confirmed by our analysis of the TESS data (Fig. A.42). The TESS time series shows an uninterrupted flare activity.

**HIP 42808.** We measured for the first time the rotation period from the TESS photometric time series (Fig. A.43). We note some residual instrumental effects around rotation phases  $\phi = 0.3$ – $0.4$ .

**$\eta$  Cha.** Member of the  $\eta$  Cha open cluster ([Mamajek et al. 1999](#)). Nine comoving objects are found within 10 arcmin in *Gaia* DR2. We listed in Table 10 the closest one, EK Cha, at a projected separation of 19 300 au.

**HD 75505 = RECX13.** Classified as a probable member of the  $\eta$  Cha open cluster ([Mamajek et al. 1999](#)). This is confirmed by kinematic analysis based on *Gaia* DR2 ([Cantat-Gaudin & Anders 2020](#)). It is also listed among the bona fide members

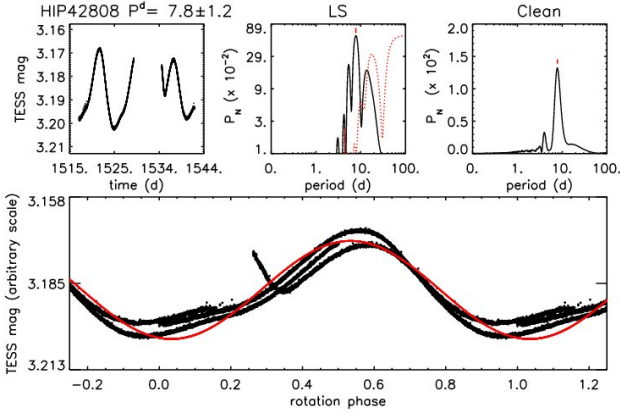


Fig. A.43. Photometric time sequence and periodogram for HIP 42808.

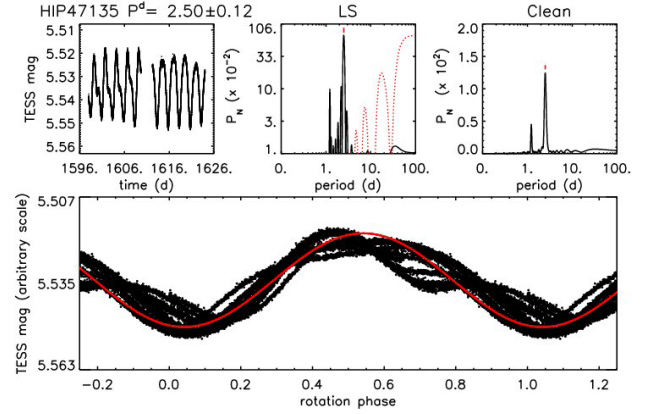


Fig. A.45. Photometric time sequence and periodogram for HIP 47135.

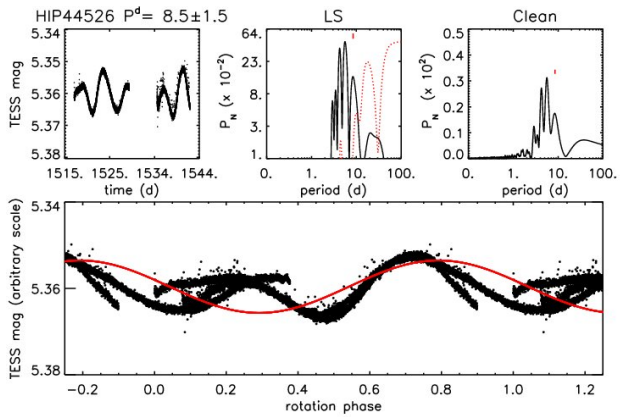


Fig. A.44. Photometric time sequence and periodogram for HIP 44526.

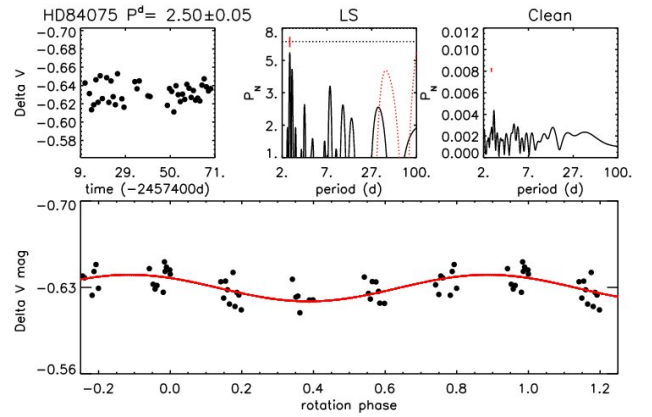


Fig. A.46. Photometric time sequence and periodogram for HIP 47135 (ROAD data).

by Gagné et al. (2018b). On the other hand, the BANYAN  $\Sigma$  online tool yields a low membership probability (9%). Specific signatures of youth are elusive considering the spectral type of the star (A1V). We consider the star to be a member on the basis of the sky position, parallax, and proper motion, which are very similar to those of the other cluster members. Nine comoving objects are found within 10 arcmin in *Gaia* DR2. We listed in Table 10 the two with a projected separation of less than 20000 au, EH Cha and EI Cha, which are both confirmed members of the cluster.

**V405 Hya = HIP 44526 = HD 77825.** All age indicators are compatible with an age intermediate between Hyades and Pleiades. We adopted 300 Myr. The star was considered a member of Castor MG, whose existence is uncertain. Our adopted age is in any case close to the typical value for proposed Castor members. The M2.5 star UCAC4 371-053521, clearly comoving at a projected separation of 6000 au from *Gaia* DR2, was not previously recognized as a wide companion to V405 Hya. It was known as an active and X-ray emitter source. The photometric rotation period first measured by Kiraga (2012) is confirmed by our analysis of the TESS data (Fig. A.44). The light curve is affected by residual instrumental effects.

**HIP 47135 = HD 84075.** G2 star classified as an Argus member in Torres et al. (2008), Zuckerman et al. (2011), Malo et al. (2013), Bell et al. (2015), and Zuckerman (2019). The age indicators are fully compatible with the proposed age for Argus. The star has an IR excess with two components

(Zuckerman et al. 2011). We measured the photometric rotation period for the first time using photometric time series collected at the ROAD observatory. Our measurement was subsequently confirmed by our analysis of the TESS data (Fig. A.45–A.46).

**HIP 50191 = HD 88955 = q Vel.** A2V star classified as an Argus member in Zuckerman et al. (2011), Bell et al. (2015), and Zuckerman (2019), and with Argus membership supported by BANYAN (probability 98%). Argus membership is also adopted in Nielsen et al. (2019). Actually, Zuckerman (2019) noted the slightly off-sequence position in  $B-V$  versus  $M_V$  CMD; instead the star is in a position similar to that of other Argus A-type stars in *Gaia* CMD. It should be noted that the HIPPARCOS parallaxes and proper motion have smaller errors than the *Gaia* values for such a bright star ( $V = 3.85$ , mag). Furthermore, the star is classified as a primary standard for A2V spectral type by Pecaut & Mamajek (2013)<sup>16</sup>. Adopting their  $T_{\text{eff}}$  for this spectral type, (8840 K), the isochrone age results  $458 \pm 182$  Myr, similar to the age reported in the literature using this technique (Vican 2012; David & Hillenbrand 2015). The pre-MS age ( $6 \pm 1$  Myr) is instead too young for Argus membership. We consider the post-ZAMS isochrone age reliable as the adopted data appears of high quality and there is no indication of binarity of the object, both at short separation from RV monitoring (Lagrange et al. 2009) and at larger separation from imaging. We adopted the isochronal age with an error bar extending

<sup>16</sup> <http://www.pas.rochester.edu/~emamajek/spt/A2V.txt>