

The BASE project

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Project Organisation

BASE: “**B**inaires **A**strométriques **S**pectroscopiques **E**clipsantes” = Astrometric, Spectroscopic & Eclipsing Binaries

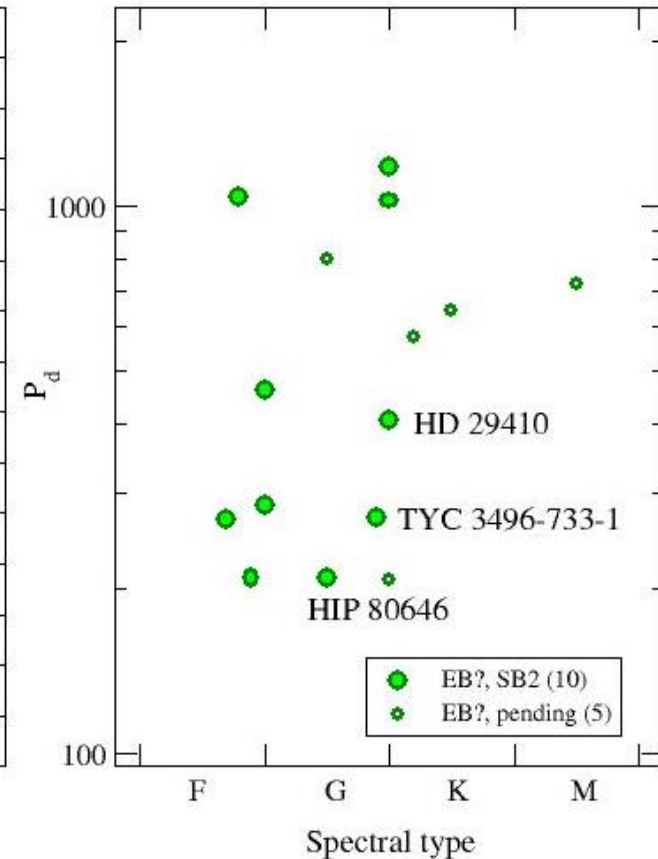
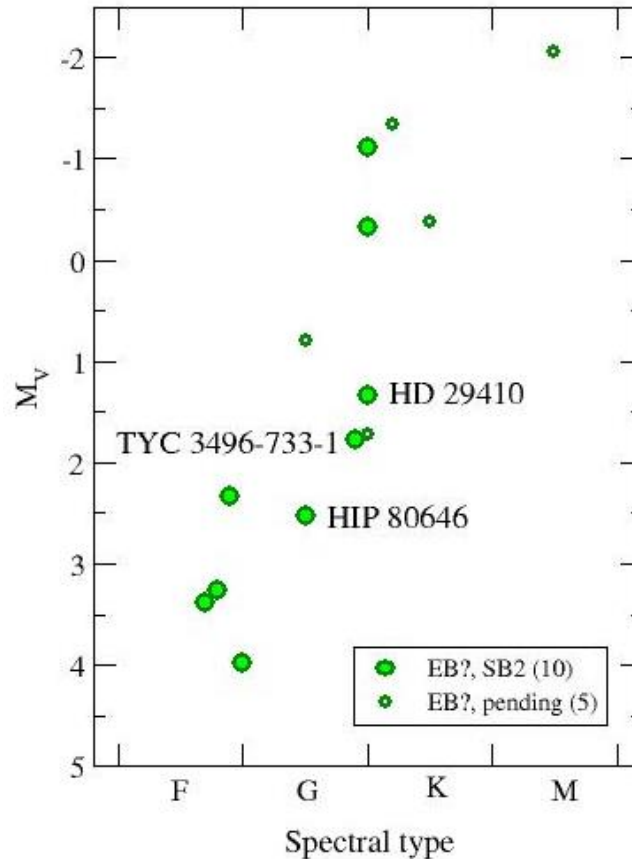
- Forty-one astrometric binaries selected from Gaia-DR3 (2023)
- Spectroscopic observations at the Haute-Provence Observatory (OHP) using T193/Sophie
 - ⇒ Selection of double-lined spectroscopic binaries (SB2)
 - ⇒ Improvements to orbital elements
 - ⇒ Calculation of eclipse predictions
- Photometric observations of the eclipses (when they occur..) made by amateur astronomers.

SB2 detection

110 spectra obtained since 2023.



- 26 stars SB1 or unobservable
- 5 stars of uncertain status
- 10 SB2.



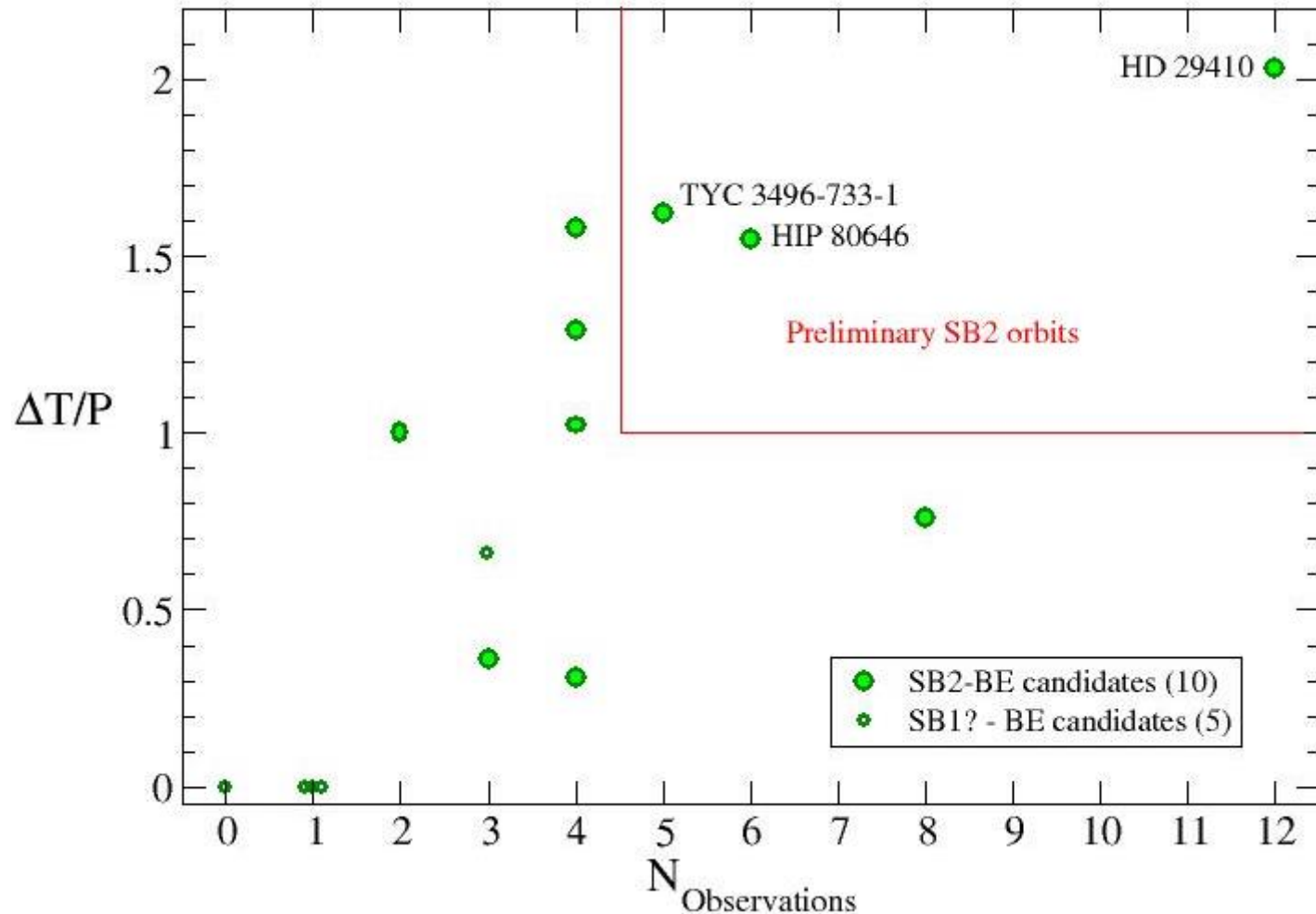
Properties of the SB2s:

- Spectral types: from late F-type to early K-type.
- Subgiant or giant stars.
- Periods: from 210 to 1172 days.

Improvement of the orbital elements

At least 11 spectra over $\Delta T > P$ are required to determine a reliable SB2 orbit.

A minimum of 5 spectra is sufficient to determine a preliminary orbit, especially if the period is already known.



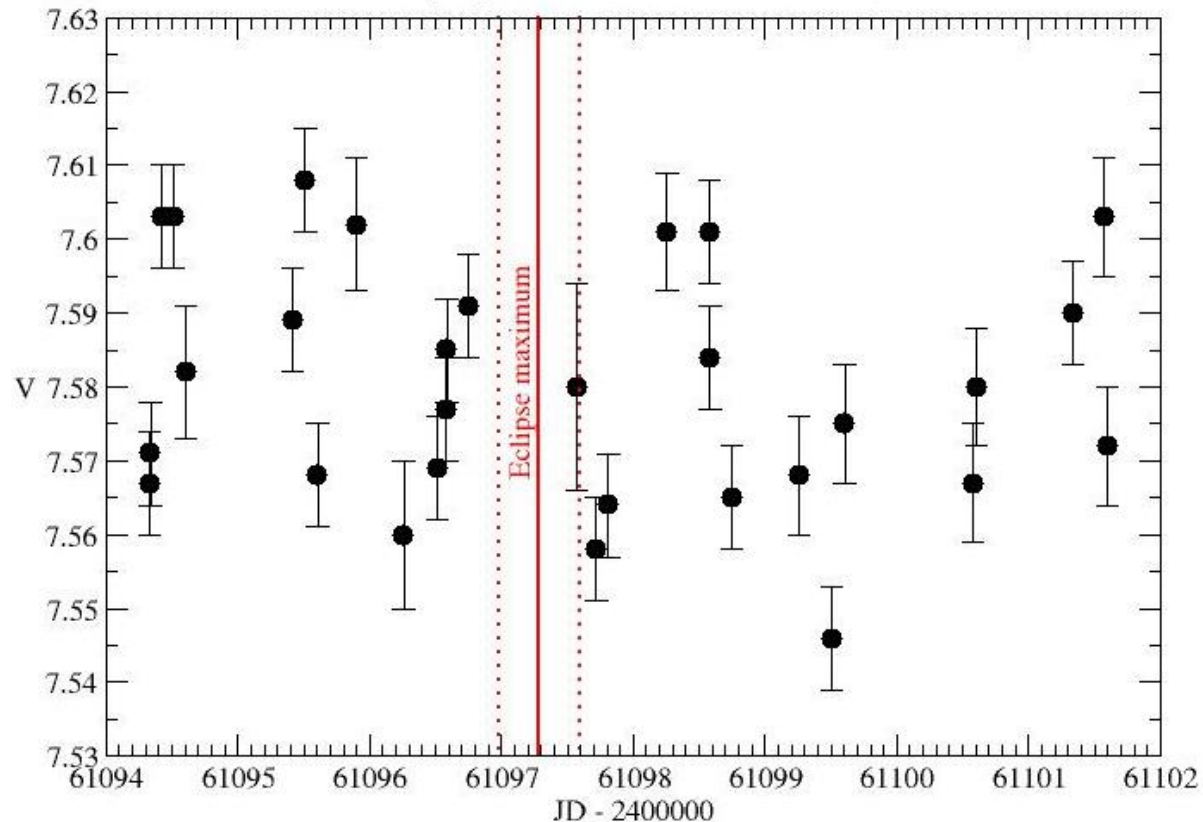
This condition is now met for 3 stars.

Searching for eclipses : HD 29410

First prediction, based on Gaia-DR3: between 4 Dec 2023 and 7 Jan 2024. No eclipse after 10 December.

SB2 orbit based on 12 RV observations \Rightarrow

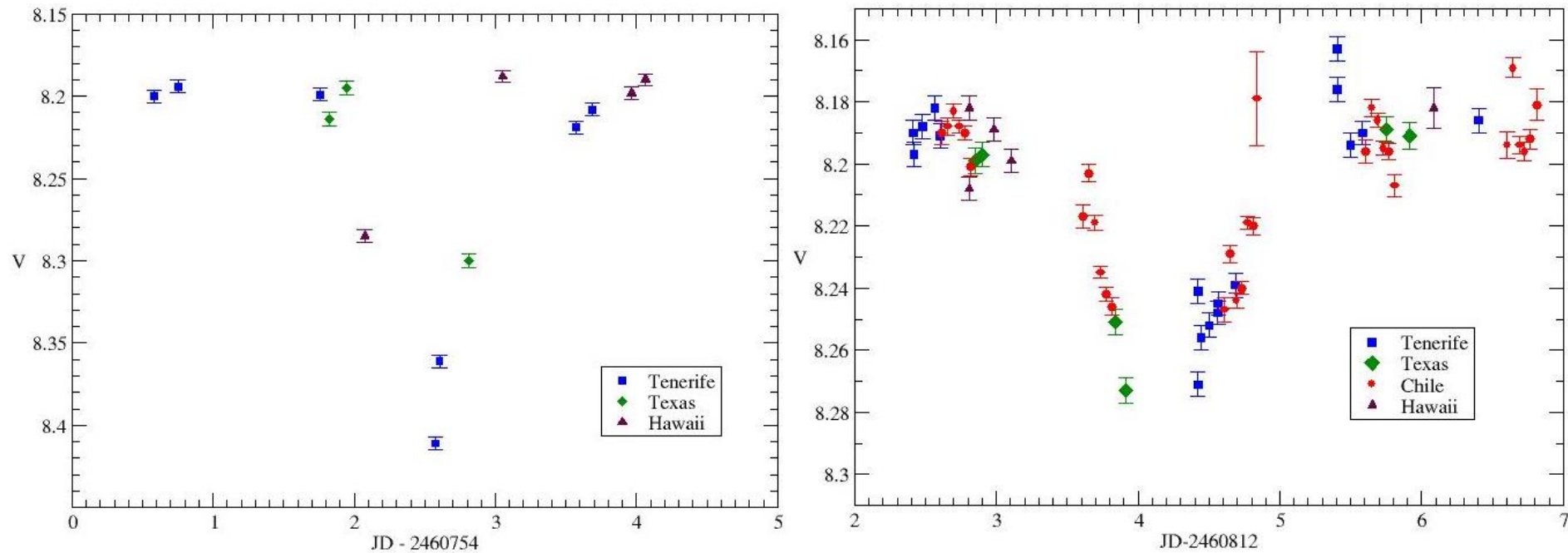
- The eclipse of 2023 (if any) occurred before Dec, 10.
- An eclipse on 25 February 2026, at 19:03 UT $\pm 7:20$
= JD 2461097.29 ± 0.31
- Duration ≤ 148 h (= 6.2 d !)



*Observations of HD 29410 by André Debackère, LCO
(Afrique du Sud, Tenerife, Chile, Texas, Hawaï, Australia)*

The observations made by André Debackère (Los Cumbres Observatory, LCO) show no eclipse

Searching for eclipses: HIP 80646

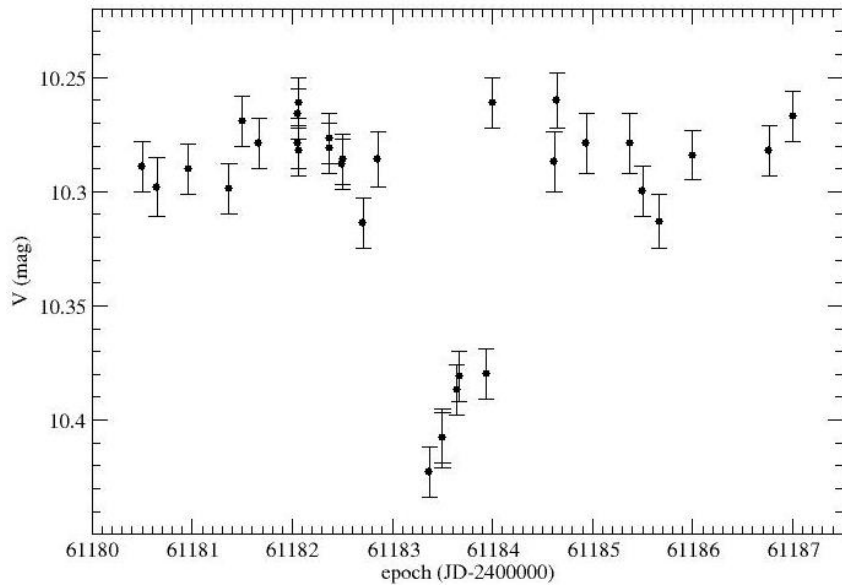


Observations of the eclipses of HIP 80646 by André Debackère (LCO) and Josch Hambsch (Chile)

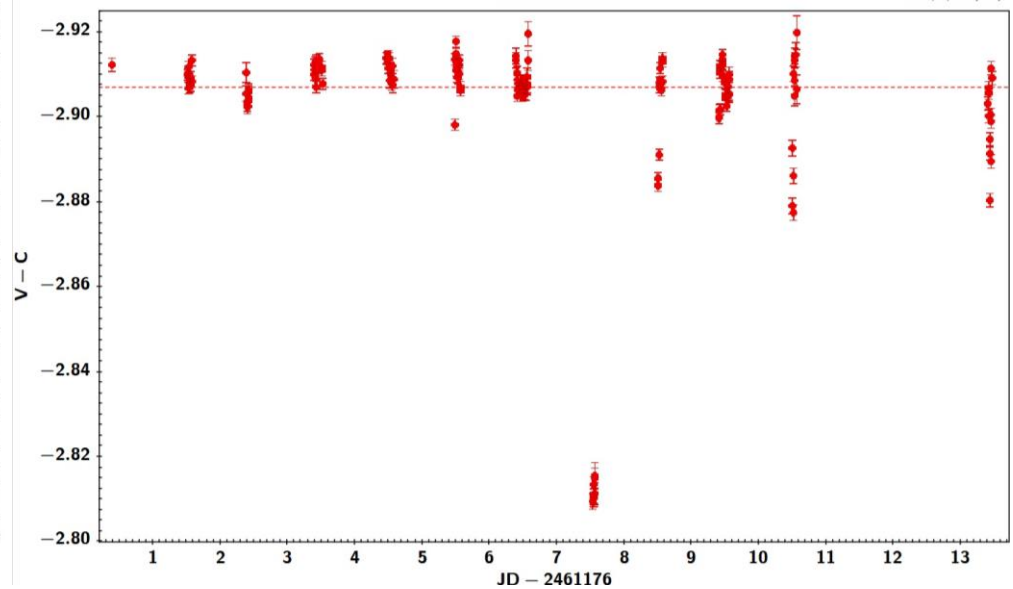
Eclipse predictions derived from Gaia-DR3 only:

- Eclipse of the secondary component observed in March 2025.
- Transit of the secondary component observed in May 2025.
- No observation of the eclipse of Mai 2026, due to competition with another star.
- **Next transit of the secondary component between 13 and 17 July 2026.**

Searching for eclipses : TYC 3496-733-1



*Transit observed by André Debackère, LCO
(Tenerife, Texas, Hawai)*



*Observations by Jean-Baptiste Salomon, Observatoire
des Baronniees Provençales*

Eclipse prediction derived from 5 RV observations, assuming $P_{DR3} = 269,2 \pm 2,2$ d

Transit of the secondary component: 22 May 2026, observed by André Debackère and by Jean-Baptiste Salomon.

Eclipse of the secondary component: Separation twice as great as during the transit.

- Between 6 and 28 August, if the period is taken from Gaia-DR3.
- Between 18 August and 4 September, if the period is taken from the SB2 orbit.

Outlook for 2027 and beyond

- Delivery of Gaia-DR4 (December 2026) :
 - Improvement of the astrometric elements and eclipse ephemerides.
 - Search for eclipses in the Gaia epoch photometry.
- Completion of the SB2 selection with the new Sophie-red camera.
- Continuation of the calculation of SB2 solutions and eclipse ephemerides using new spectroscopic observations from Sophie-red.
- Observation of eclipses to plot the exact profiles of the light curves, selection of stars exhibiting total eclipses, estimation of radii, magnitudes and color indices of the components.