Orbital period change of Pleione?

Based on ongoing observation campaigns of the Be binary star 28 Tau, observer of the ARAS community (C. Sawicki, J. Guarro, A. Favaro, K. Graham, F. Houpert, V. Desnoux, Ch. Buil, M. Leonardi, Th. Garrel, O. Garde, J. Montier, B. Mauclaire, DongLi, St. Charbonnel, P Berardi, M. Leonardi, J. Devaux, E. Pollmann) had been able, with the radial velocity of the Hα absorption core and the Hα V/R ratio as indicator, to observe three periastron passages (see page 2).

The time of the first periastron at 2455955 (2012-01-28) fits well with Nemravova´s ephemerides (A&A, 516, A80, 2010) and the 218d period. The deviation amounts one day only. The times of the following periastron at 2456213 (2012-10-10) and 2456642 (2013-12-15) could mean, that the orbital period has increased to 254d (see also the RV period analysis page 3, bottom). It is remarkable in this context that the disk perturbation through the companion obviously leads to a deviating V/R period of 219 days (see page 3, top).

Possibly this reflects the tidal torque effect from the companion star as a warp and twist of the disk. These processes are described in detail among others of R. G. Martin et al. in Mon. Not. R. Astron. Soc. 000, 1-15 (2010).

I discussed this phenomenon with J. Katahira (he is, along with R. Hirata one of the 28 Tau expert, Bisei Astronomical Observatory, Okayama, Japan). He suggests the following scenario:

When 28 Tau fully developes the envelope, the secondary star clearly does a perturbation over the envelope. A short time scale variation of Hα V/R may suggest a temporary warp of the envelope due to the companion at the periastron. (I suppose a Hα profile variation alike to the one at January 2012 periastron at JD 245595). But, I could not think a reason for the time-lag in the Hα velocity variation.

How such a tidal interactions can disturb an envelope around a primary component, shows impressive the Okasaki model computation of the periastron passage of the Be binary star delta Sco in 2011.

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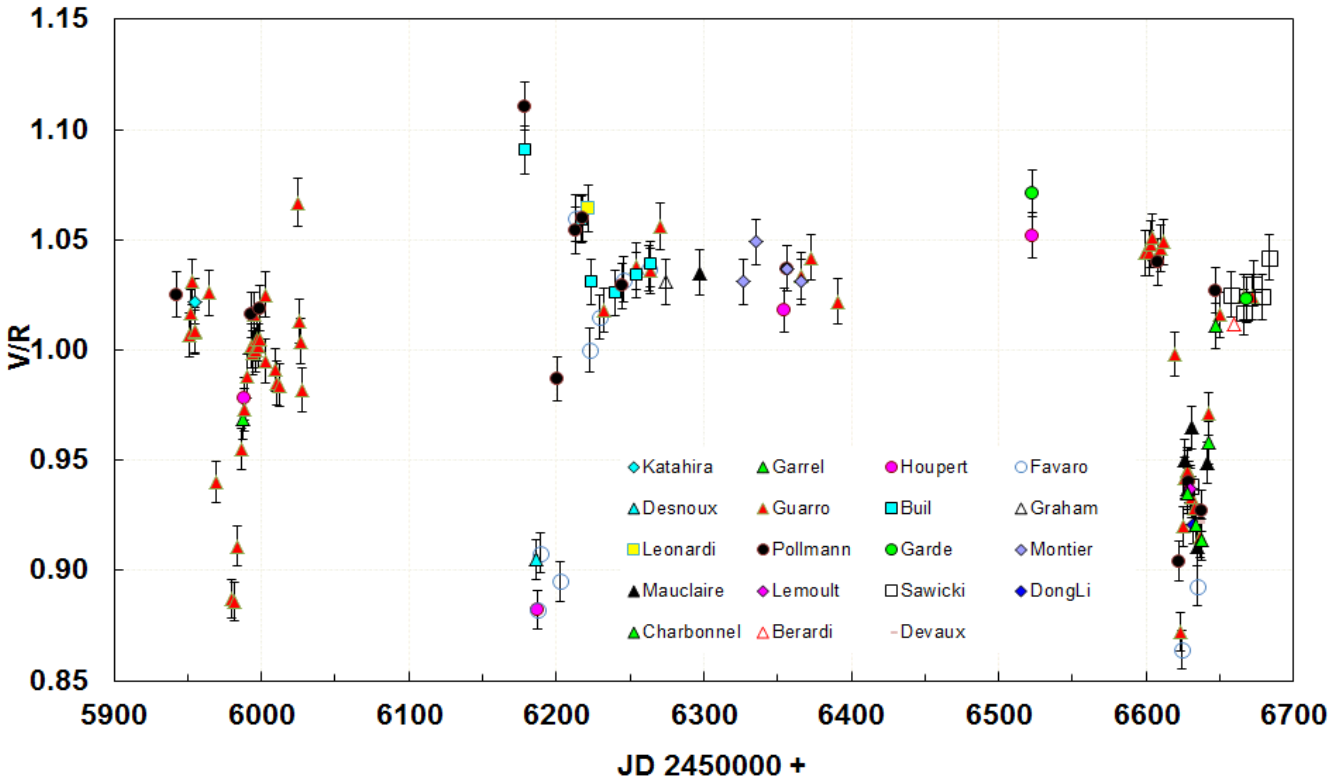
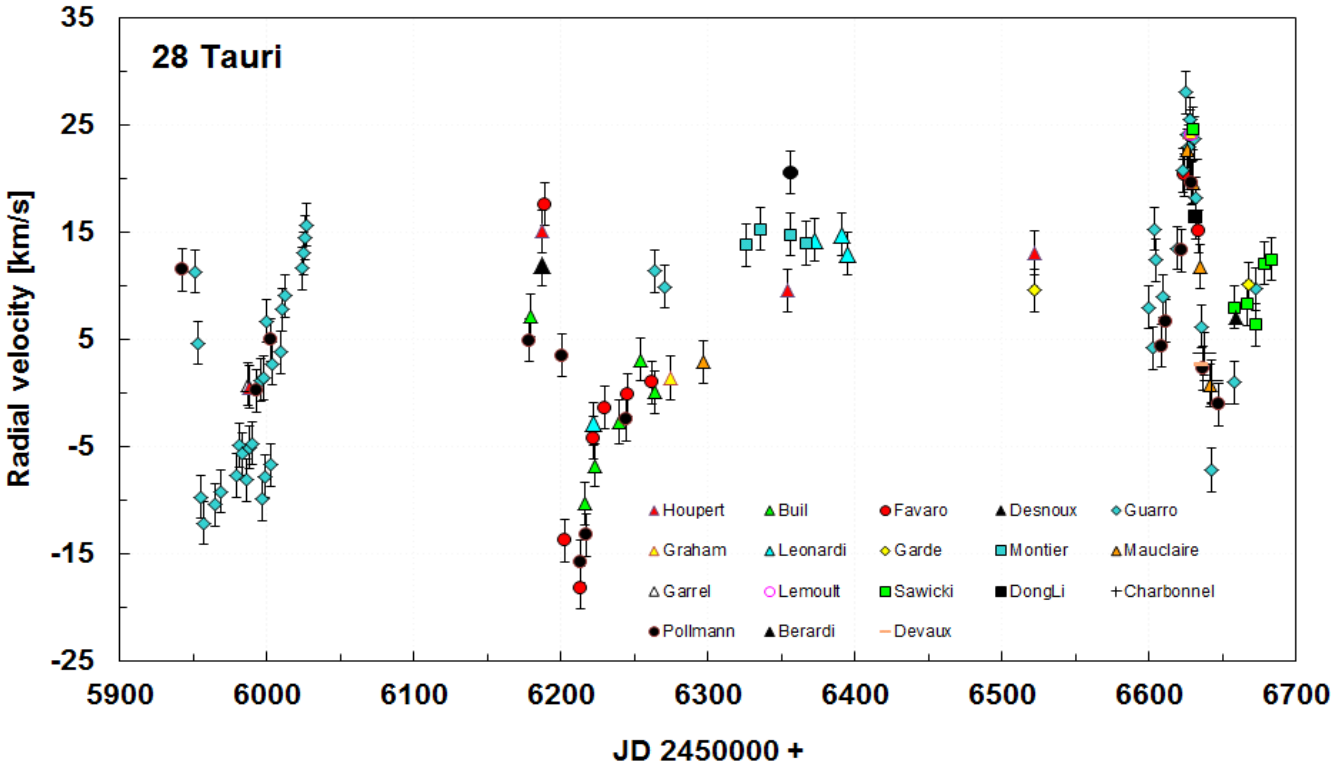
Ernst Pollmann





Periastron 1: 2455955 (2012-01-28)

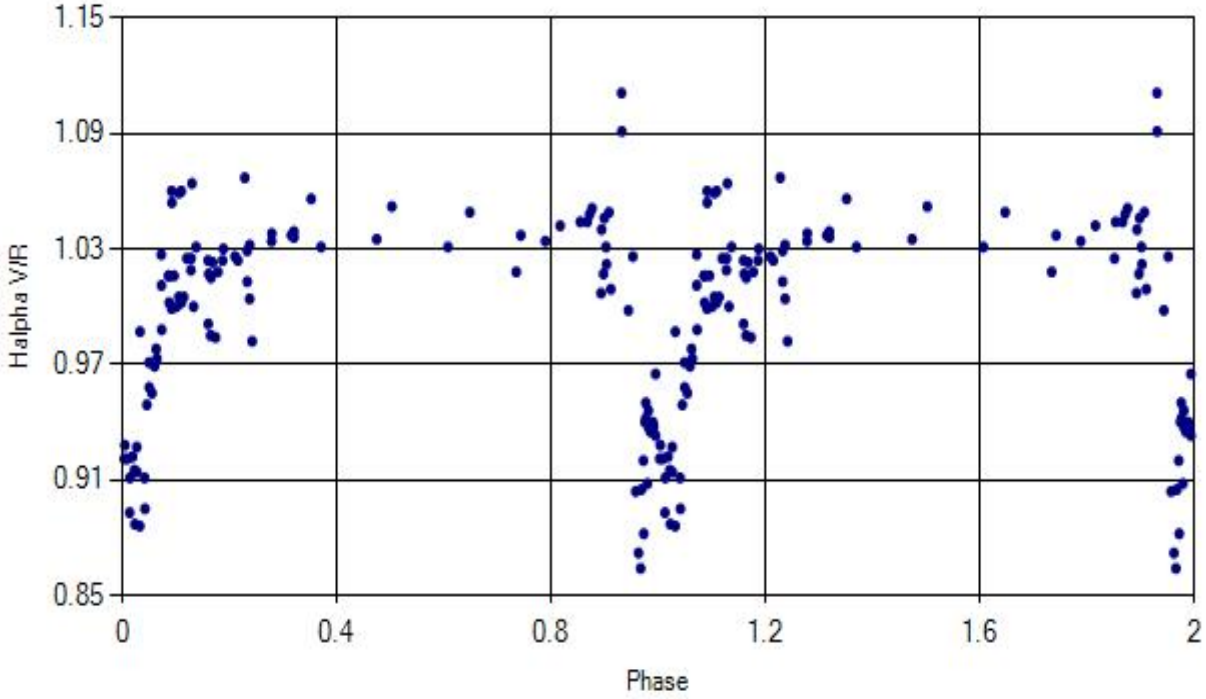
Periastron 2: 2456213 (2012-10-10)

Periastron 3: not observed

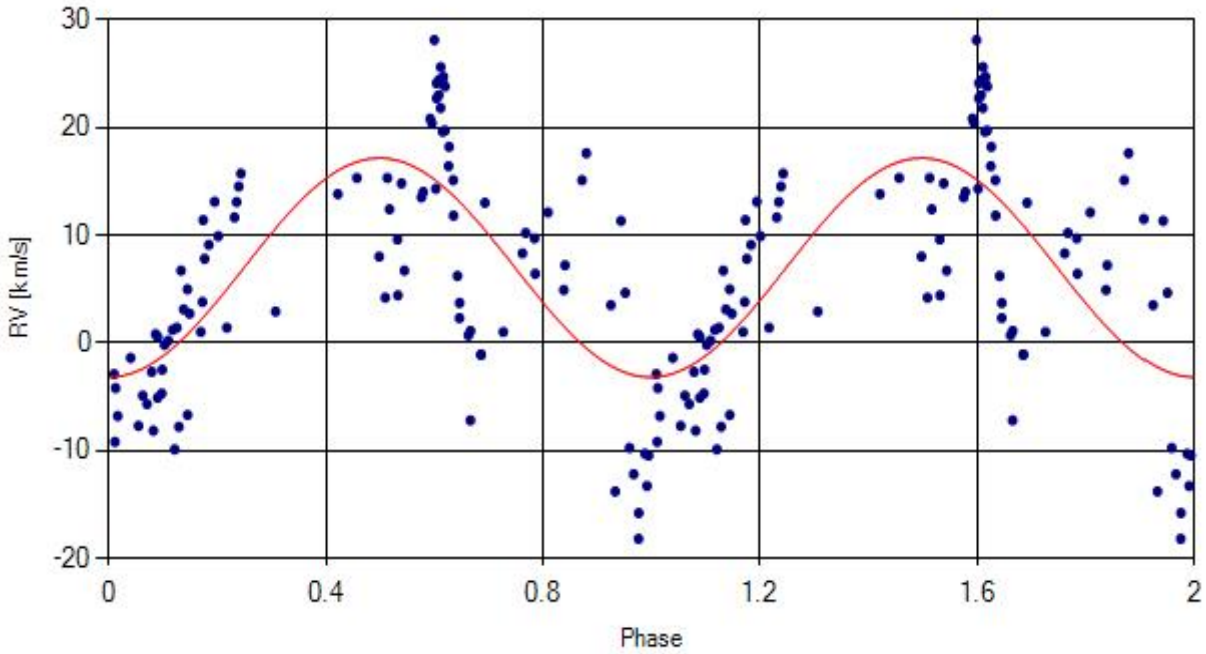
Periastron 4: 2456642 (2013-12-15)

Next: 2456871 (2014-08-01)

Next: 2457100 (2015-03-18)



Period = 219 d (± 4.5)
Amplitude = 0.058 (±0.0097)
T0 [JD] = 2456029.2 (± 8.2)
RMS = 0.047 km/s



Period = 253.8 d (± 5.9)
Amplitude = 10.2 km/s (±1.1)
T0 [JD] = 2455774.9 (± 12.8)
RMS = 7.7 km/s