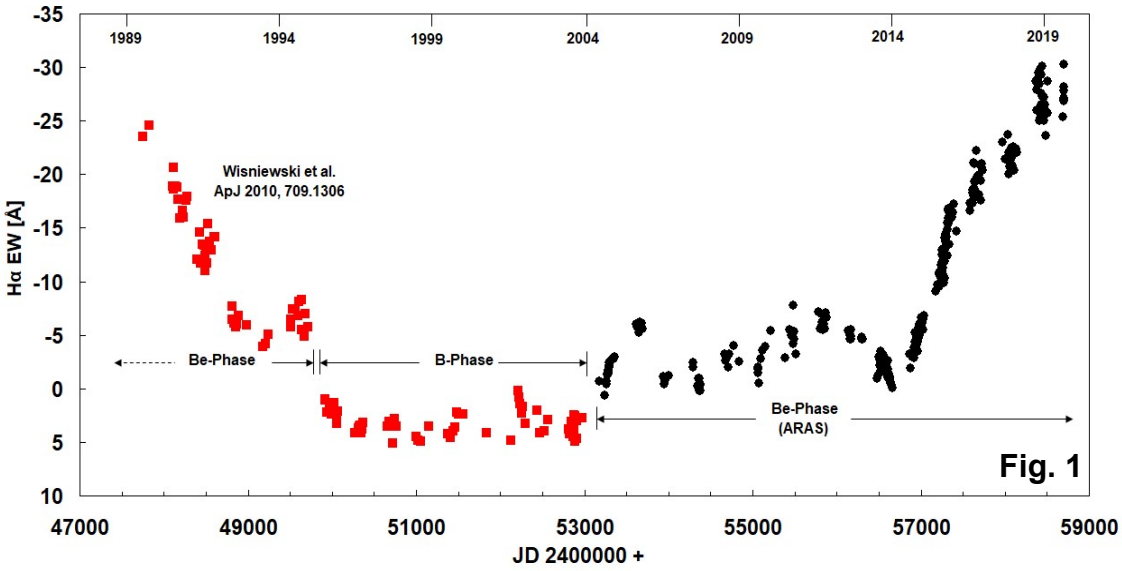


Fig. 1

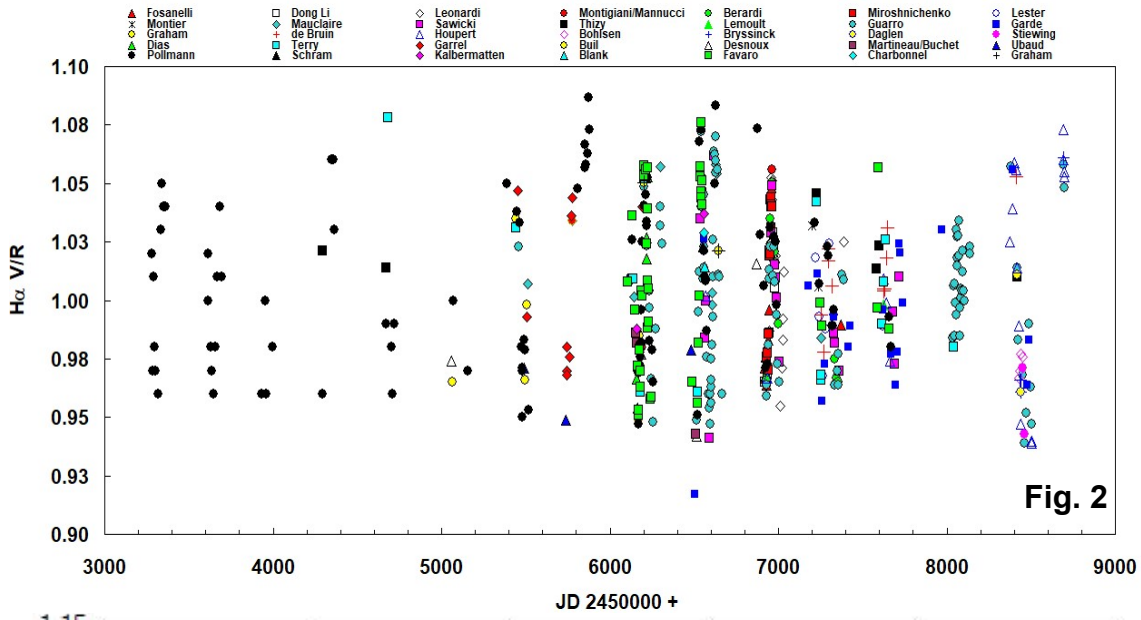


Fig. 2

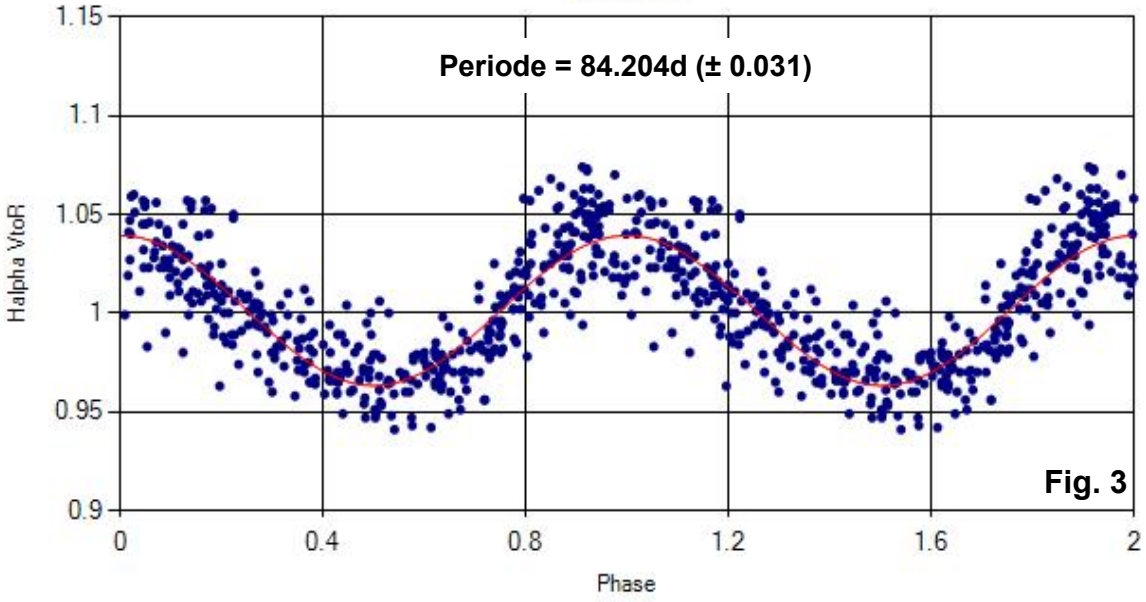


Fig. 3

E. Pollmann 2019-08-11

# Monitoring the Hα equivalent width (EW) and V/R of π Aqr

## Hα equivalent width

As discussed in *Bjorkman et al. (2002, ApJ, 573, 812),* π Aqr's previous disk likely developed in the early 1950s and persisted until December 1994. Analysis of spectroscopic data obtained after 1996, when the star was in a diskless "normal B star" phase, revealed it star has a close binary companion with a circular orbit and period of 84.1 days.

Fig. 1 indicates that the likely beginning of the disk transformation to its minimum state of pure absorption could be observed on 1995 July 15 (JD 2449914; EW = 1.1 Å). The temporal evolution of the Hα EW of π Aqr provides clear evidence of a disk-loss event from July 1995 until November 2003 (JD 2452945).

The timescale for π Aqr's disk-loss episode (~3055 days) corresponds to 36 complete orbits of its binary companion which suggests that the companion´s orbital motion was not responsible for triggering the disk-loss episode. After the start of its minimum pure absorption state, π Aqr's Hα EW remained until June 2004 (approx. JD 2453181). It's a nice coincidence that the ARAS EW monitoring began when π Aqr was building a new disk. As in Fig. 1, this process is going on very steeply since August 2014 (approx. JD 2456875).

## Hα V/R

The recent increase of the Hα EW needs a close attention, because it might be the beginning of a large disk development, such as that in the 1950's. The fact that nothing has changed to the V/R variations yet (Fig. 2) is probably due to a slow disk re-structuring process. As more matter is added to the disk, its density structure will probably change and the density enhancement, which is moving with the period of 84.2 d (Fig. 3) in phase with the secondary companion now *(Zharikov et al. 2013, A&A, 560, A30*), may be modified.

What we see is that Be stars with small disks that result in a weak line emission (such that in π Aqr between 2001 and 2005) may show phase-locked V/R variations (*Hα-V/R period analysis of the binary π Aqr, Pollmann, IBVS No. 6023, 2012).* Be stars with larger disks (or with disks that contain more mass) and a stronger line emission show much larger periods of the V/R variations that do not match the orbital periods (examples are γ Cas, ζ Tau, 48 Lib). It is unknown what happens when a Be star disk gets larger and exhibits a stronger line emission. We suggest that the phase-locked V/R variations will not be observed anymore, but rather larger period V/R variations may develop.

However, when and whether such a transition occurs is unknown as well. If π Aqr is indeed going to increase its disk mass, then it is the right target to start getting answers to the above questions. Perhaps, there are already some data on stars that show such a transition between different periods, but π Aqr is in transition right now and a dense monitoring is very valuable.

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