

## VV Cephei Campaign 2025 – Newsletter December 2024

Manfred Schwarz & Ernst Pollmann, 2025-01-02

At first, thank you for your effort and the numerous spectra sent in 2024.

We wish you a happy new year, health for you and your family.

Since the campaign started in September 2024, 15 participants have contributed 165 spectra of VV Cephei (average 1.55 spectra per day), that means, 2.5 periods of the axial precession of the B-star have passed. The 43-day period remains clearly identifiable in all measurements.

Additionally, we included now radial velocity measurements of the V- and R-peak. Also, this parameter shows clearly that period.

**Fig. 1: H $\alpha$  EW since September 16<sup>th</sup>, 2024**

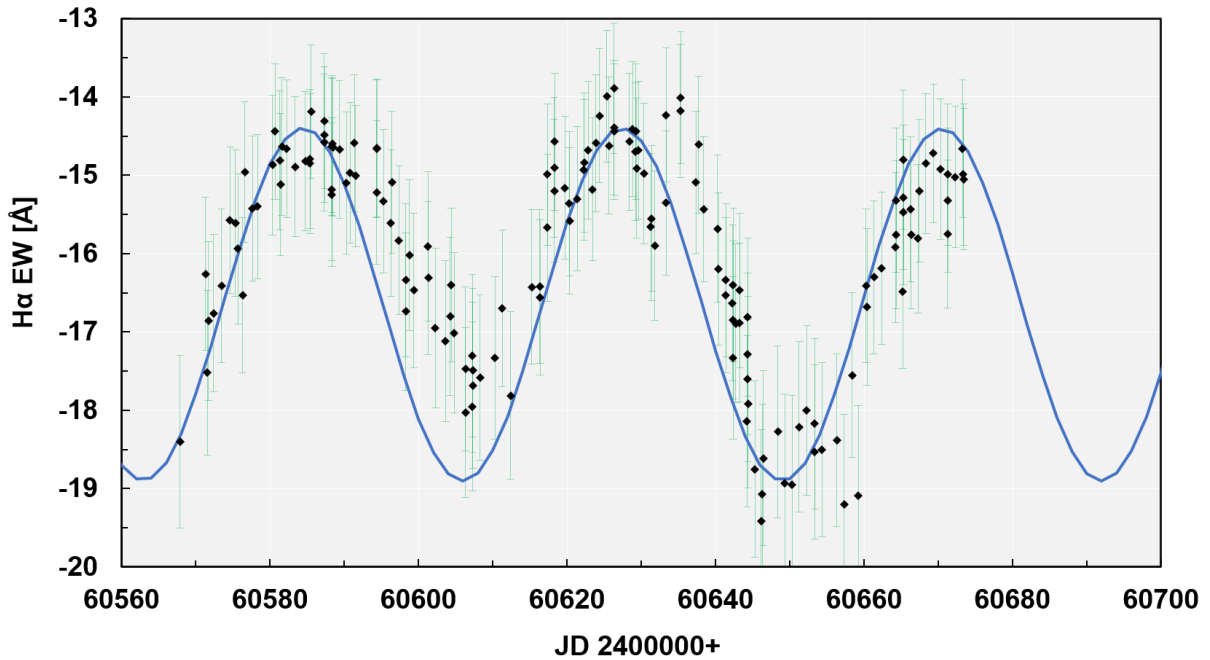


Figure 1 shows the total H $\alpha$  equivalent width, as the sum of the V and R emission components:

The blue line represents the fitted (expected) period.

**Fig. 2: H $\alpha$  EW of the V-component since September 16<sup>th</sup>, 2024**

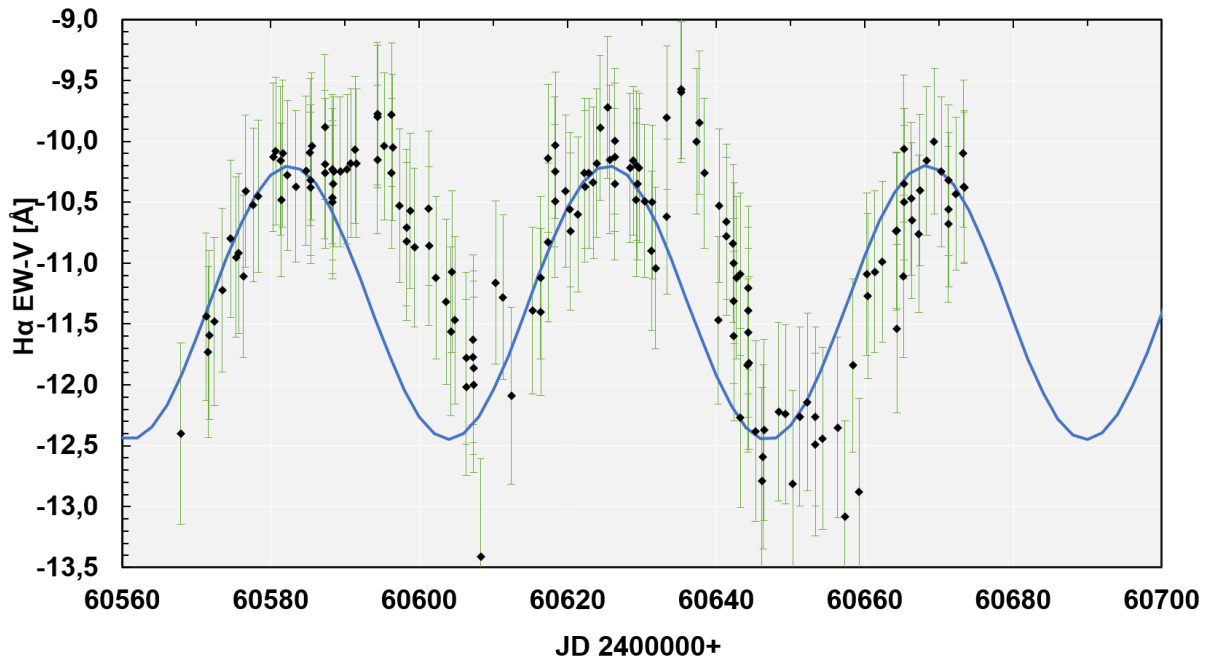


Figure 2 shows the equivalent width of the V component.

**Fig. 3: H $\alpha$  EW of the R-component since September 16<sup>th</sup>, 2024**

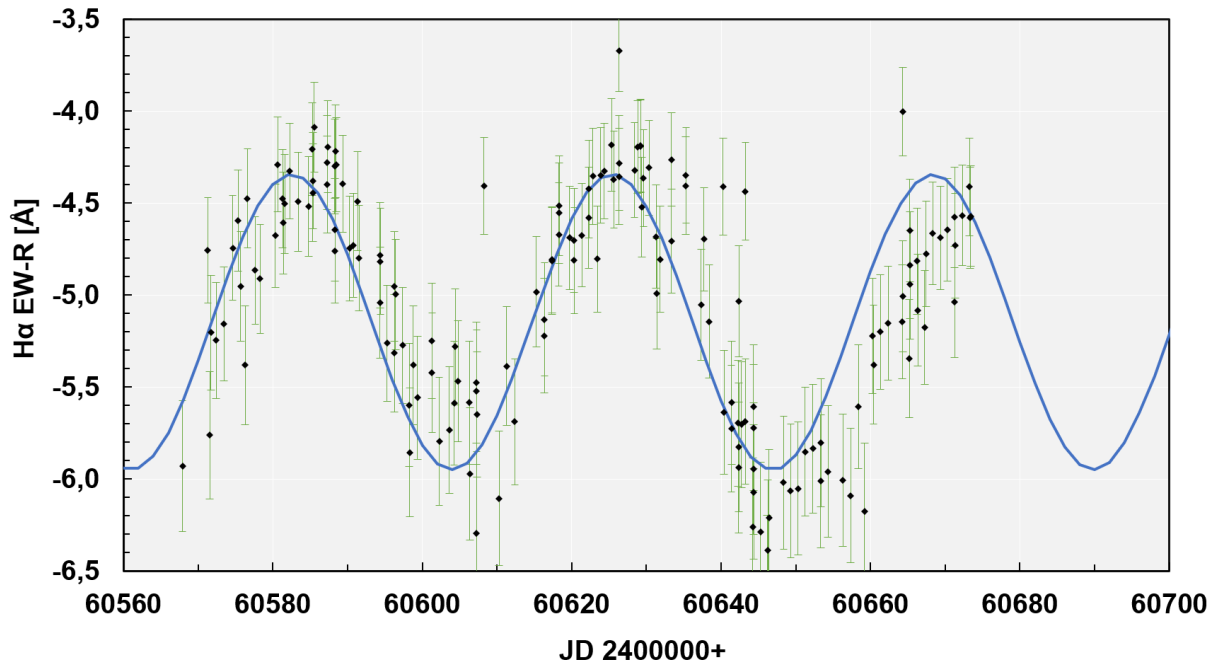
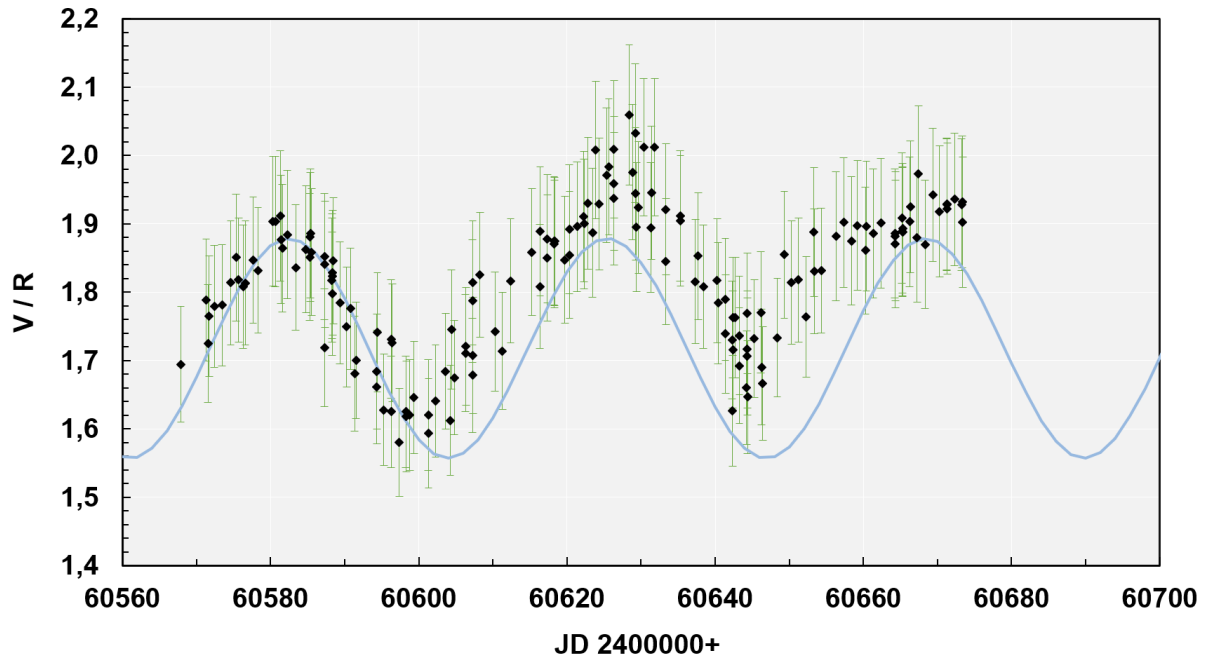


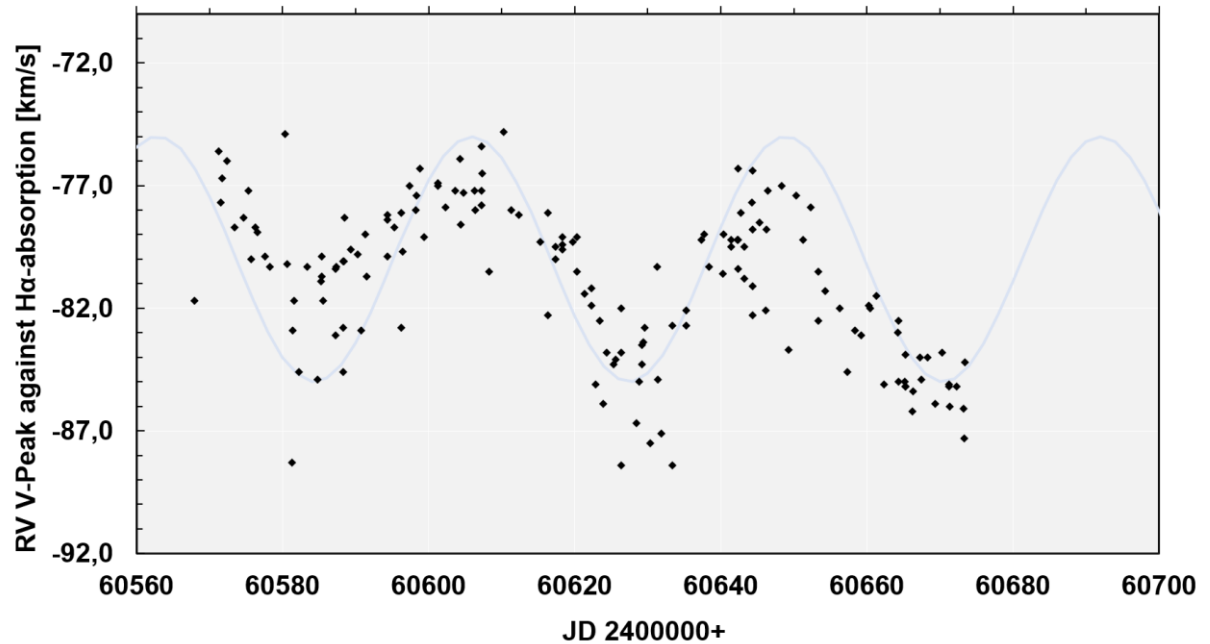
Figure 3 shows the equivalent width of the R emission component.

**Fig. 4: Ratio of the V-Emission Flux versus the R-Emission Flux since September 16<sup>th</sup>, 2024**

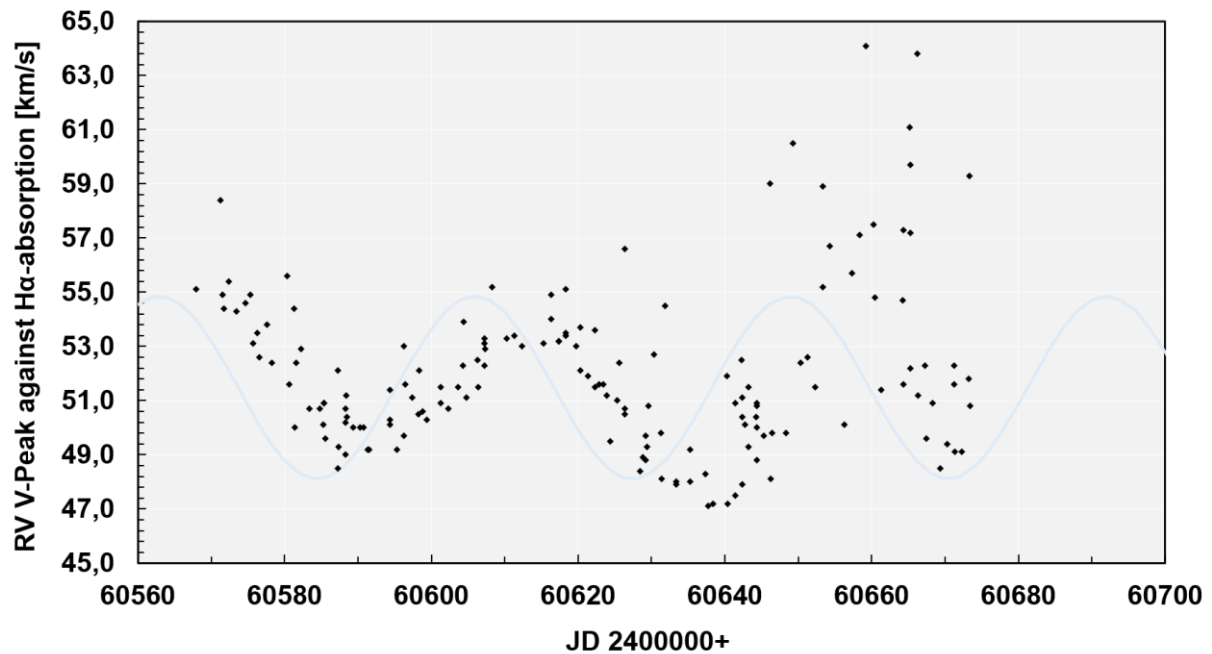


The V/R ratio reflects clearly the precession of the B star rotational axis.

**Fig. 5: Radial Velocity of the V-Peak versus the Ha-central depression**



**Fig. 6: Radial Velocity of the R-Peak versus the Ha-central depression**



Related to the Ha central absorption line, generated by the neutral hydrogen cloud which extends far beyond the entire system, the radial velocity of the emission changes synchrony with the precession of the B-star rotational axis. The total emission is generated by the two emission lobes along the rotational axis and the B star disk itself. As a result of the precession movement of the rotational axis, the Ha peaks shifts periodically towards to blue when the axis is tilt to the observer and vice versa to red when the axis is tilt away from the observer (comparable to the rotational axis of the earth).

The actual total H $\alpha$  emission is superimposed by the absorption of the neutral hydrogen cloud. This results in a central absorption line at the centre of the Ha emission, so that the total emission is split into two emission components, a V-peak and an R-peak. With reference to the stable wavelength of the absorbing hydrogen cloud, the radial velocity of the emission peaks can be measured.

The change in radial velocity is not very large, especially at the R-peak. It should be noted that the resolution of the submitted spectra per pixel ranges between 3 and 8 km/s. Therefore, in these diagrams, the signal-to-noise ratio is significantly lower compared to, for example, the equivalent width measurements.

Now begins a particularly exciting time, as the B-star will be at periastron in March. We hope to be able to observe effects by mass interactions during this period and in the following months. Therefore, we kindly ask you to stay involved in the project so that we can maintain the high density of measurement points.

**Original paper of the campaign:**

<https://www.dropbox.com/scl/fi/qto1zqiwan9x4vcj4yk94/VV-Cep-2025.pdf?rlkey=sxk6j3cdntkbfumk3pqsh1yfc&dl=0>

**Newsletter September 2024:**

[https://www.dropbox.com/scl/fi/m3oeplwahcld5jyp29ij6/vvCep\\_Newsletter\\_202409.pdf?rlkey=xufqf084yqd81hbda2ba5odap&dl=0](https://www.dropbox.com/scl/fi/m3oeplwahcld5jyp29ij6/vvCep_Newsletter_202409.pdf?rlkey=xufqf084yqd81hbda2ba5odap&dl=0)

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