Radial-velocity variations of the Be star BU Tauri

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Previous work on BU Tauri no.1

- Katahira, J. et al., 1996 - rich observational history (359 spectra), measured Hα absorption , derived orbital period P = $218\overset{\mathrm{d}}{.}0$, eccentricity $e = 0.60$ We present their RV[phase] dependency in next slide.

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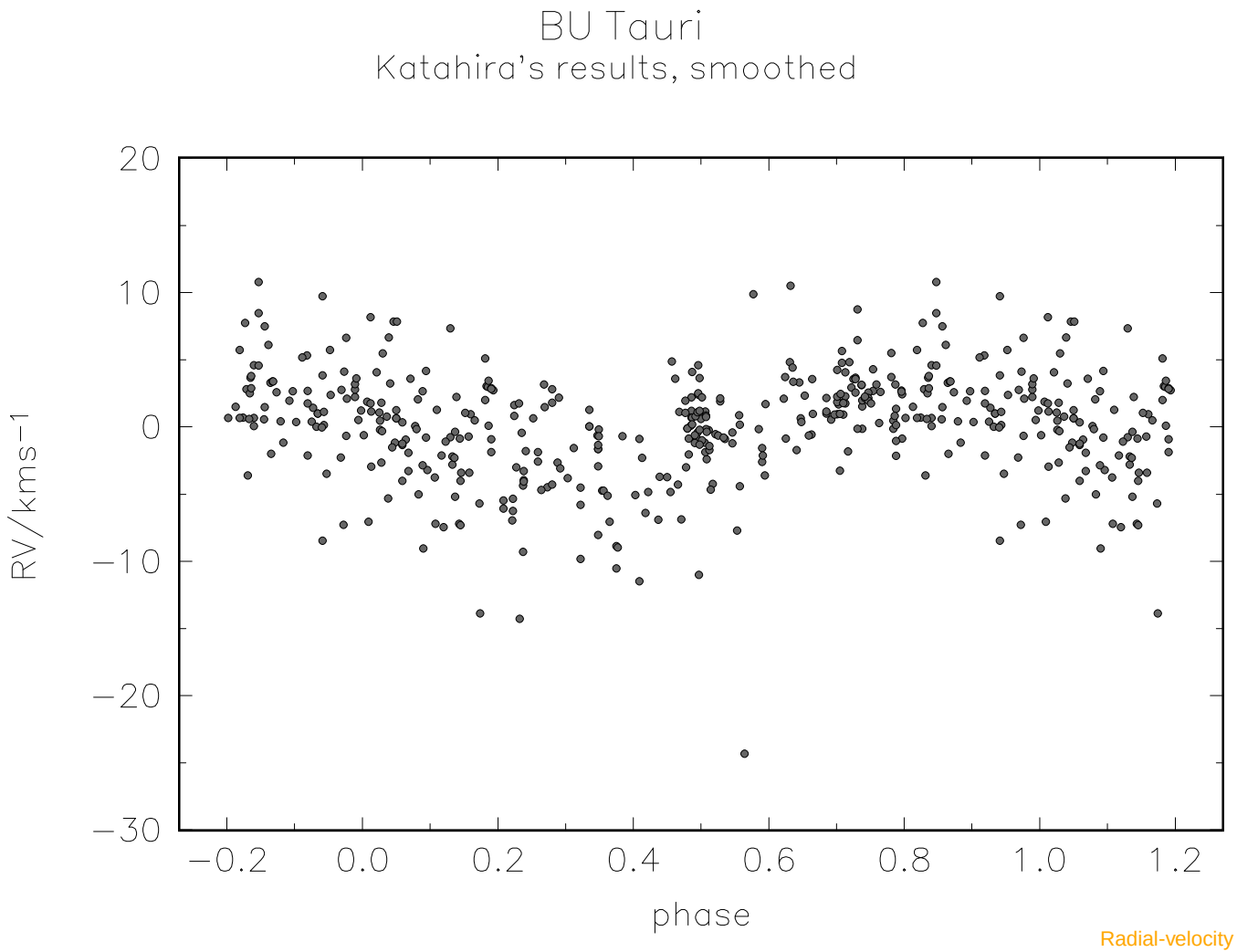
- Rivinius, T.H.; Štefl, S; Baade, D. - Bright Be stars

Previous work on BU Tauri no.2



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- Rivinius et. al studied several Be stars including BU Tauri , discussing also possible connection between duplicity and the Be phenomenon. They were unable to confirm any RV variations of BU Tauri with the 218-d period.

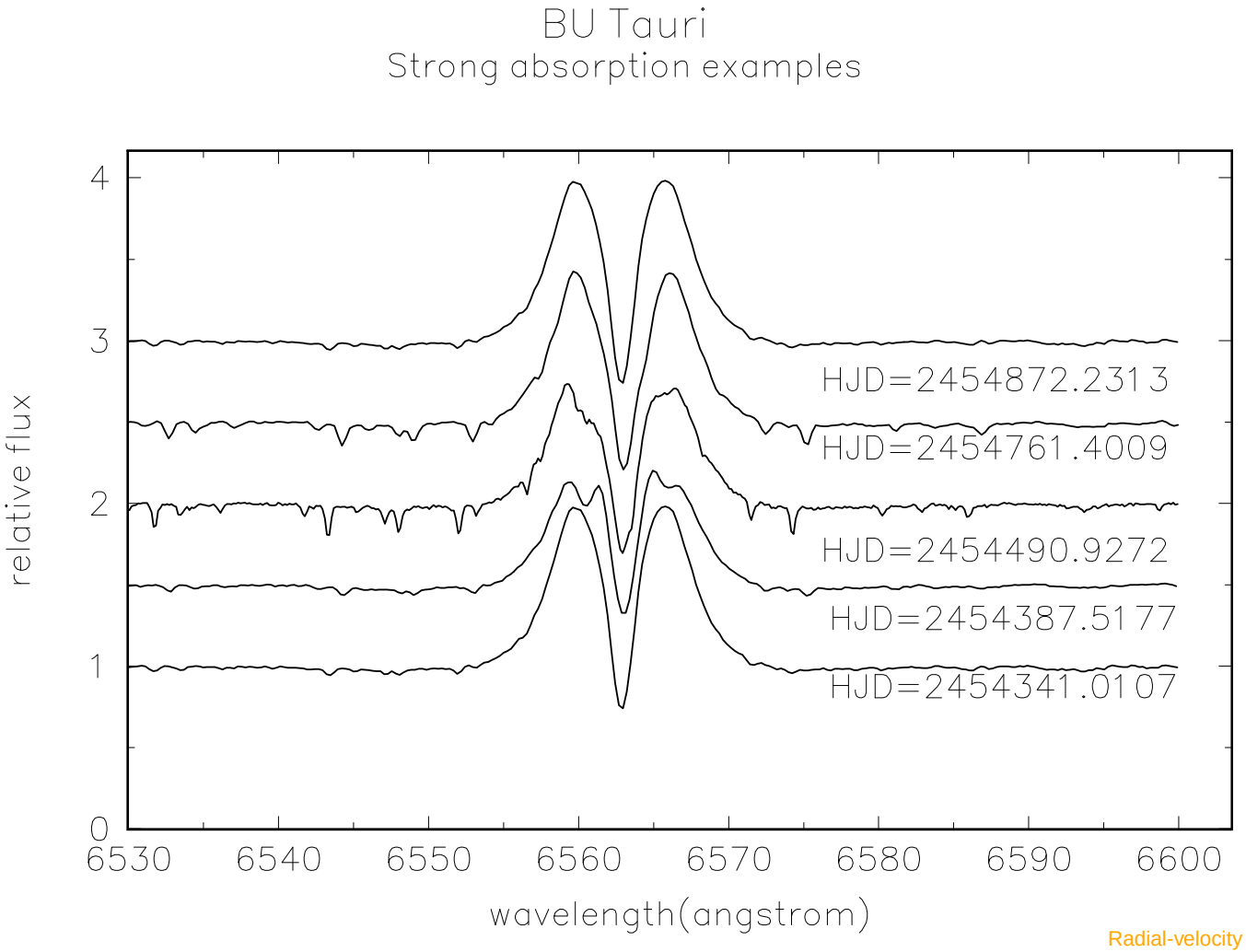
Spectral variations of BU Tauri

Next three slides contain examples of Hα shape ordered according to the strength of the Hα line emission

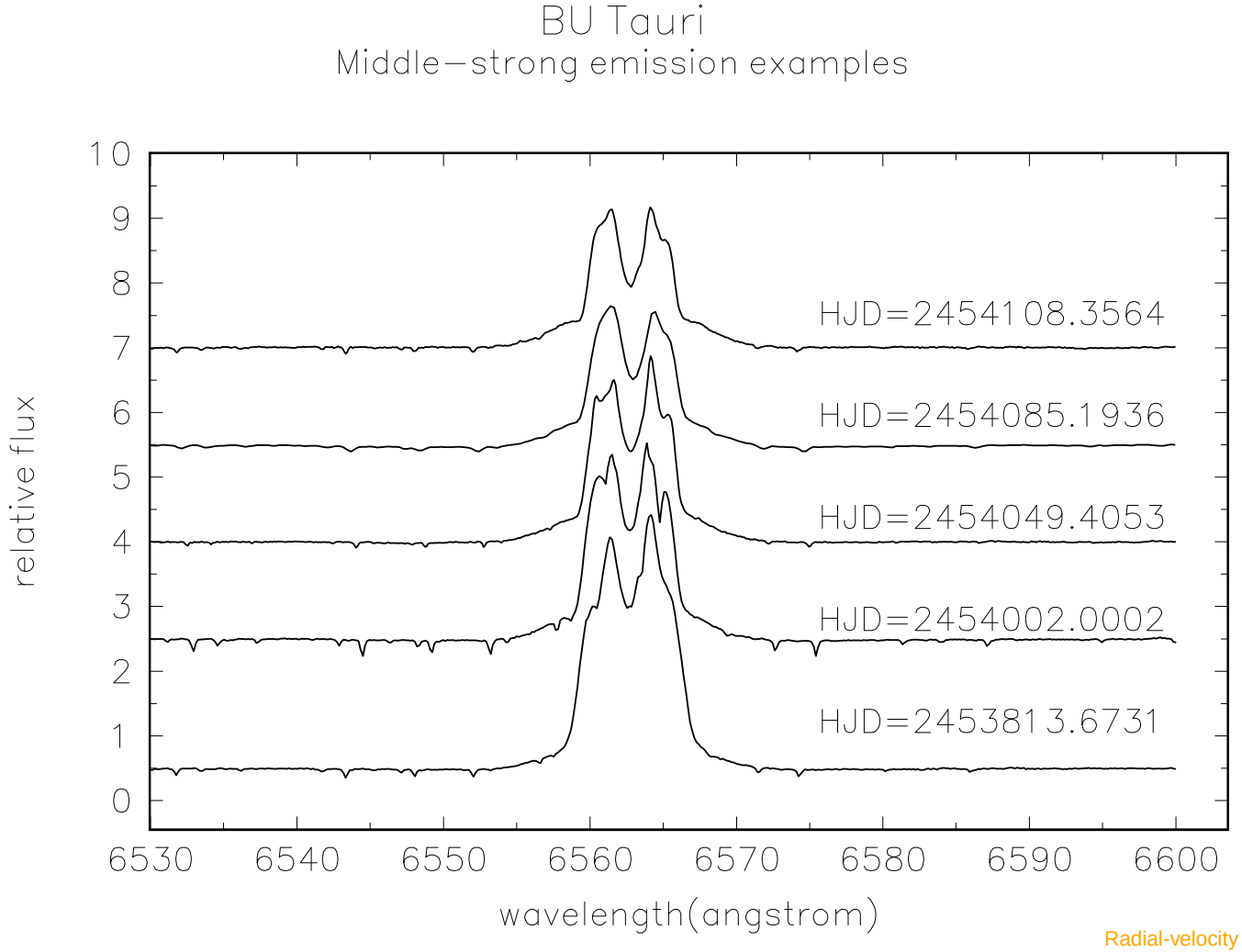
- Weak emission
- Moderately strong emission
- Strong emission

After these examples: He I shape variations

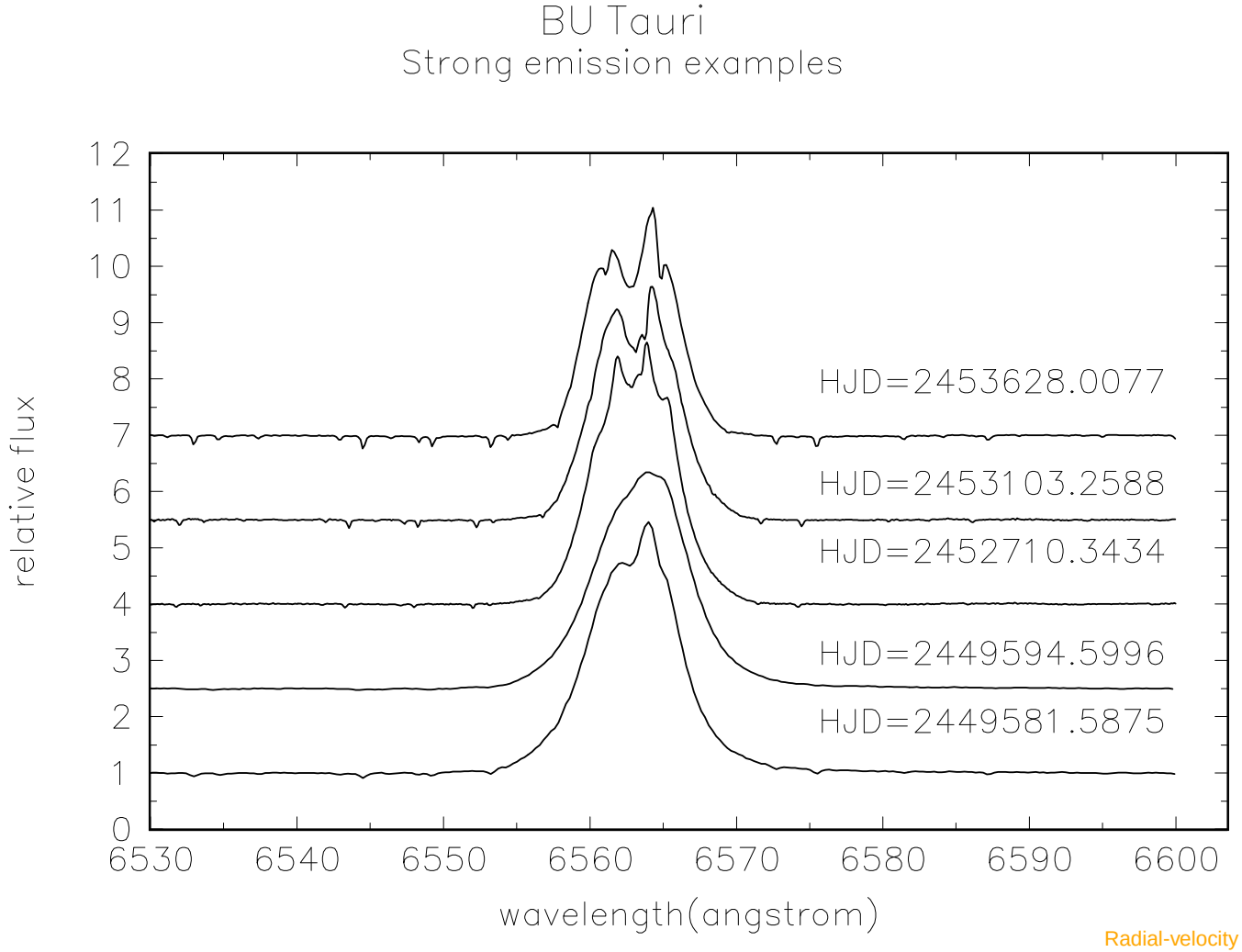
Hα shape variations no.1



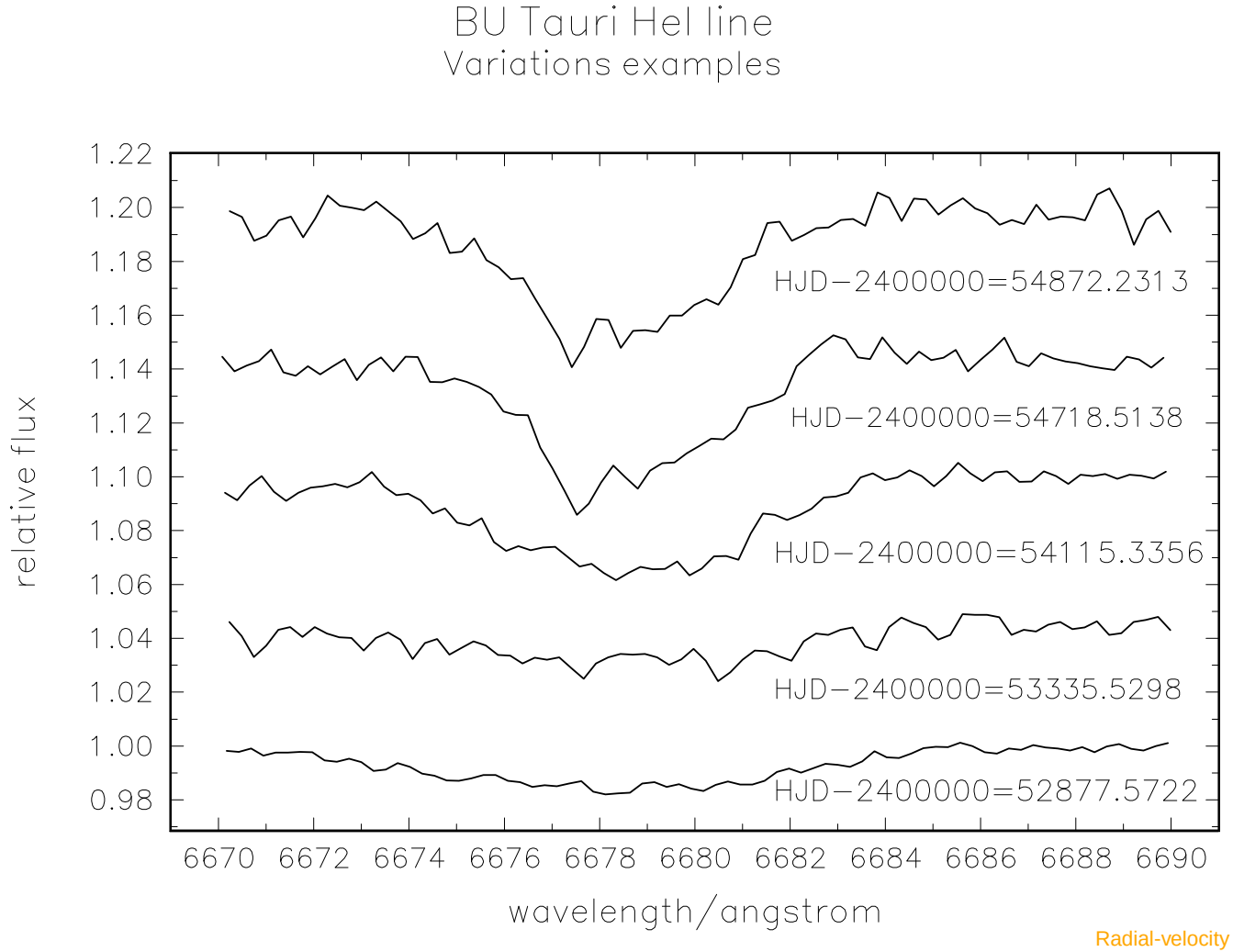
Hα shape variations no.2



Hα shape variations no.3



HeI shape variations



Deriving RV's of the HeI line

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- Difficult to decide where to measure
- Generally very low absorption minimum

Problems with Hα measurements

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- Almost no absorption core on Hα when the emission is strong
- Asymmetry of the Hα peak
- Very different results between Hα emission and Hα absorption results during phases with moderately weak and weak absorption
- No meaningful results from HeI because of reasons discussed above
- We compare radial-velocity results obtained from measuring Hα wings and Hα core.

Comparison for strong emission

All presented data were obtained during strong emission phase from Ondřejov Observatory.

HJD-2400000	Em.RV[kms^{-1}]	Abs.RV[kms^{-1}]
49581.5875	8.91	-5.74
51227.6834	15.24	-7.01
52710.2434	9.54	-1.08
53628.0077	3.47	-4.98

During strong emission on Hα results differ a lot!

Comparison for strong absorption

All presented data were obtained during strong absorption phase from Ondřejov Observatory.

HJD-2400000	Em.RV[kms^{-1}]	Abs.RV[kms^{-1}]
54341.0107	8.59	9.27
54387.5177	7.69	8.86
54490.2613	2.59	6.11
54761.4009	10.97	10.38
54872.2313	-0.15	0.44

During strong absorption on Hα are results almost equal!

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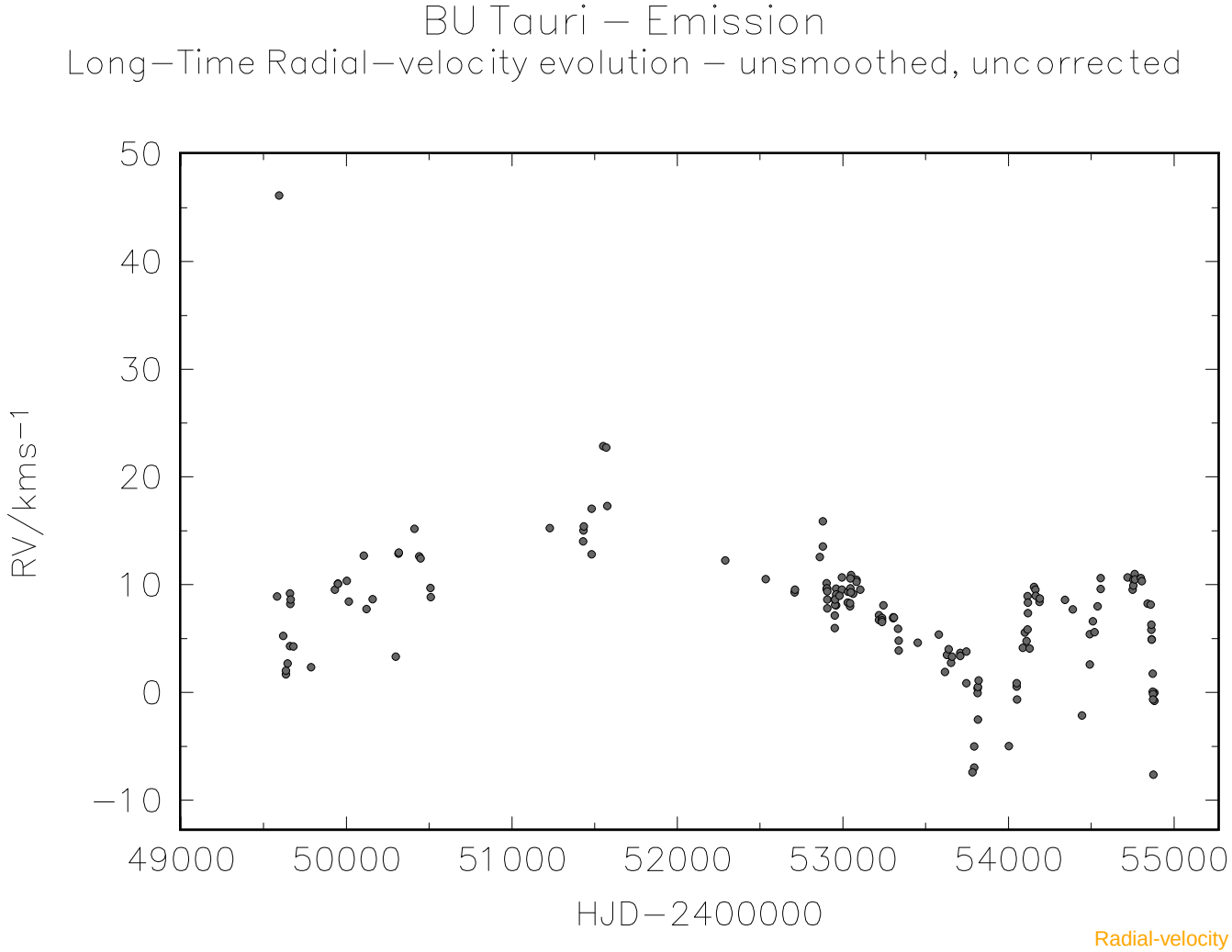
- All data could be analyzed, but separately core and wings
- Absorption core is influenced by envelope, it may mislead us, while determining shape of orbit and period

All radial-velocity results gained

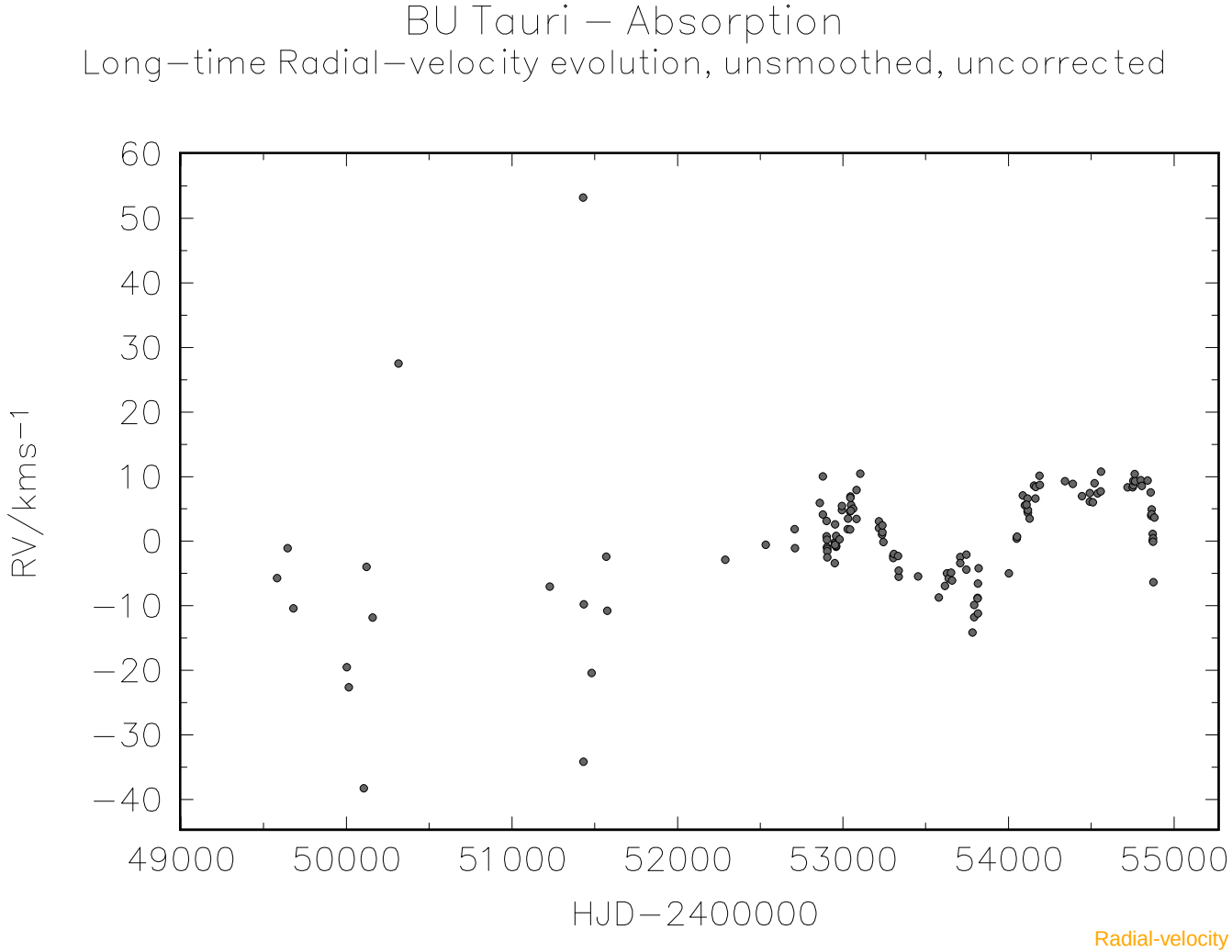
In next two slides: All data gained from measurement on Hα unsmoothed, uncorrected for:

- Emission wings of Hα
- Absorption core of Hα

Data gained on Hα emission



Data gained on Hα absorption

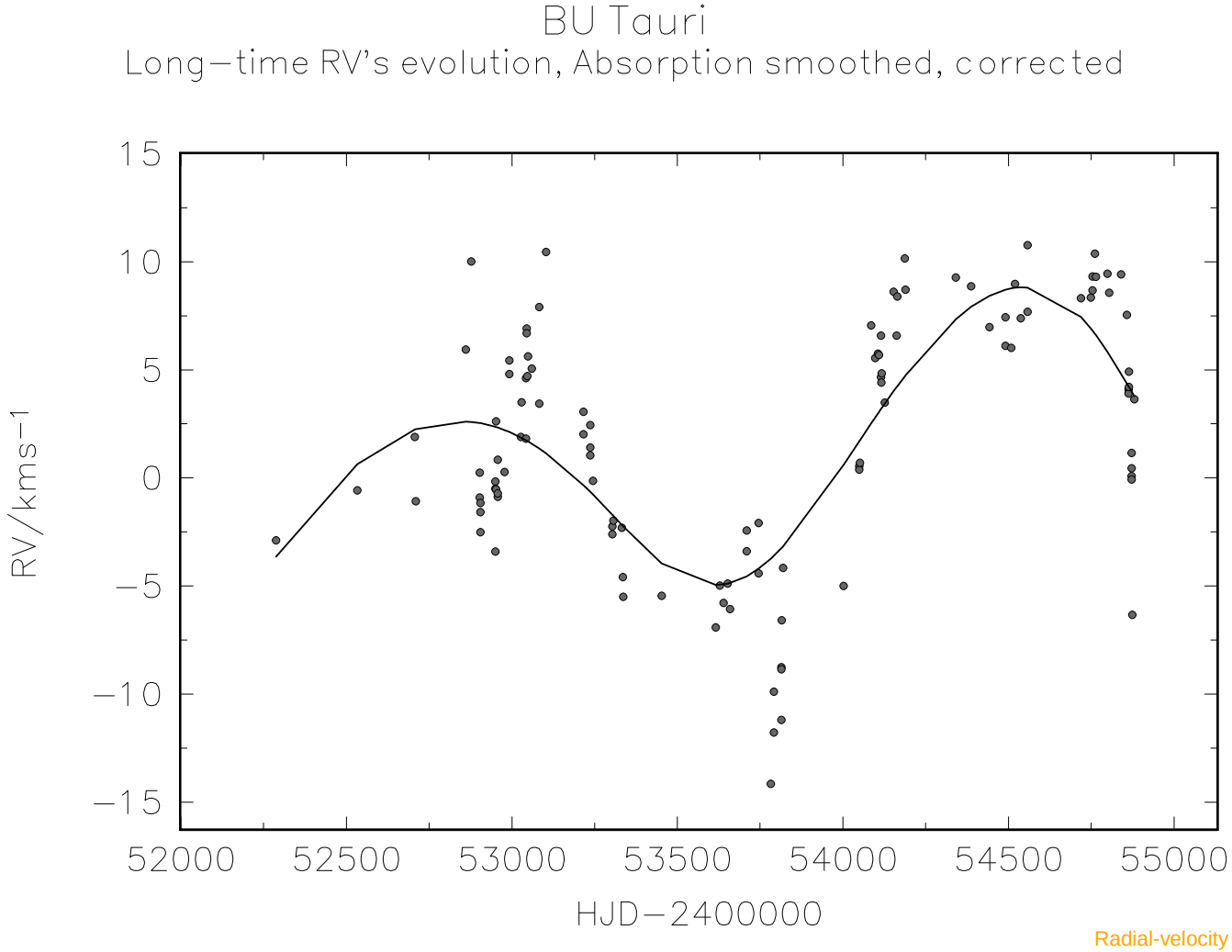


Long-time RV's evolution

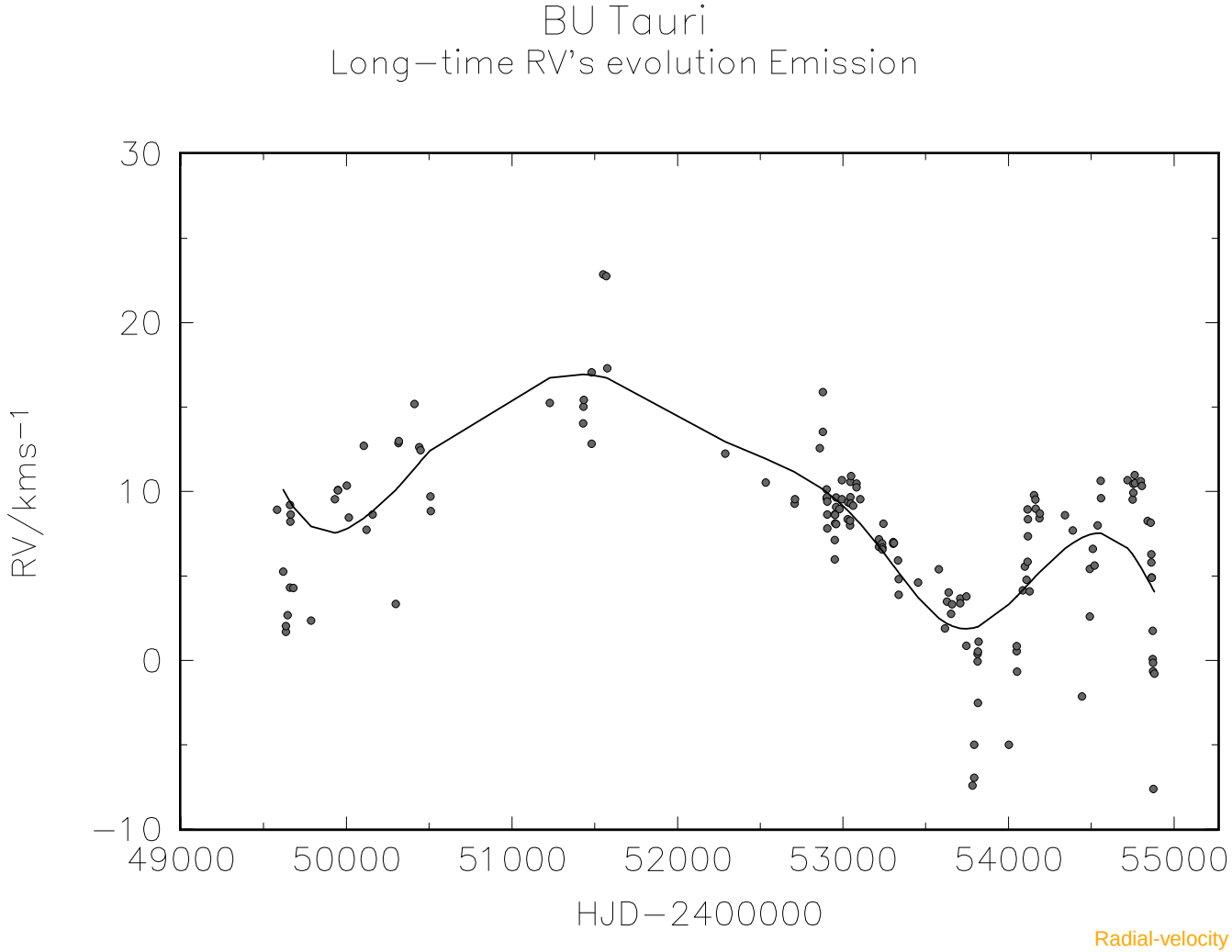
Results obtained from measuring radial-velocity after smoothing in program HEC13.

- Absorption wings of Hα
- Emission core of Hα

RV's evolution Hα of absorption



RV's evolution Hα of emission



Period analysis in HEC27

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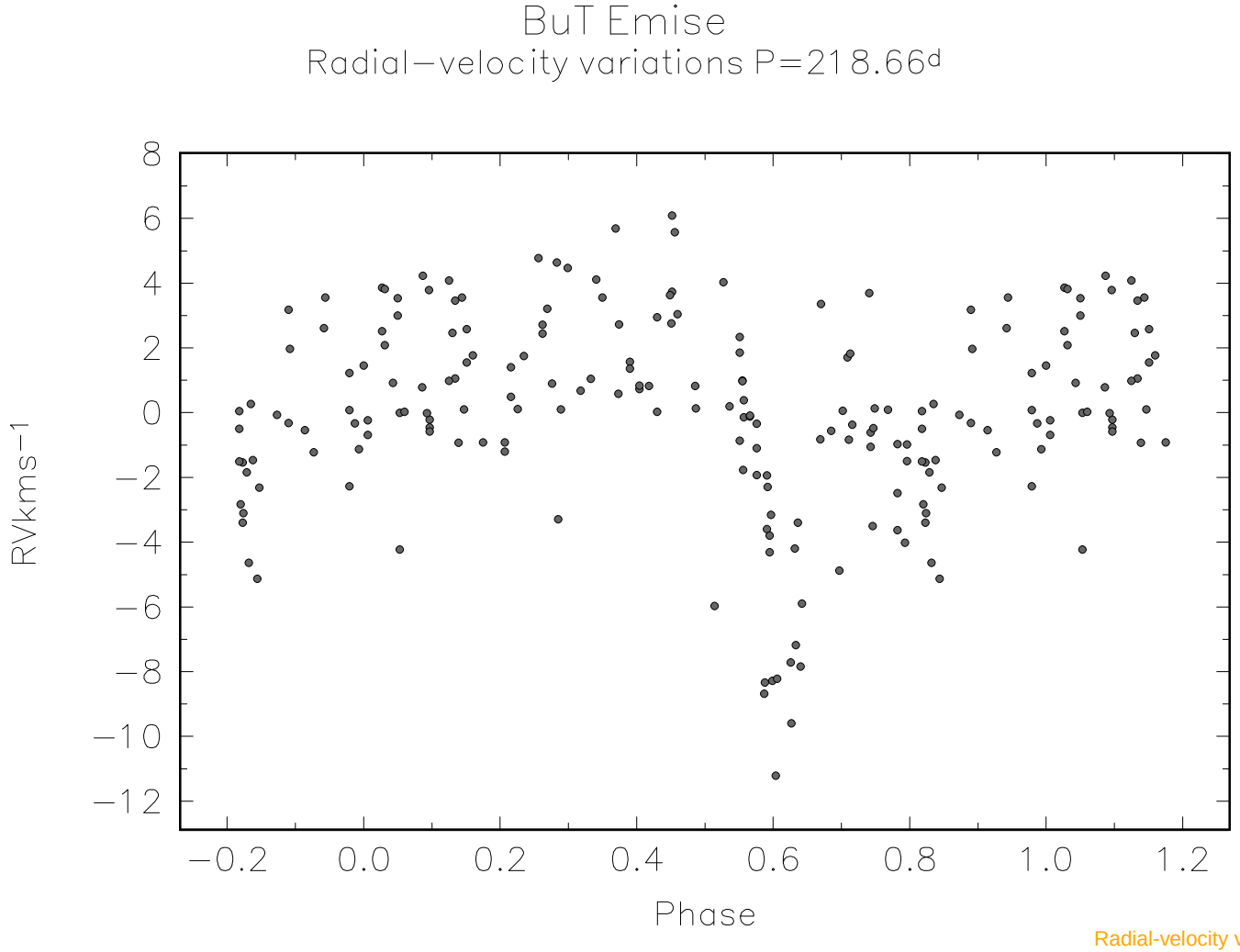
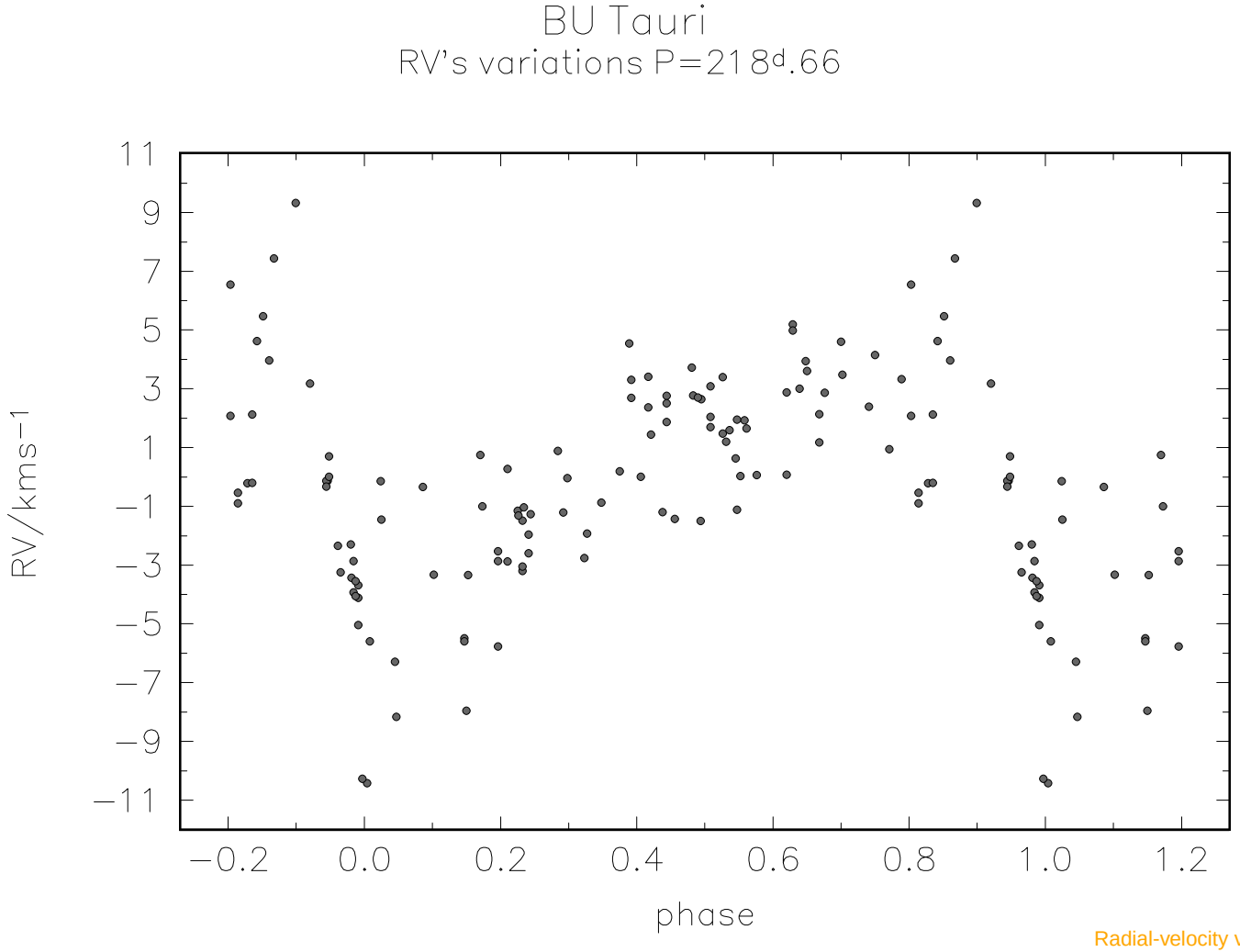
- Periods obtained:
- Emission : $\{218^{d}.7; 217^{d}.4; 218^{d}.0\}$
- Absorption : $\{218^{d}.7; 220^{d}.0; 217^{d}.4\}$
- Note strange behaviour - RV's increasing rapidly to the dependency maximum

RV's variations emission



RV's variations absorption



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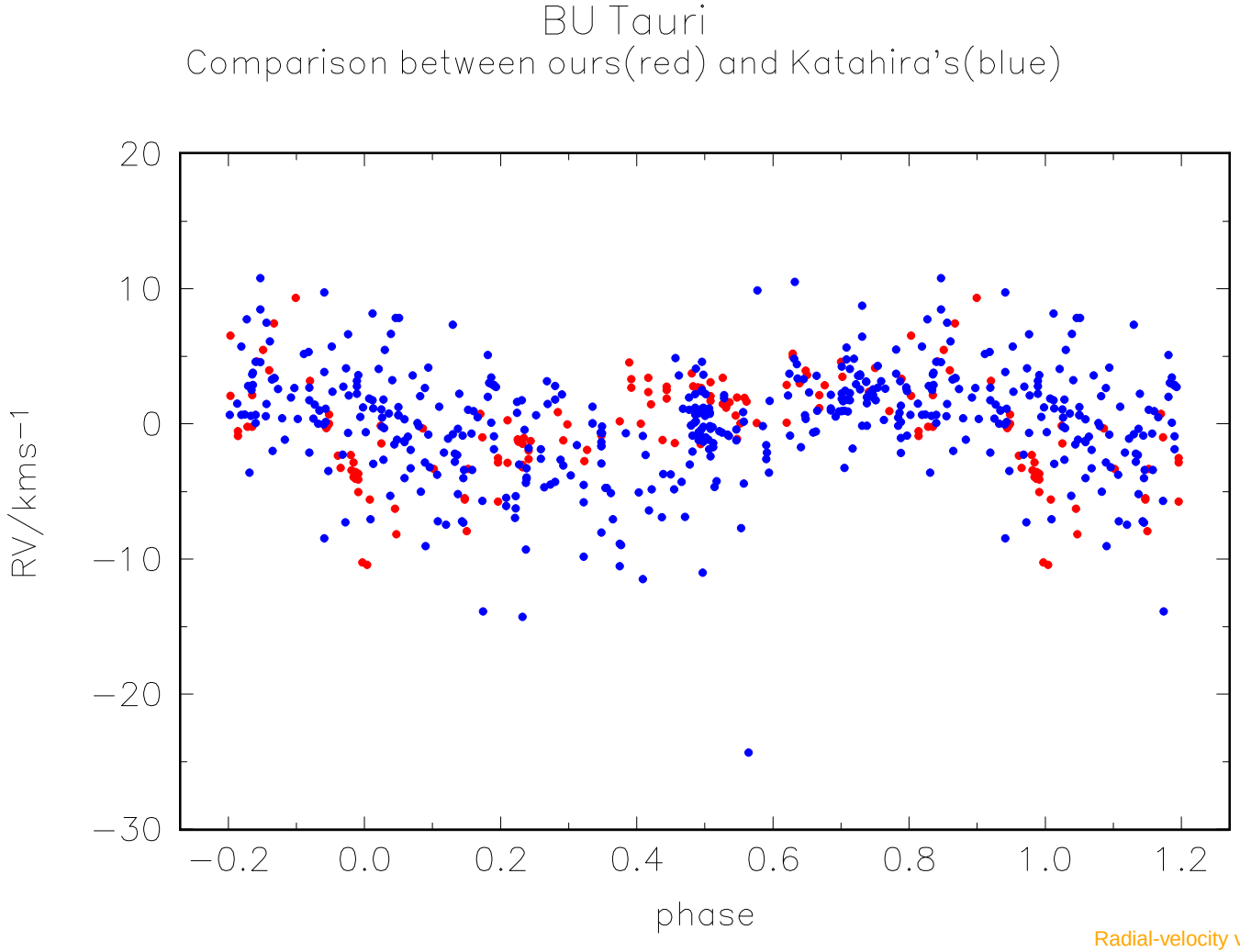
- Next slide contains comparison between ours and Katahira's results gained on Hα core

Ours:Katahira's results P=218.d7



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- Data ratio: 359(Katahira) vs. 112(Us) - it seems the period would even converge P=$218^{d}.7$, if we had more data

Problem

- Problem of interpretation of peculiar RVs near one conjunction - opposite to the rotational (Rossiter) effect

Conclusion

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- The same we expect from shape of the orbit and maybe strange behaviour in radial-velocity (phase) dependency will disappear or there will be more evident explanation
- We plan to analyse V/R variations and expect confirming the period P = $218^{\mathrm{d}}.7$