

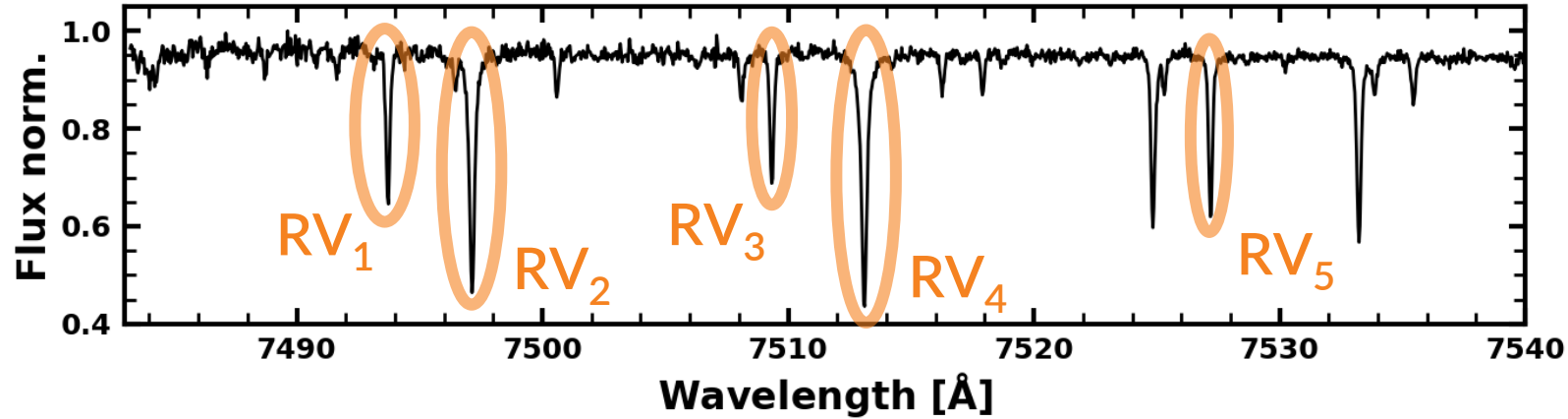
Sensitivity to activity of M dwarf spectral lines

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University of Warwick

Motivation Activity on individual lines

G3
dwarf



CARMENES
observation
S/N~140

Data

CARMENES spectra

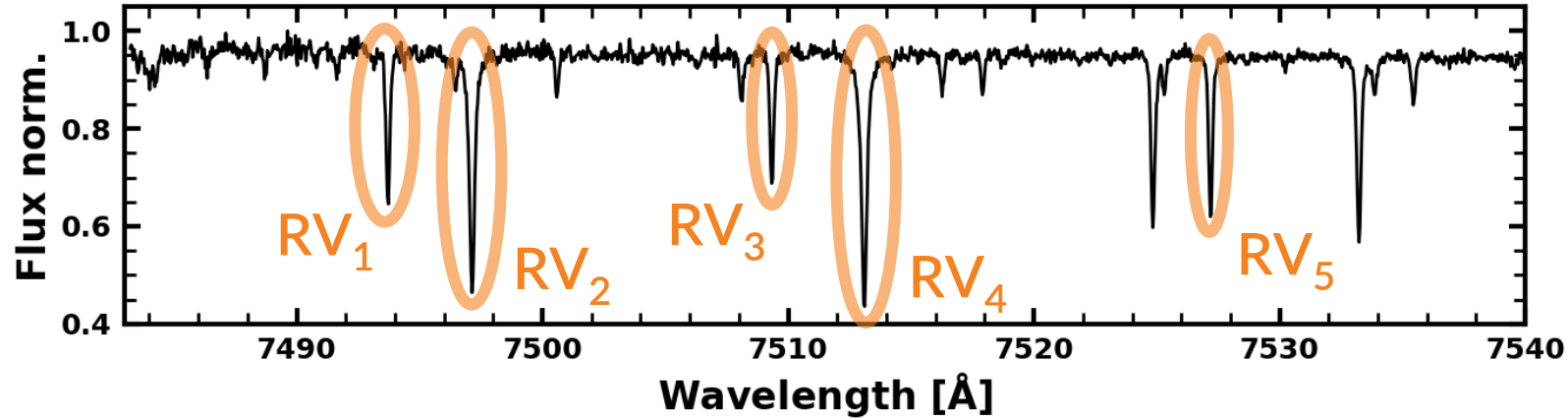
- ▶ 520 – 960 nm, R = 94 600
- ▶ Initial GTO survey of M dwarf stars

Our sample

- ▶ 6 active M dwarfs
 - ▶ J < 9 mag
 - ▶ vsini < 7 km/s
 - ▶ > 20 observations
 - ▶ RV scatter > 15 m/s

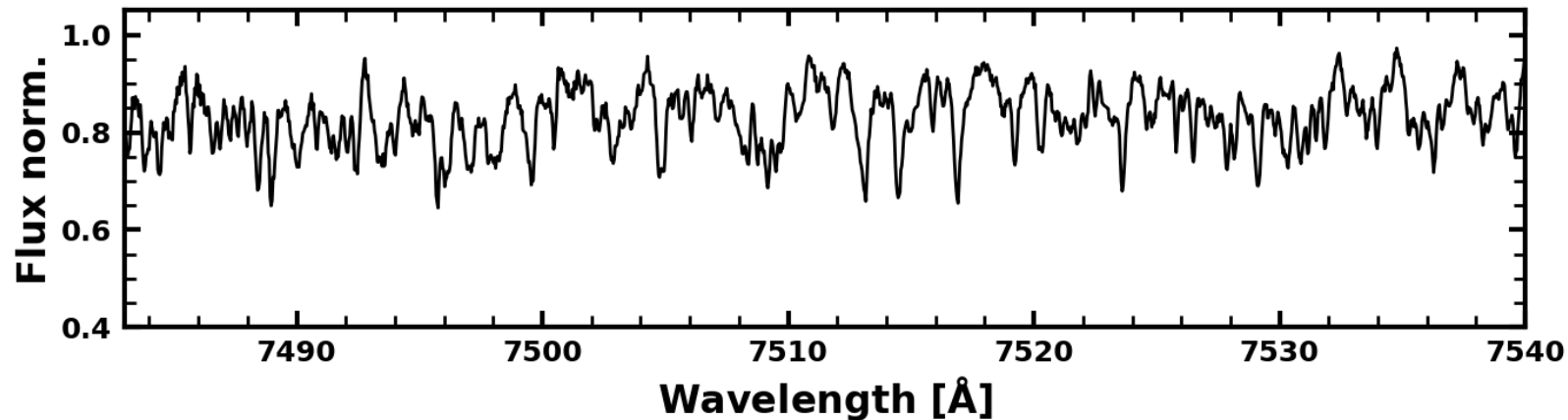
Activity on individual lines

G3
dwarf



CARMENES
observation
S/N~140

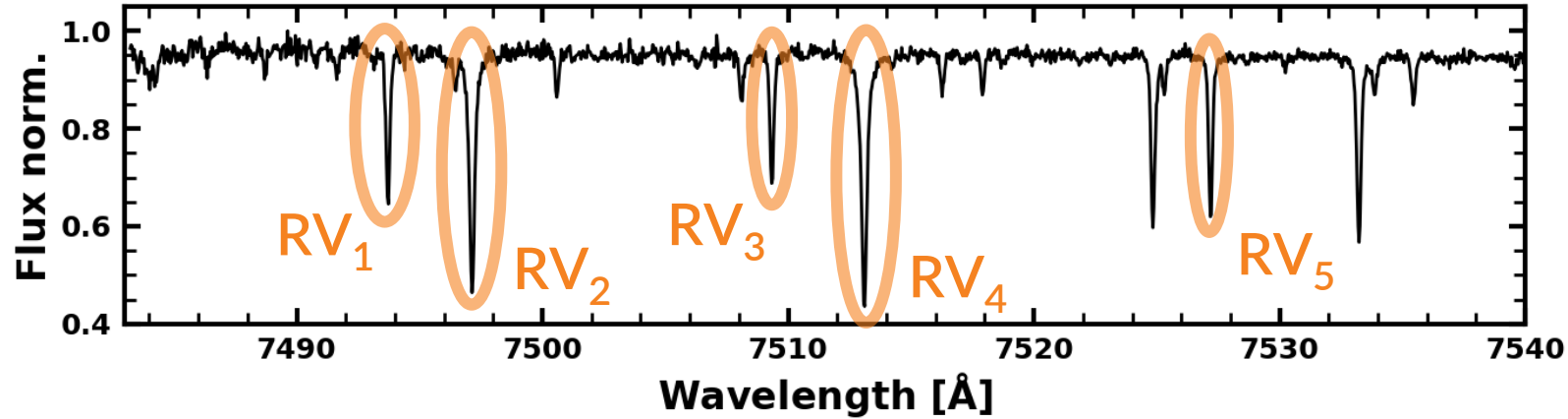
M4.5
dwarf



CARMENES
observation
S/N~140

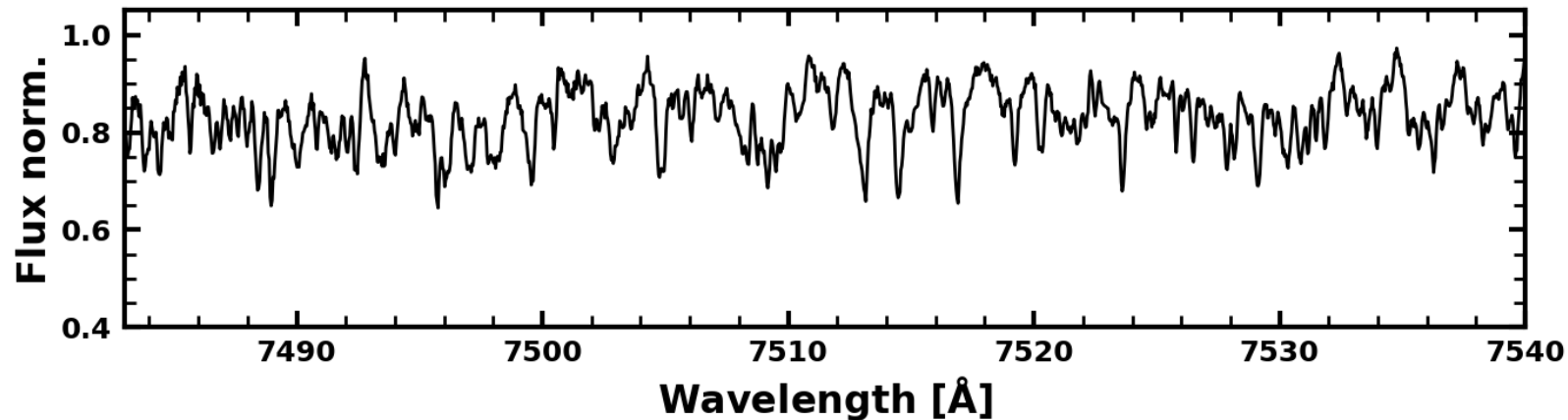
Activity on individual lines (?)

G3
dwarf



CARMENES
observation
S/N~140

M4.5
dwarf



CARMENES
observation
S/N~140

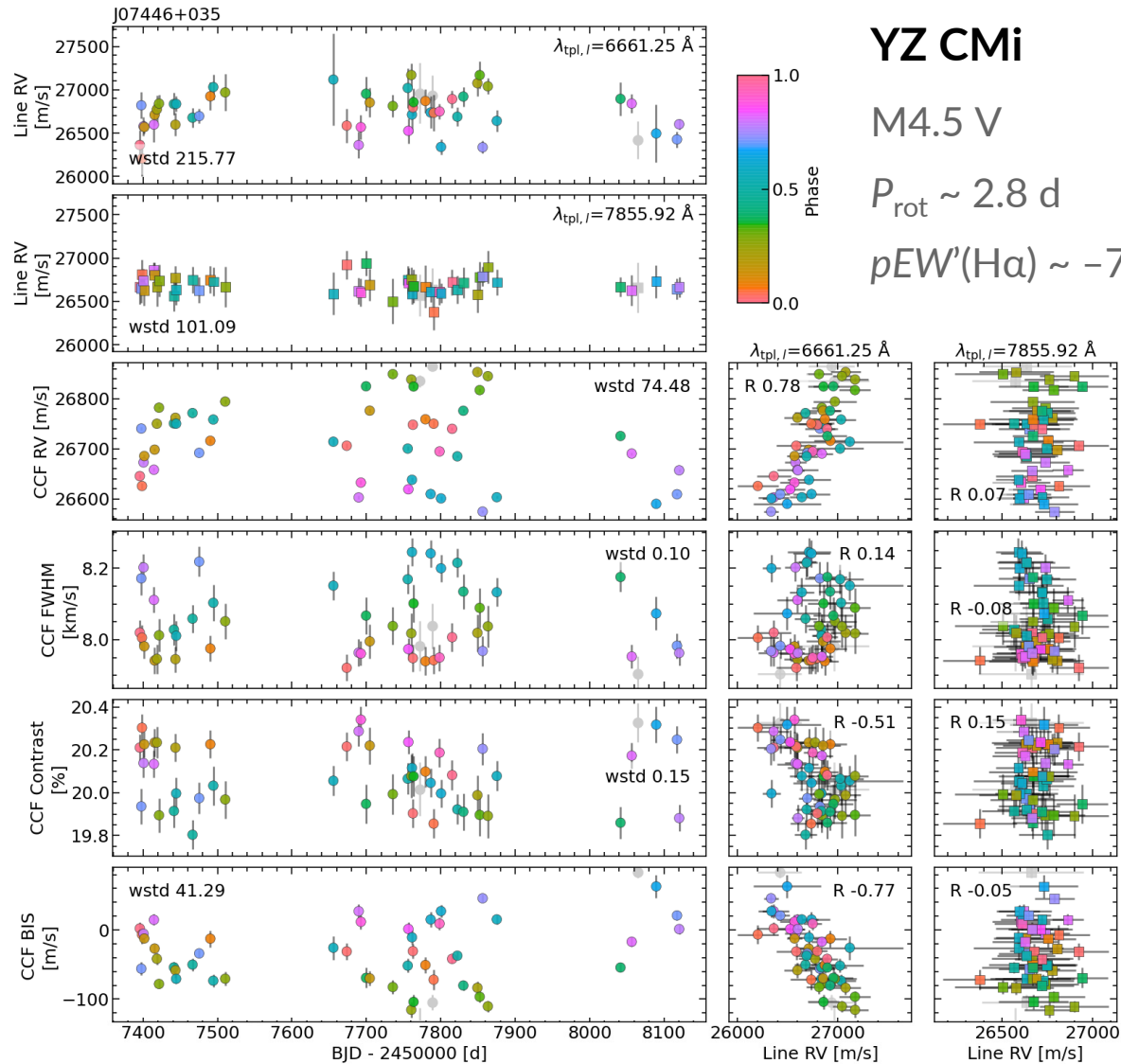
Activity on individual lines

Line 1

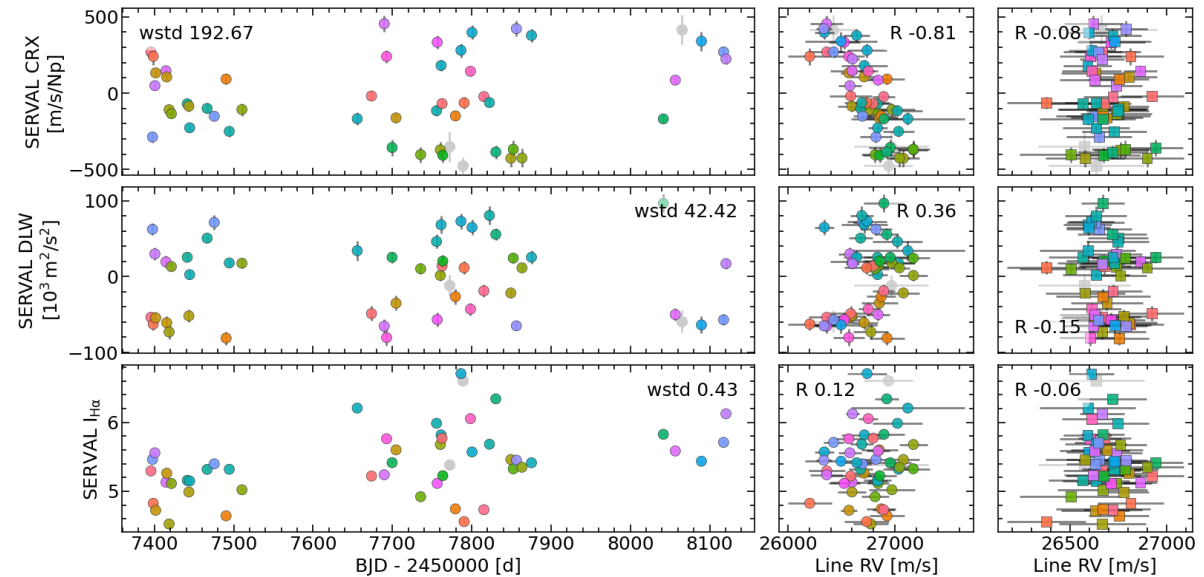
Line 2

All lines

Activity indicators



- ▶ Correlation line RV & activity indicator
- ▶ Pearson's correlation coefficient R
- ▶ “Linear” correlations: total RV, BIS, CRX



Line 1

Line 2

Line 1

Line 2

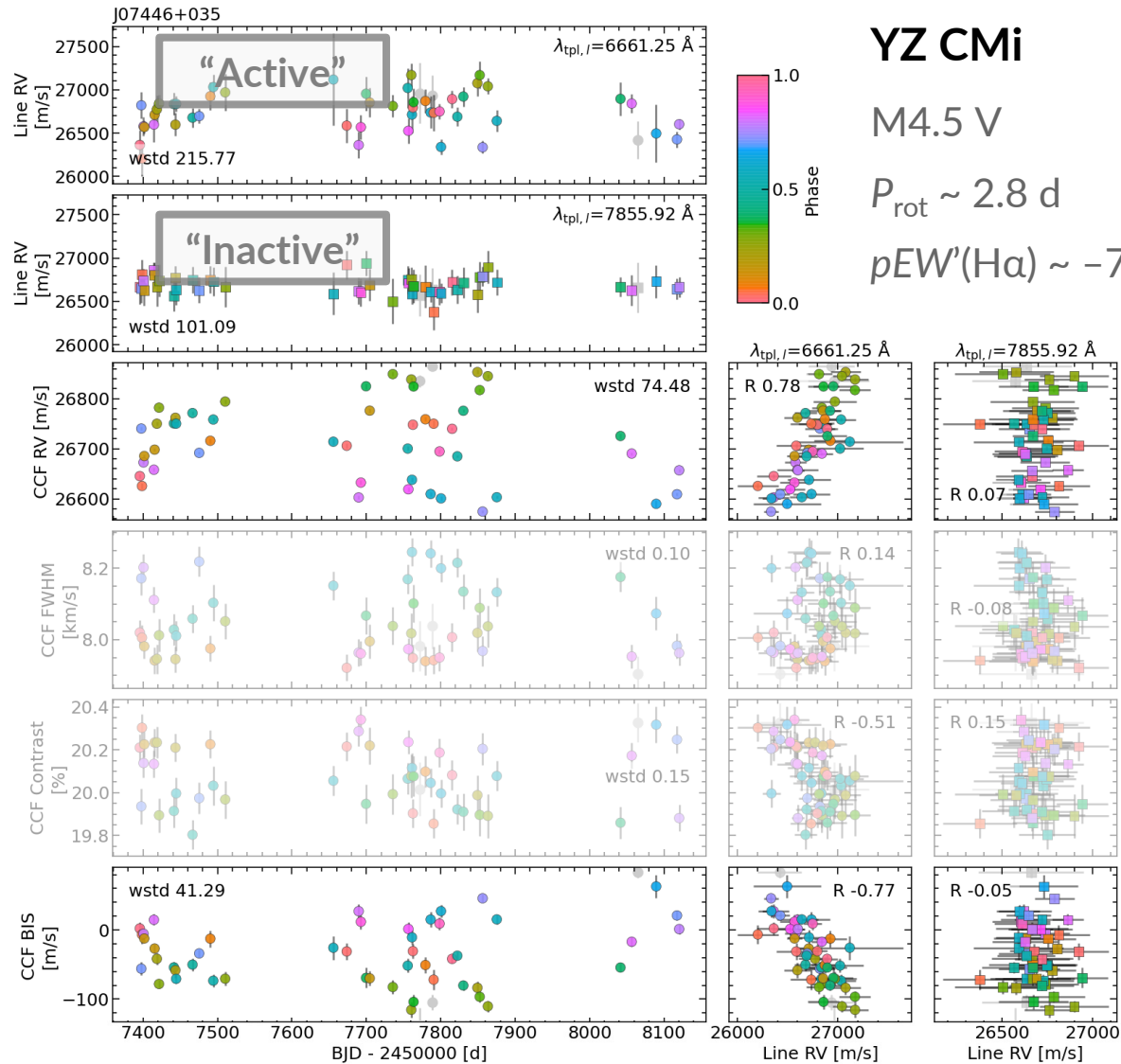
Activity on individual lines

Line 1

Line 2

All lines

Activity indicators

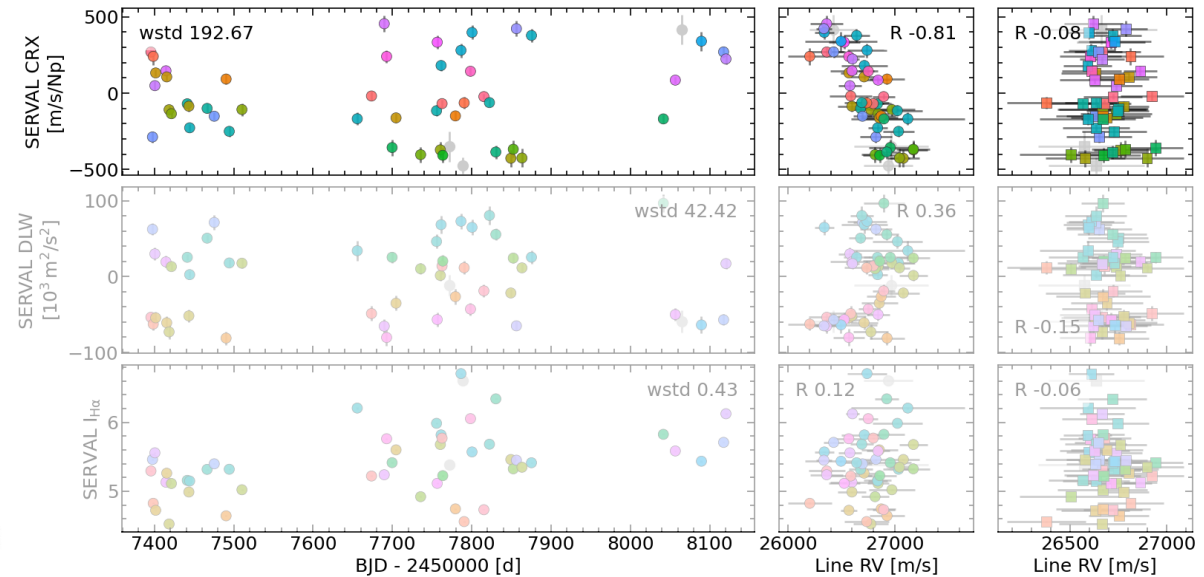


YZ CMi
M4.5 V
 $P_{\text{rot}} \sim 2.8 \text{ d}$
 $pEW'(\text{H}\alpha) \sim -7$

Line 1

Line 2

- ▶ Correlation line RV & activity indicator
- ▶ Pearson's correlation coefficient R
- ▶ "Linear" correlations: total RV, BIS, CRX

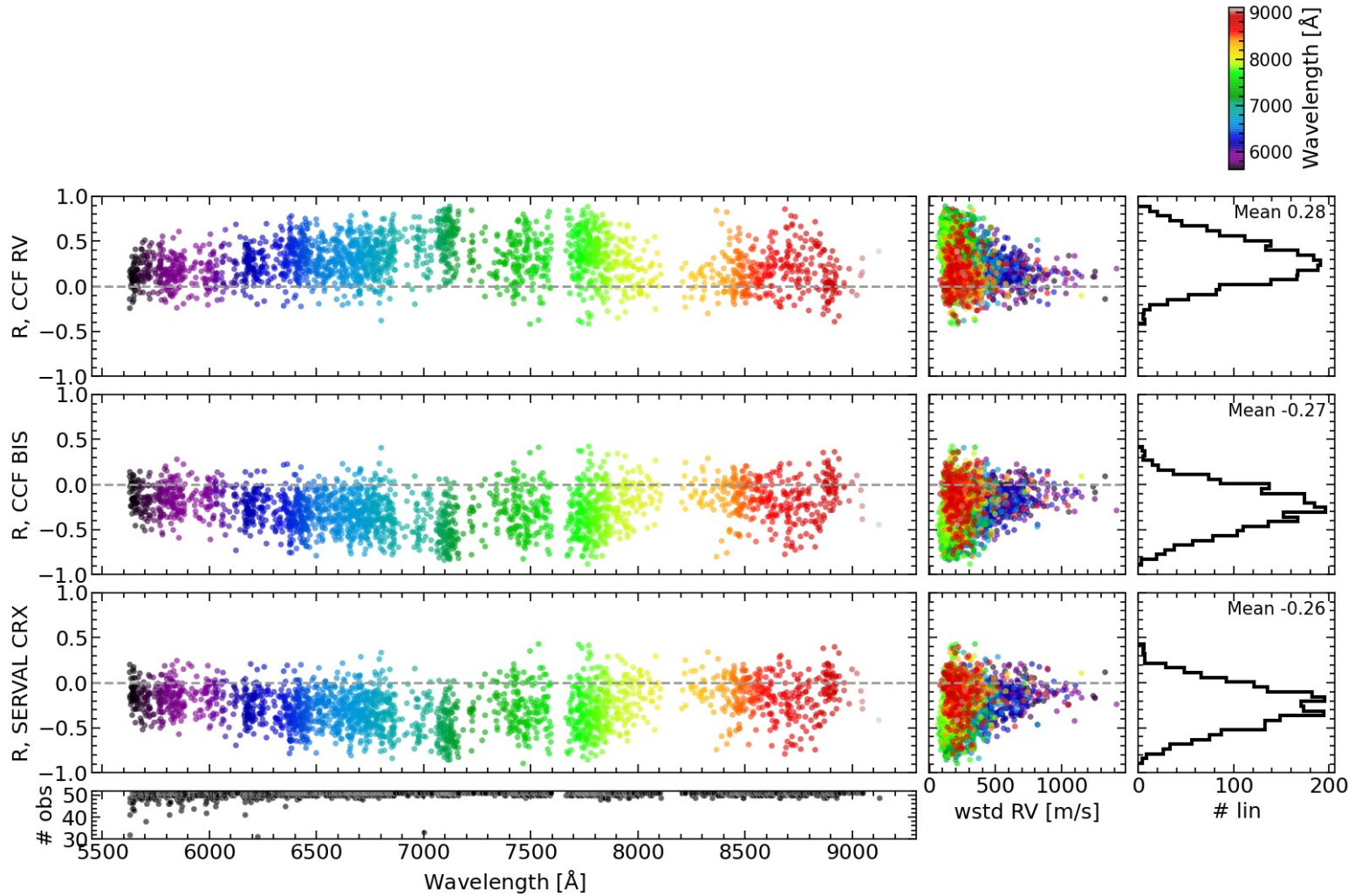


Line 1

Line 2

Activity on individual lines

J07446+035, 2136 lines

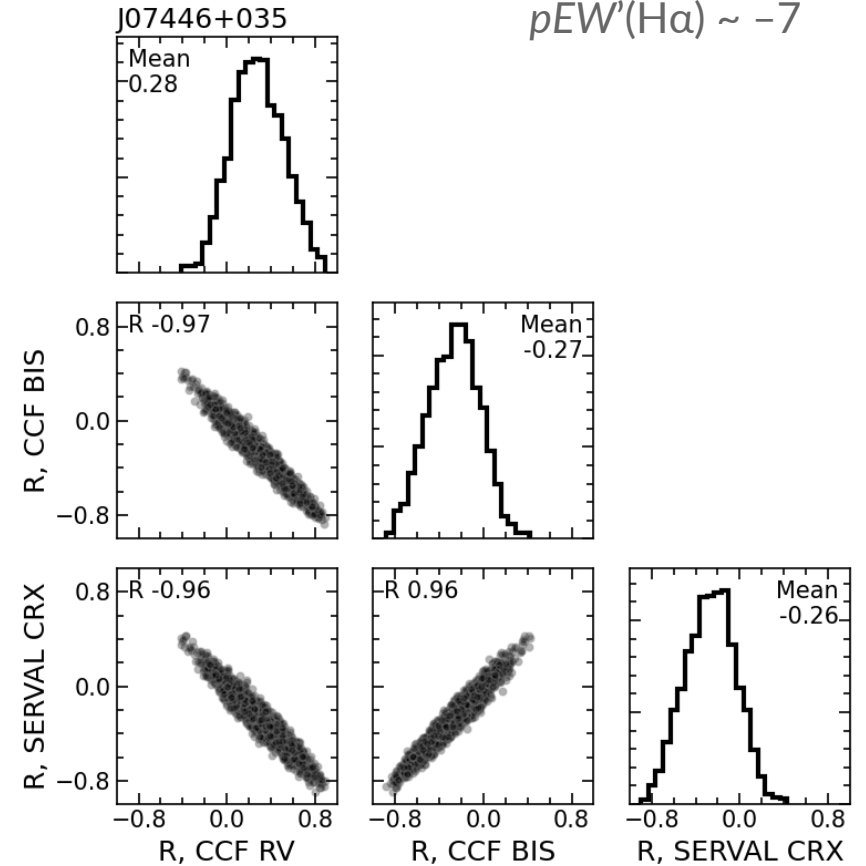


YZ CMi

M4.5 V

$P_{\text{rot}} \sim 2.8$ d

$pEW'(\text{H}\alpha) \sim -7$



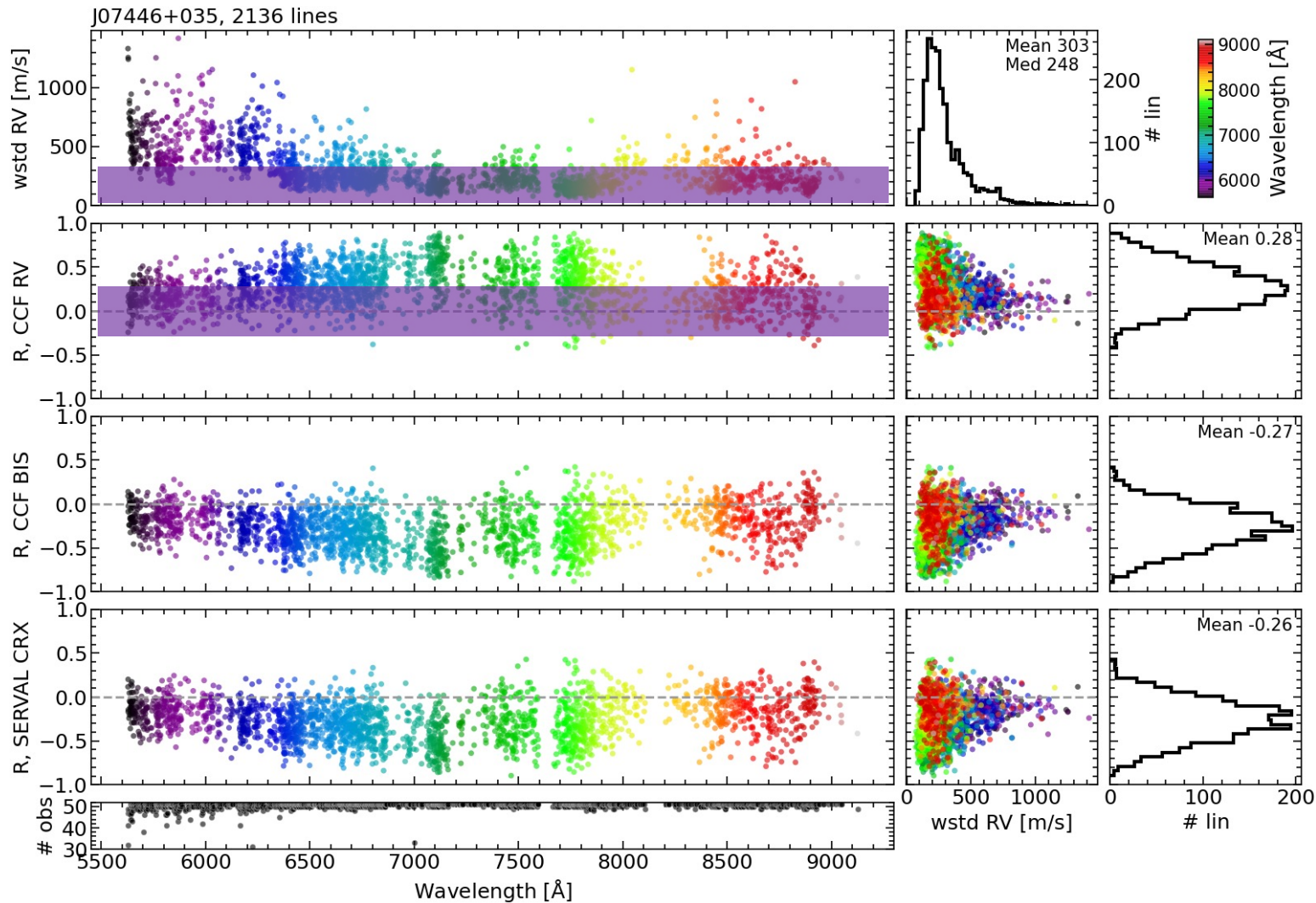
Inactive lines

YZ CMi

M4.5 V

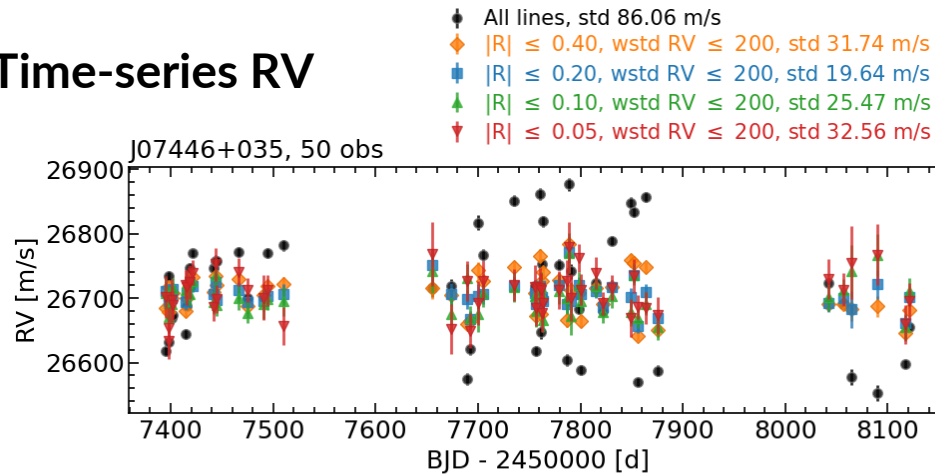
$P_{\text{rot}} \sim 2.8$ d

$pEW'(\text{H}\alpha) \sim -7$

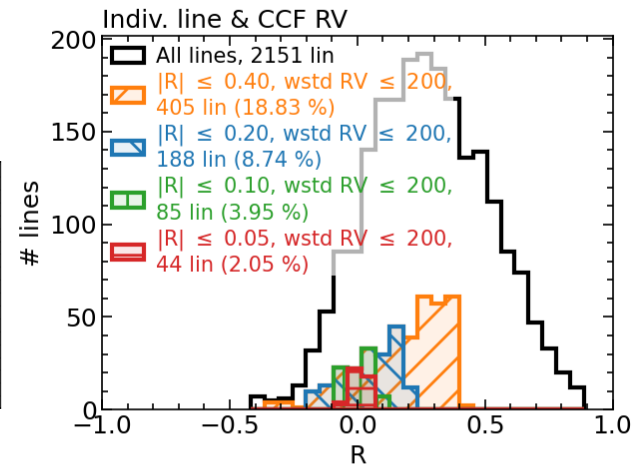


Inactive lines

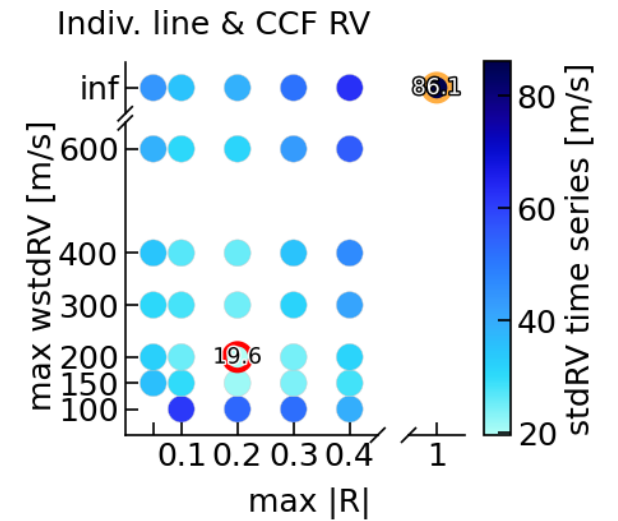
Time-series RV



Line selection



Change in RV scatter



YZ CMi

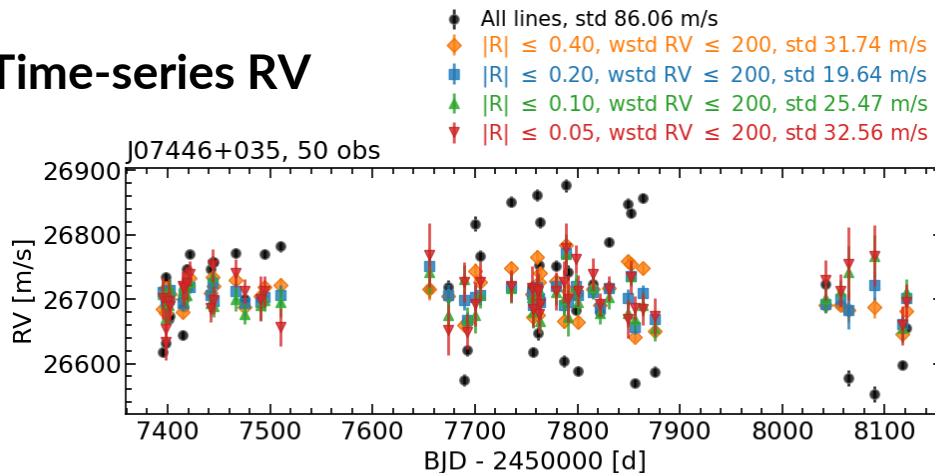
M4.5 V

$P_{\text{rot}} \sim 2.8$ d

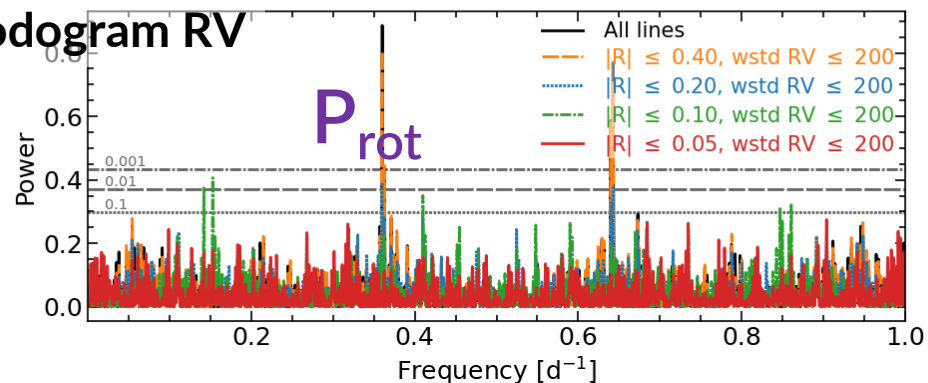
$pEW'(\text{Ha}) \sim -7$

Inactive lines

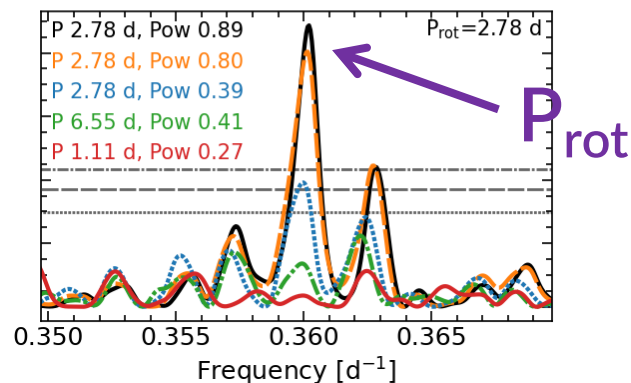
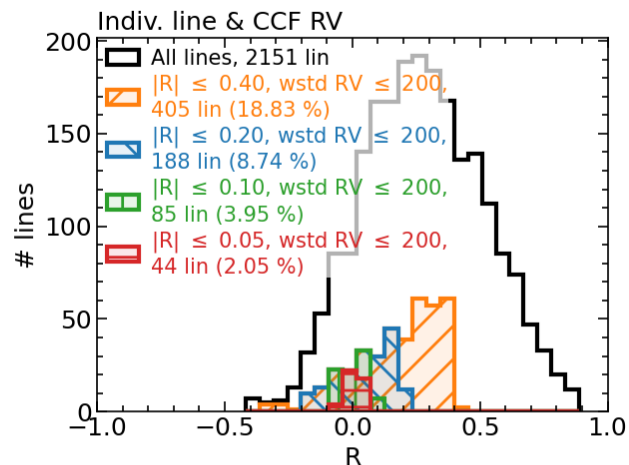
Time-series RV



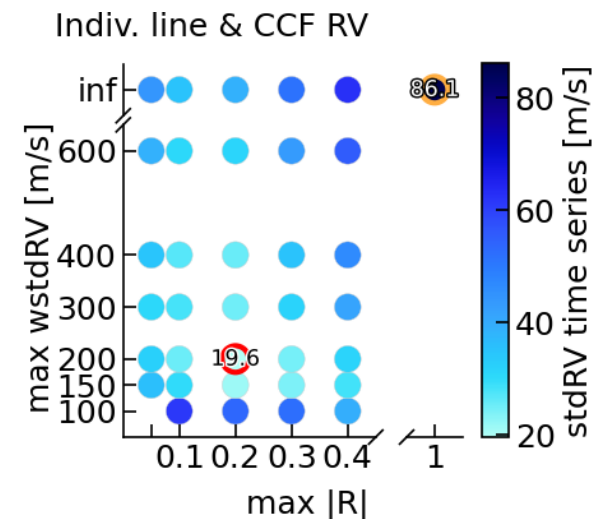
Periodogram RV



Line selection



Change in RV scatter



YZ CMi

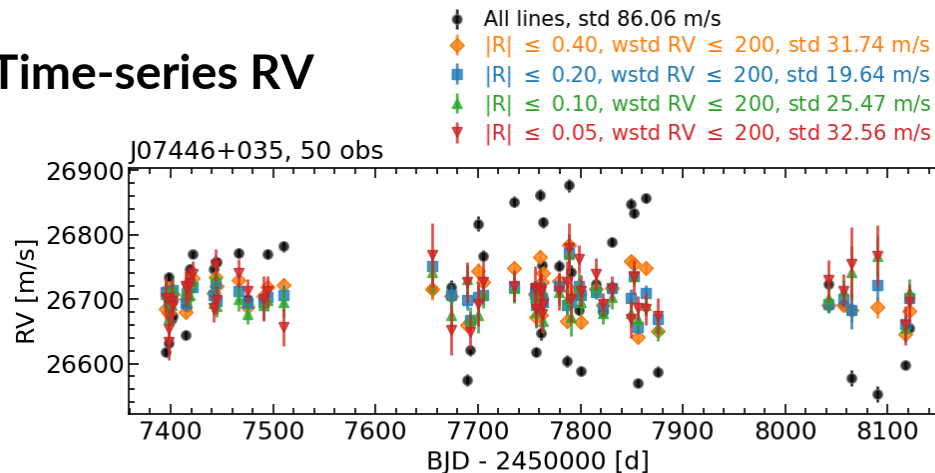
M4.5 V

$P_{rot} \sim 2.8$ d

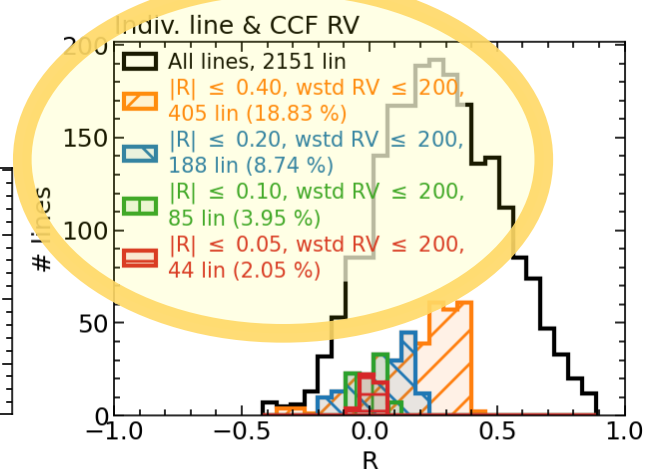
$pEW'(Ha) \sim -7$

Inactive lines

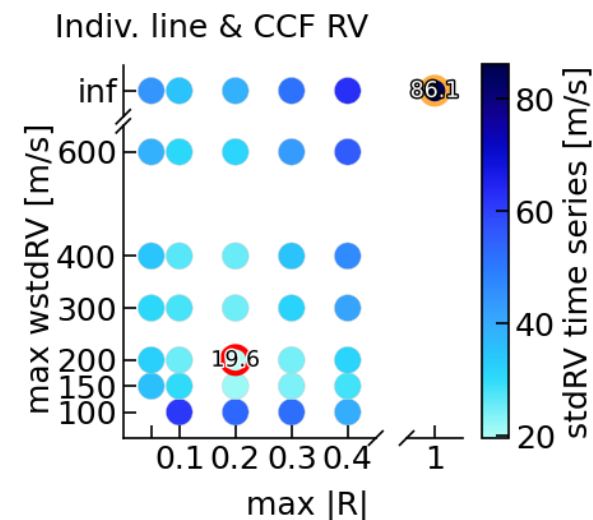
Time-series RV



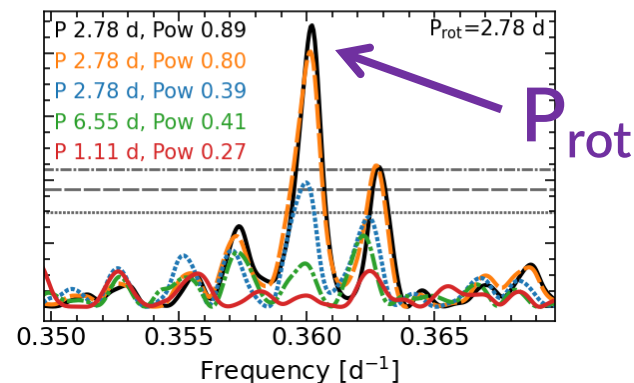
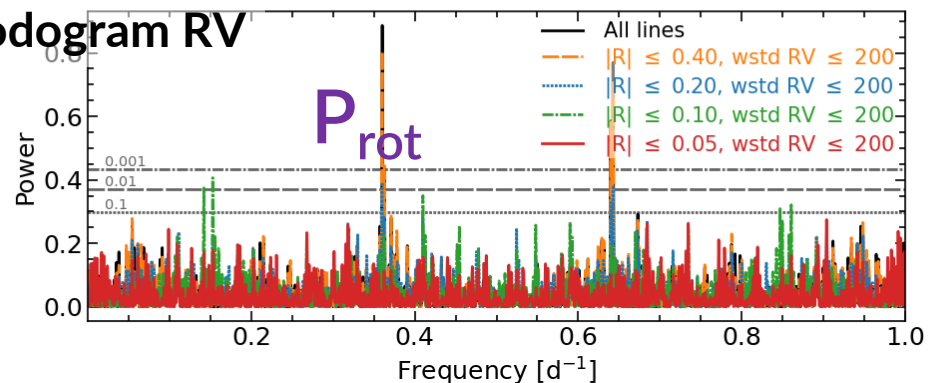
Line selection



Change in RV scatter



Periodogram RV



YZ CMi

M4.5 V

$P_{rot} \sim 2.8$ d

$pEW'(Ha) \sim -7$

Active lines

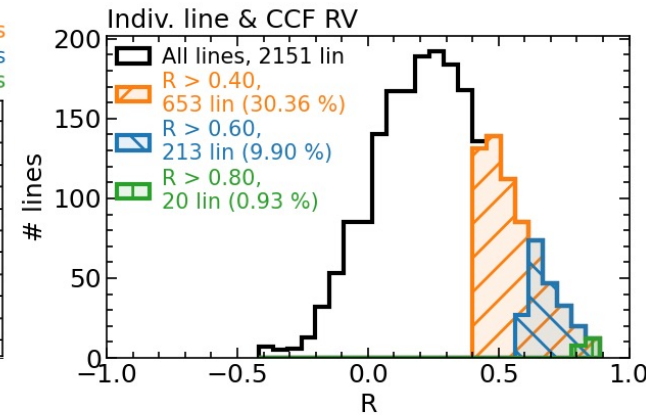
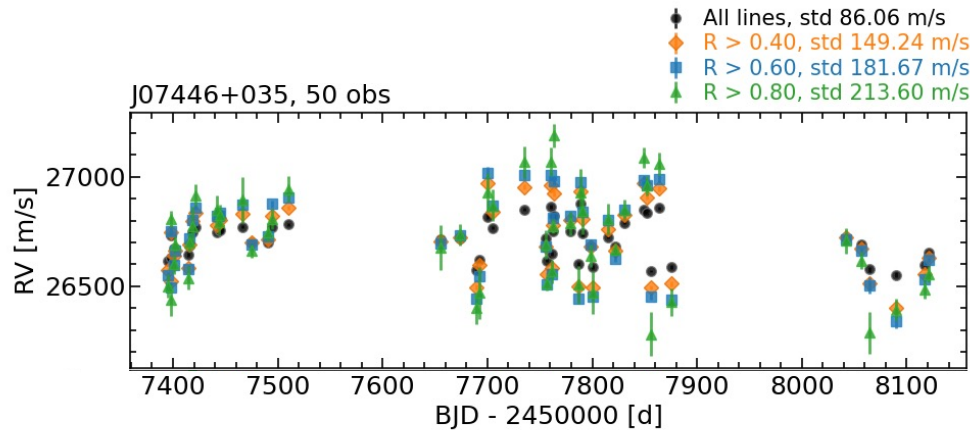
YZ CMi

M4.5 V

$P_{\text{rot}} \sim 2.8$ d

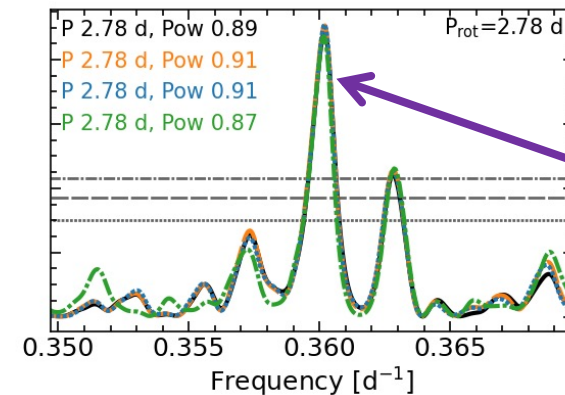
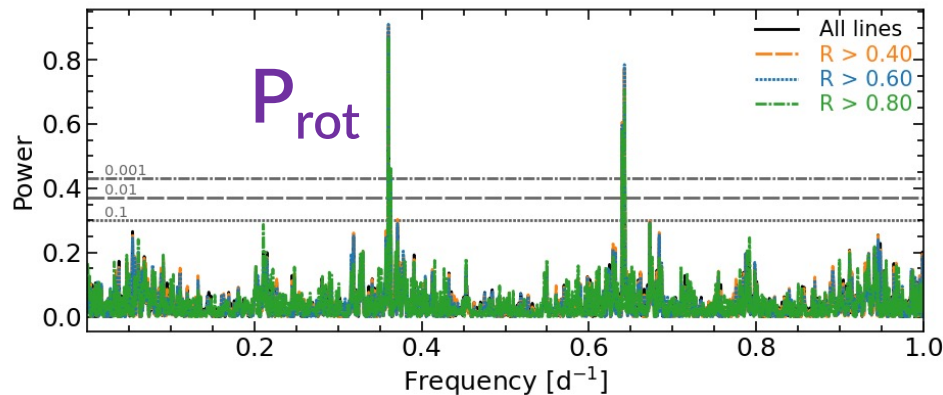
$pEW'(H\alpha) \sim -7$

Time-series
RV



Line selection

Periodogram
RV



Active lines

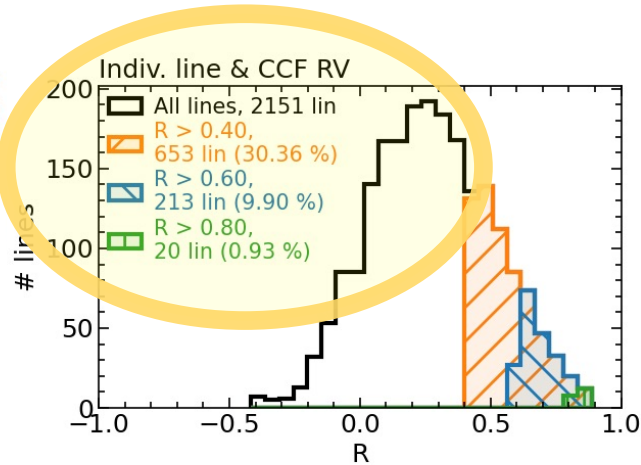
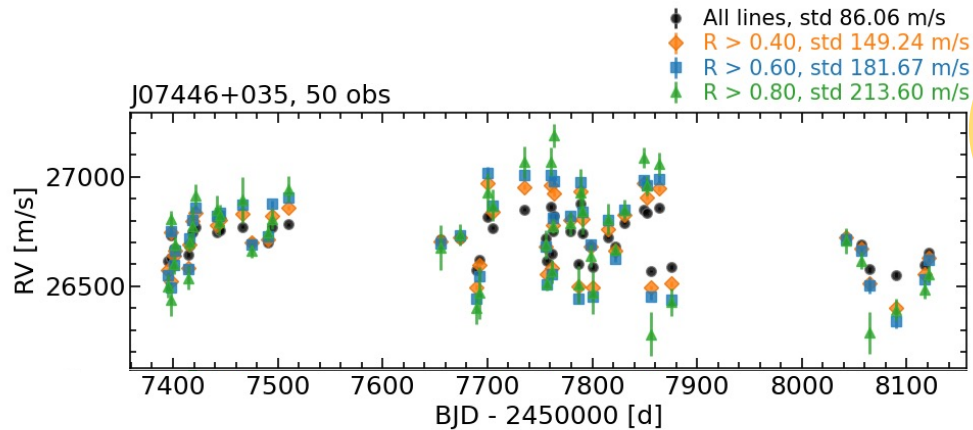
YZ CMi

M4.5 V

$P_{\text{rot}} \sim 2.8$ d

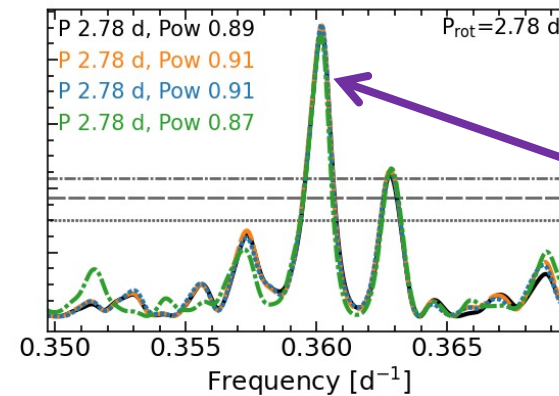
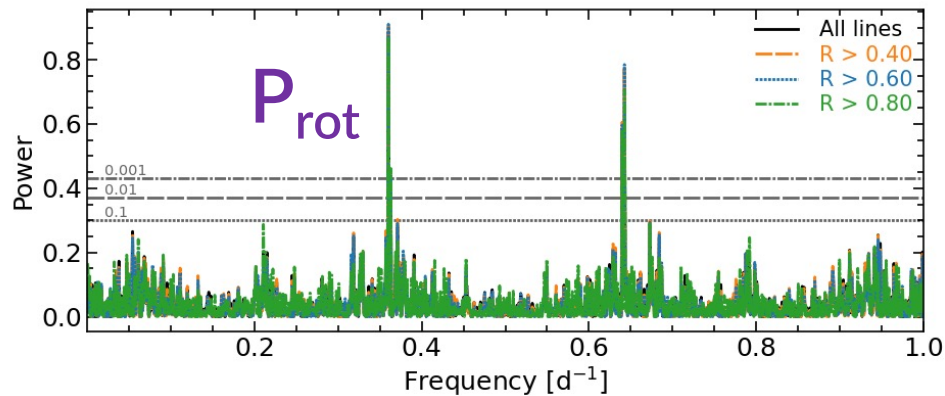
$pEW'(H\alpha) \sim -7$

Time-series
RV



Line selection

Periodogram
RV



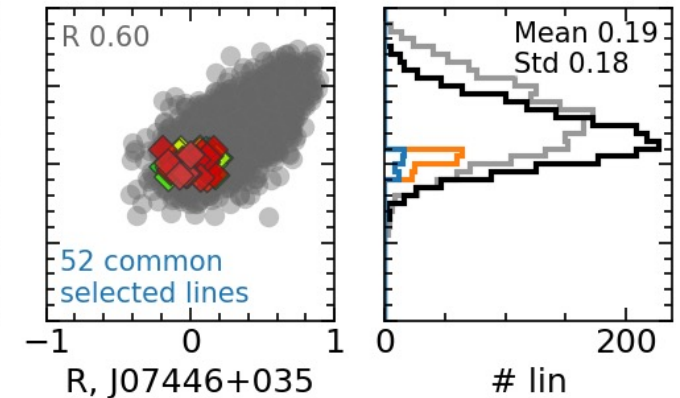
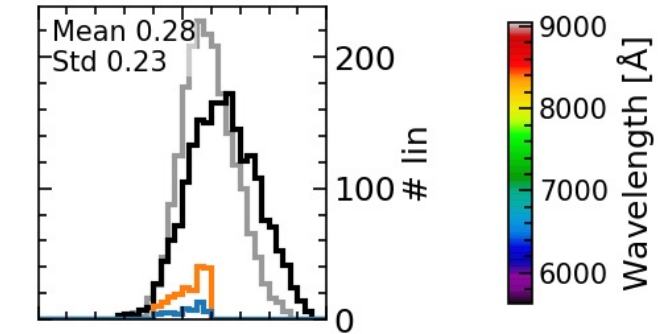
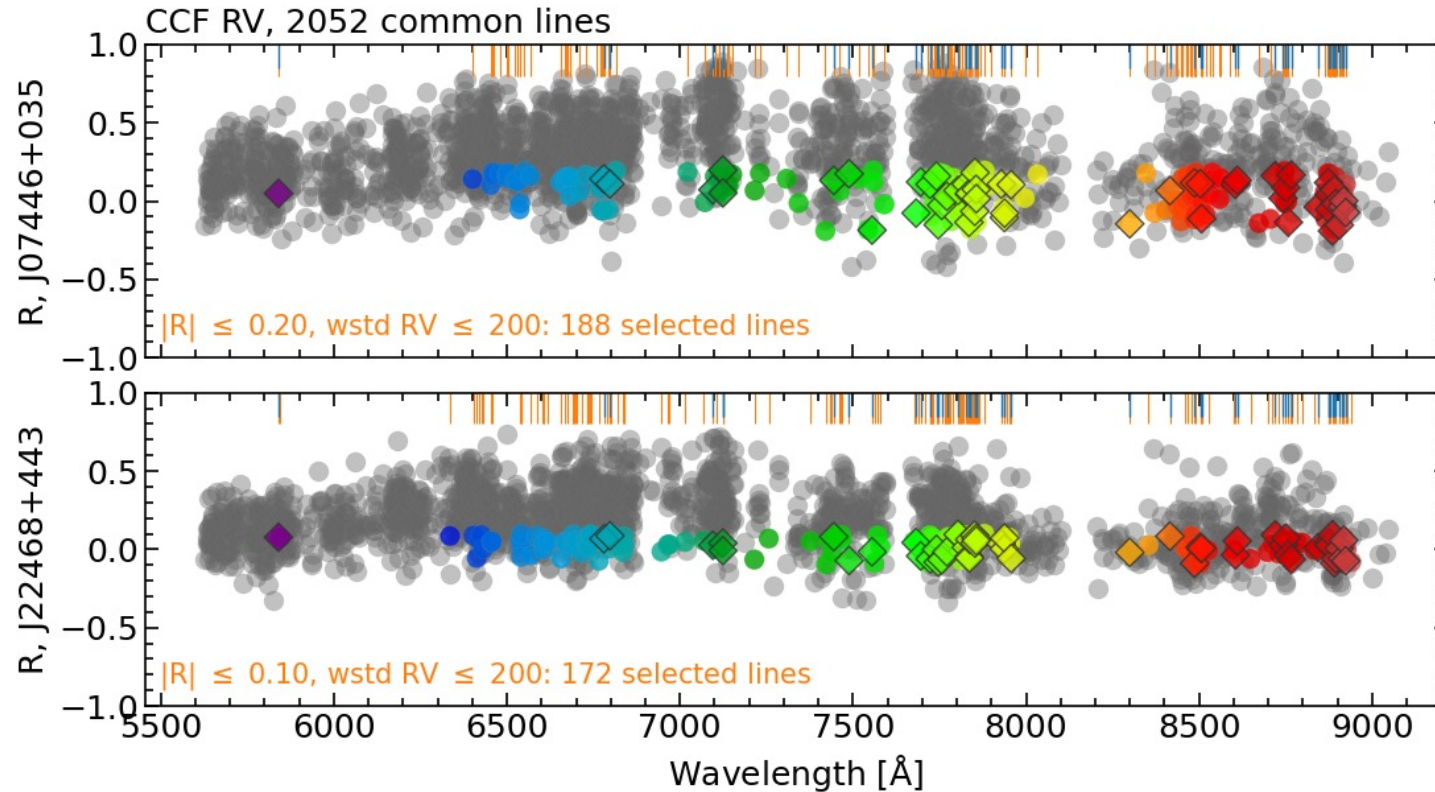
Lines in different stars

YZ CMi

M4.5 V

$P_{\text{rot}} \sim 2.8$ d

$pEW'(\text{H}\alpha) \sim -7$



Summary

- ▶ Different correlations between RVs and different activity indicators
- ▶ Stellar “lines” in active M dwarfs show different sensitivities to activity
- ▶ Activity sensitivity is different for the same “lines” in stars with similar properties