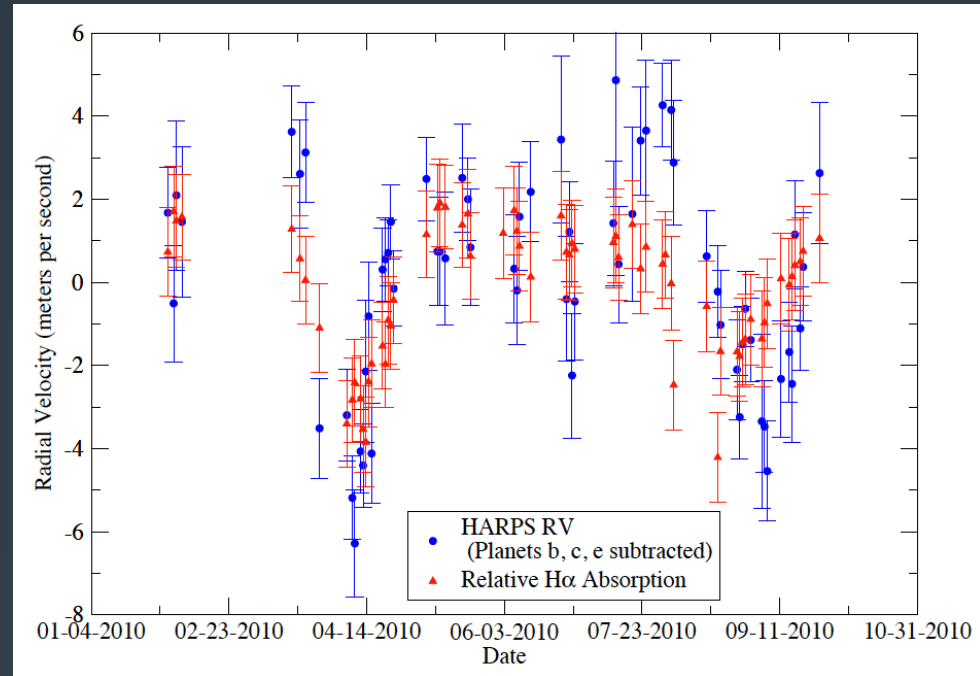


Spotting Blue Planets Around Spotted Red Stars

Removing Stellar Activity from Radial
Velocities of M Dwarf Stars

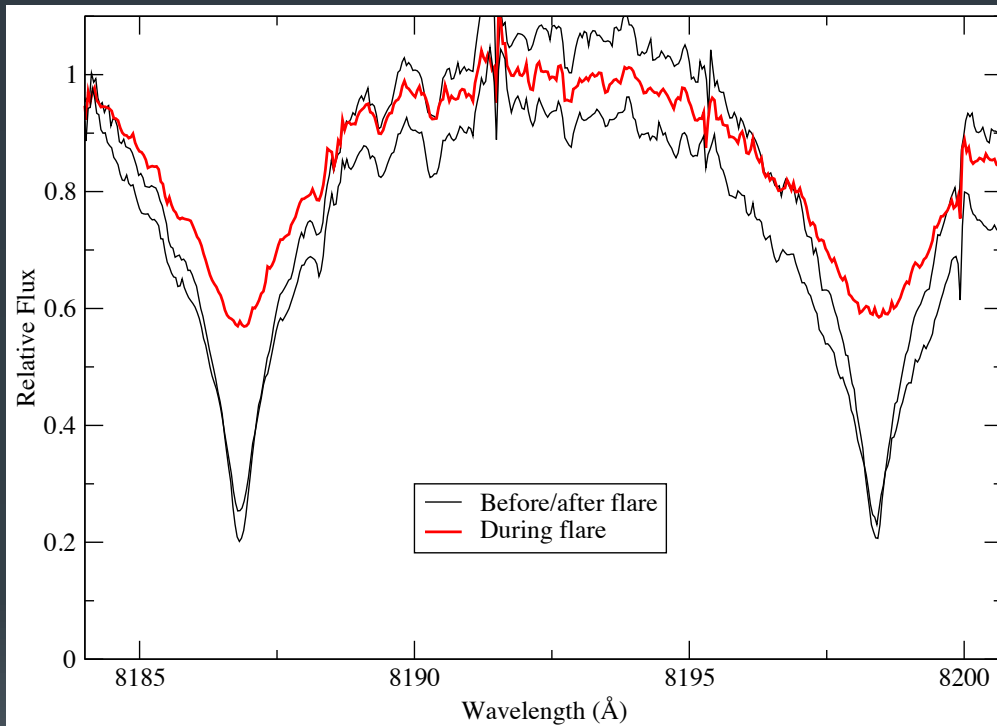
The Problem: Planet or Activity?

- Current and upcoming instruments have the Doppler precision (<1 meter per second) to detect super-Earth planets in the habitable zones of nearby M dwarf stars.
- BUT, at these velocity amplitudes, signals from stellar magnetic activity dominate!



Above: Doppler signal (blue) believed to be caused by the super-Earth planet Gliese 581d, and the hydrogen-alpha variations (red) that show the “planet” is actually a stellar activity signal!

Spectral Characterization of Activity

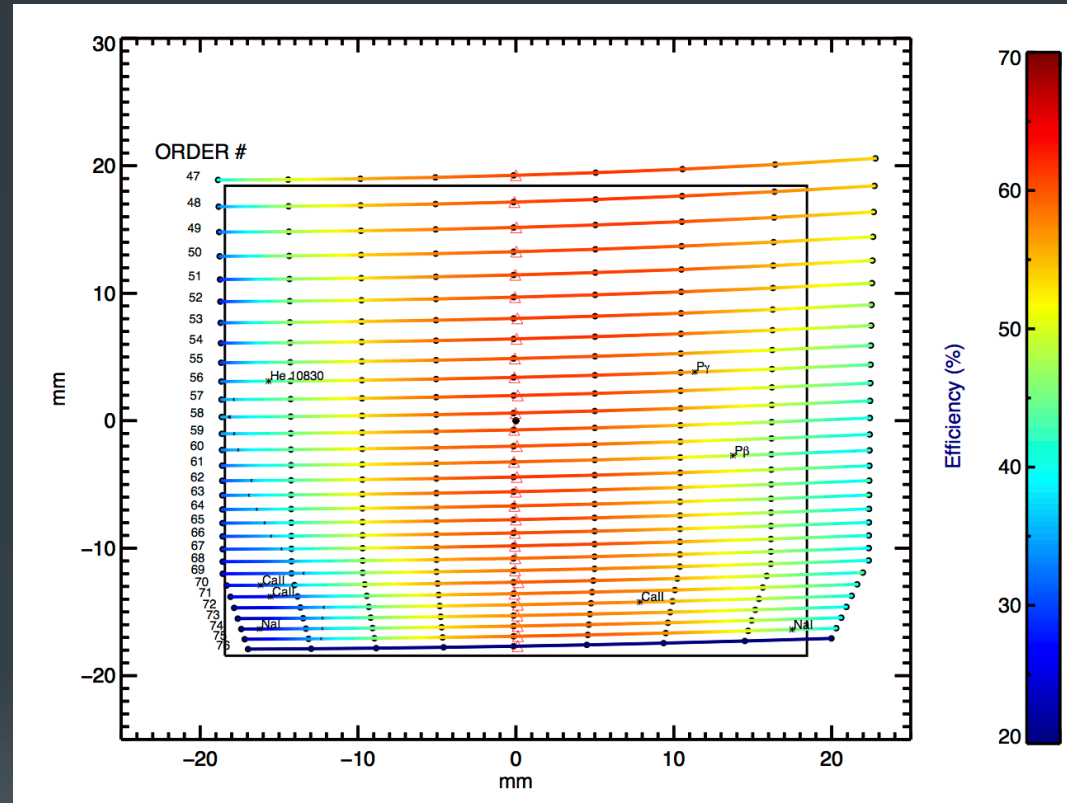


Above: A sudden increase in emission in the near-infrared sodium doublet reveals a flare on CN Leo. This spectral feature may be a powerful tool for tracing activity in M stars.

- In order to correct for stellar activity, we must know it's there!
- New indicators of magnetic activity are needed for M stars, for which Doppler surveys will soon use near-infrared spectra.
- Tracer characterization also enables better understanding of activity in old, late-type stars.

Disentangling Planets from Activity

- Better modeling tools are needed to separate planets from activity-induced false positives.
- Should efficiently utilize multiple spectral activity tracers and photometry, if it exists.
- Need to model planet orbits and activity-velocity correlations simultaneously.



Above: spectral coverage map for the Habitable Zone Planet Finder Spectrograph, with candidate activity tracer features marked. These tracers will be used as inputs for my activity-RV modeling program.