SPORK That Spectrum: Increasing Detection Significances from High-Resolution Exoplanet Spectroscopy with Novel Smoothing Algorithms

Fahim Rahman, Kaitlin C. Rasmussen, Matteo Brogi, Hayley Beltz, Miles Currie, Emily Rauscher, Alexander P. Ji

**PURPOSE**

- When studying planets outside of the solar system, some of the most crucial information are found through spectroscopy.
- Extracting the planet’s signal becomes difficult due to noisy signals.
- Emission spectra from CRIRES where we introduce an algorithm called SPORK (SPectral cOntinuum Refinement for telluriKs).
- We primarily focus on two hot Jupiter exoplanets: HD 209458 b, and HD 179949 b.

**SPORK**

- Cross correlation is used to maximize the information from a set of spectral lines.
- We locate the host star’s continuum and clip off outliers iteratively, and apply it before using a telluric removal method.
- Air mass detrending method to remove tellurics.
- SPORK itself also takes in a smoothing factor between 0 and 1 as an input.
- Apply the smoothing to the median spectrum.
- Cross correlate to extract the planet’s signal.

**APPLICATIONS & USAGE**

- Test SPORK before, after, and both, with telluric removal.
- Terrestrial-sized exoplanet observations can be optimal.
- It is a highly accessible technique.
- Helping to find life outside our solar system?