New UV Spotlights on Exoplanets with SPARCS & UV-SCOPE

Evgenya Shkolnik
Star-Planet Activity Research Cubesat

**Mission** SPARCS will be the first ever mission dedicated to monitoring the high-energy radiation environments of exoplanets throughout their lifetimes by continuously and simultaneously measuring the FUV and NUV emission of low-mass stars from young to old.

**Technology** SPARCS will advance UV detector technology by flying state of the art ‘2D-doped’ detectors and metal dielectric filters.

**Education** SPARCS is training the next generation of scientists and engineers in mission development, operations, and data analysis.

**SPARCS** will determine the high-energy radiation environment around the most common types of exoplanet hosts. By measuring month-long light curves in two UV bands, SPARCS will map stellar activity due to flares and stellar rotation. These data are crucial to understand the evolution and habitability of planets and for interpreting their spectra and atmospheres.

**KEY SPECIFICATIONS**

- **Spacecraft**: 6U CubeSat, 9 cm telescope
- **Orbit**: Sun synchronous terminator for continuous power, cooling, and uninterrupted observations
- **Bands**: FUV [153 - 171 nm] and NUV [258 - 308 nm]
- **FOV**: 0.7°
- **Photometric Requirements**: 1% to 10% per observation
- **Pointing**: Stable to <6°
- **Cadence**: 0.1 - 60 min observations
  5 - 45 days per M star
Radiation Environment

Stellar NUV, FUV, EUV incident on planet atmosphere

Exosphere $\lesssim 1 \text{ nbar}$

- NUV + FUV transits of escaping hydrogen (Ly-α) and metals.
- How much mass is being lost to space? Across the diverse planet population?

Upper Atmosphere $1 \text{ mbar} - 1 \text{ nbar}$

- NUV + FUV transits.
- What roles do the upper atmospheric properties play in the escape processes?

Lower Atmosphere $\gtrsim 1 \text{ mbar}$

- UV photochemistry probed by optical/IR, but require UV inputs.
- How does high energy stellar environment have on atmospheric evolution and habitability?
A 60 cm telescope
Two-armed, long-slit, FUV+NUV spectrograph
High-QE delta-doped detectors

UV-SCOPE Spectra

FUV channel R=6000
NUV channel R=100