National Aeronautics and Space Administration

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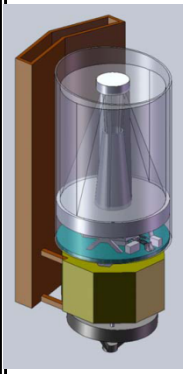

Exoplanet Characterization: A Combined Light Mission Concept

Combined light mission

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Objectives – Example Key Questions

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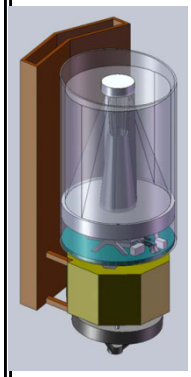

Combined light mission

- What are the conditions, composition, and chemistry of exoplanet atmospheres?
- How do dynamics affect atmospheric composition and chemistry?
- Are biologically important molecules present in habitable-zone rocky or ocean worlds?

Combined Light Mission Aspects

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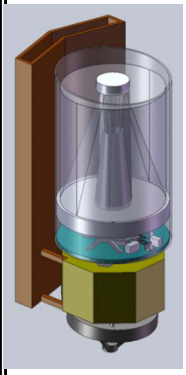

- Low technical risk
- Observational method proven with Hubble and Spitzer
- Potential for simultaneous broad spectral coverage (X-Y microns “all at the same time”)
- Long term stability (near photon noise calibrated stability over the mission life)
- Enables a large sample of exoplanets to be characterized
- Highly complimentary to other missions (Kepler, JWST, COROT)
- SNR ~ telescope diameter (not area)

Combined light mission

Non-transiting planet emission

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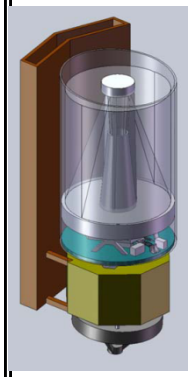
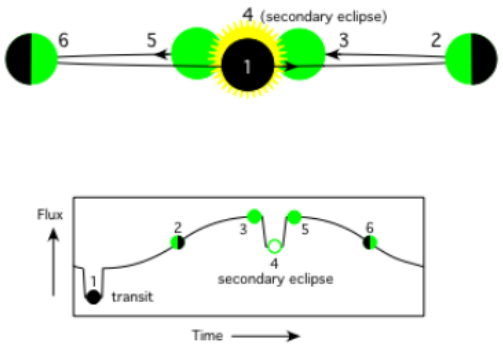
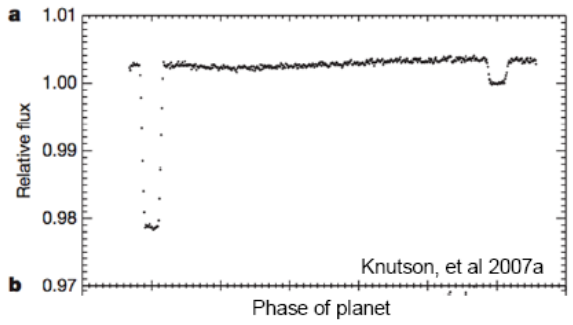


- Enabled by long-term stability
- Demonstrated with Spitzer (Harrington et al. 2006, Cowan et al. 2007)

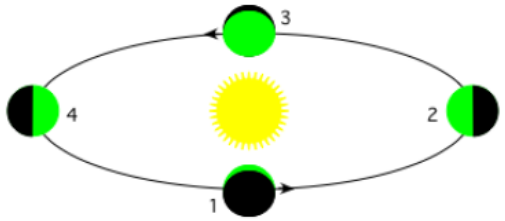
Combined light mission

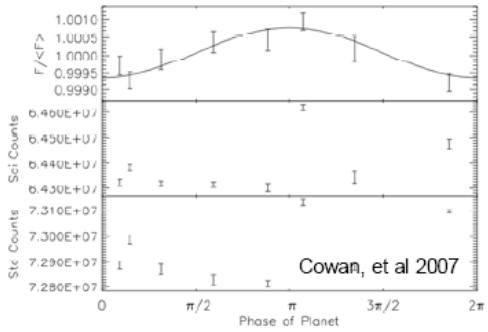
Transiting





Non-transiting





Example – THESIS overview

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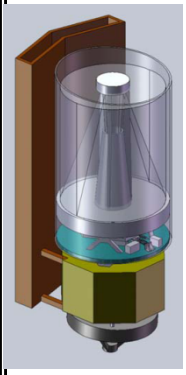

- 1.4 m telescope with passive cooling
- Falcon launch to L2 orbit (1250 kg injected mass)
- 3 year mission life
- Cryo-cooler for FPAs
- R~2000 continuous spectroscopy from visible to 14 microns
- No filter wheels or optics repositioning
- Calibration for long term stability
  - Periodic observations of a network of calibrator stars to tie-in data over mission life
  - Simultaneous visible observations to remove variations from star spots

Combined light mission

Mission definition questions

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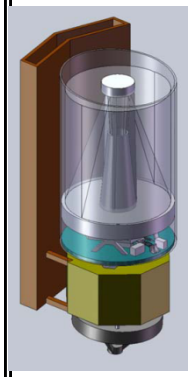

- Key Science objectives
- Telescope size
- Orbit
- Mission length
- Wavelength coverage
- Spectral resolution
- Instrument features
- Cost category
- Connection to other missions/ activities
- Calibration strategy
- Data rate

Combined light mission