SPARCS
Star-Planet Activity Research Cubesat
Danny Jacobs (Arizona State University) + SPARCS Team
75% of all stars are red dwarfs
25% of all red dwarfs have planets in the habitable zone

Dressing and Charbonneau, 2015
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= Most habitable zone planets orbit red dwarfs
FLARING

X class solar flare: May 5 2015
UV RADIATION DRIVES THE PLANETARY ATMOSPHERE

Tracer Molecules
Dissociated by UV

H$_2$O
O$_3$ (indirect tracer for O$_2$)
SO$_2$ (volcanic activity)
NH$_3$ (key for amino acids)
M Dwarfs Flares are poorly studied
Flares happen mainly in the UV, which can only be observed from space.
UV IS BEST SEEN FROM SPACE

(Ultraviolet rays)

UV-C
100~280nm

UV-B
280~315nm

UV-A
315~400nm

(Altitude)
50 km

Ozone layer

15 km

Ground surface

Outer space

Mesosphere
Ionosphere

Stratosphere

Troposphere
- 6U cubesat
- ultraviolet camera (JPL)
- passive radiative cooling
- active pointing
- two year mission
SPARCS INSTRUMENT

Maximum volume envelope: 9cmx9cmx30cm

Mass: 4.96kg

Data: 150 MB/day.

C&DH: Onboard image processing

Power: 10W

Thermal:
CCD science: 238K
CCD bakeout: 320K

Pointing Jitter Requirement: 7” 1 sigma
**SPARCS CONCEPT OF OPERATIONS**

- Sun Synchronous
- 6pm Terminator LTAN
- Observe stars along ecliptic in anti-sun direction
CHALLENGES

- Pointing (need 10” 1sigma)
- Orbit (need 6pm SS)
- Thermal control (cold and hot)
- UV sensor contamination control
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See Nikzad et al. 2012
THANK YOU!