



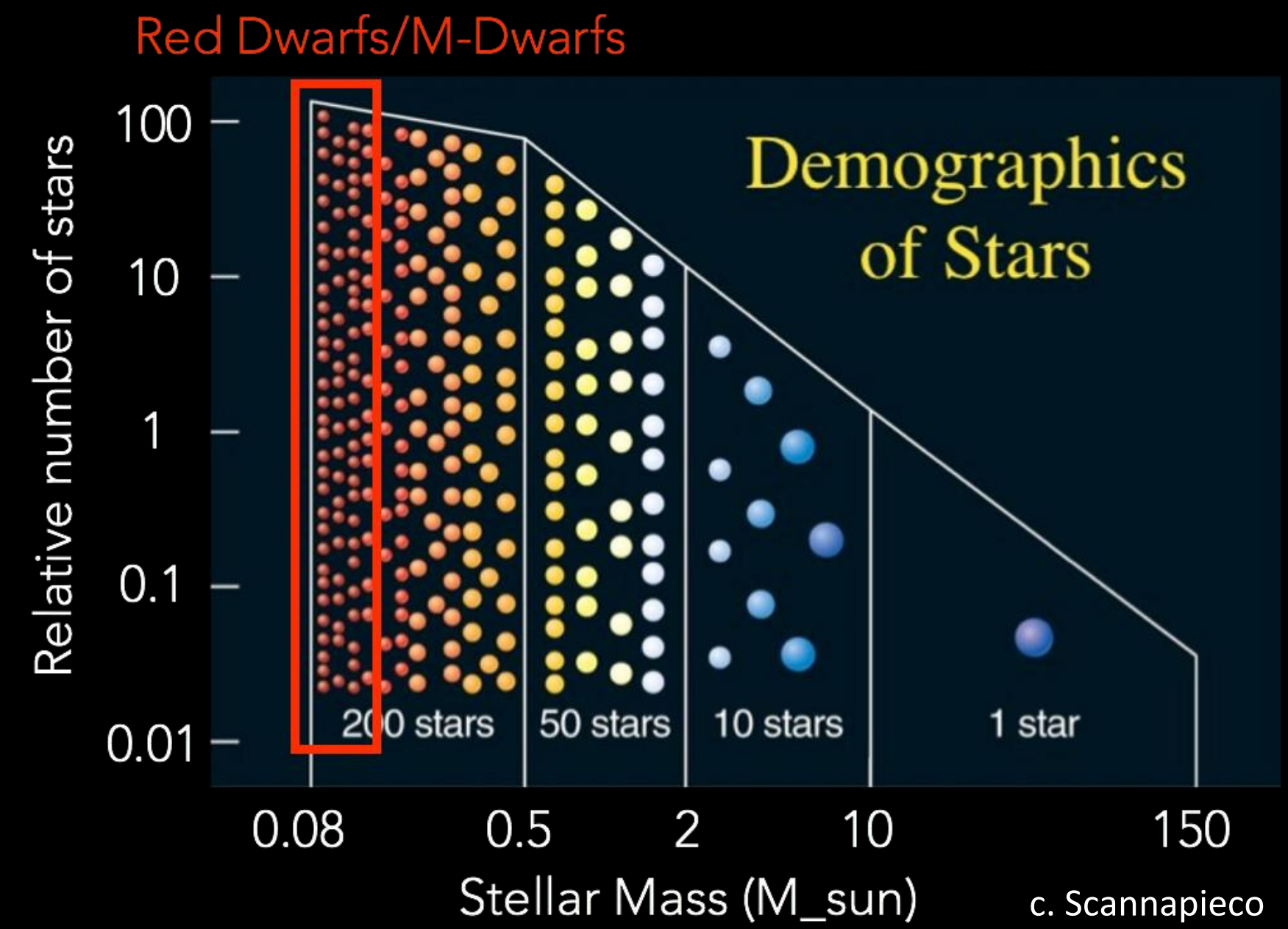
SPARCS

Star-Planet Activity Research Cubesat

Danny Jacobs (Arizona State University) + SPARCS Team

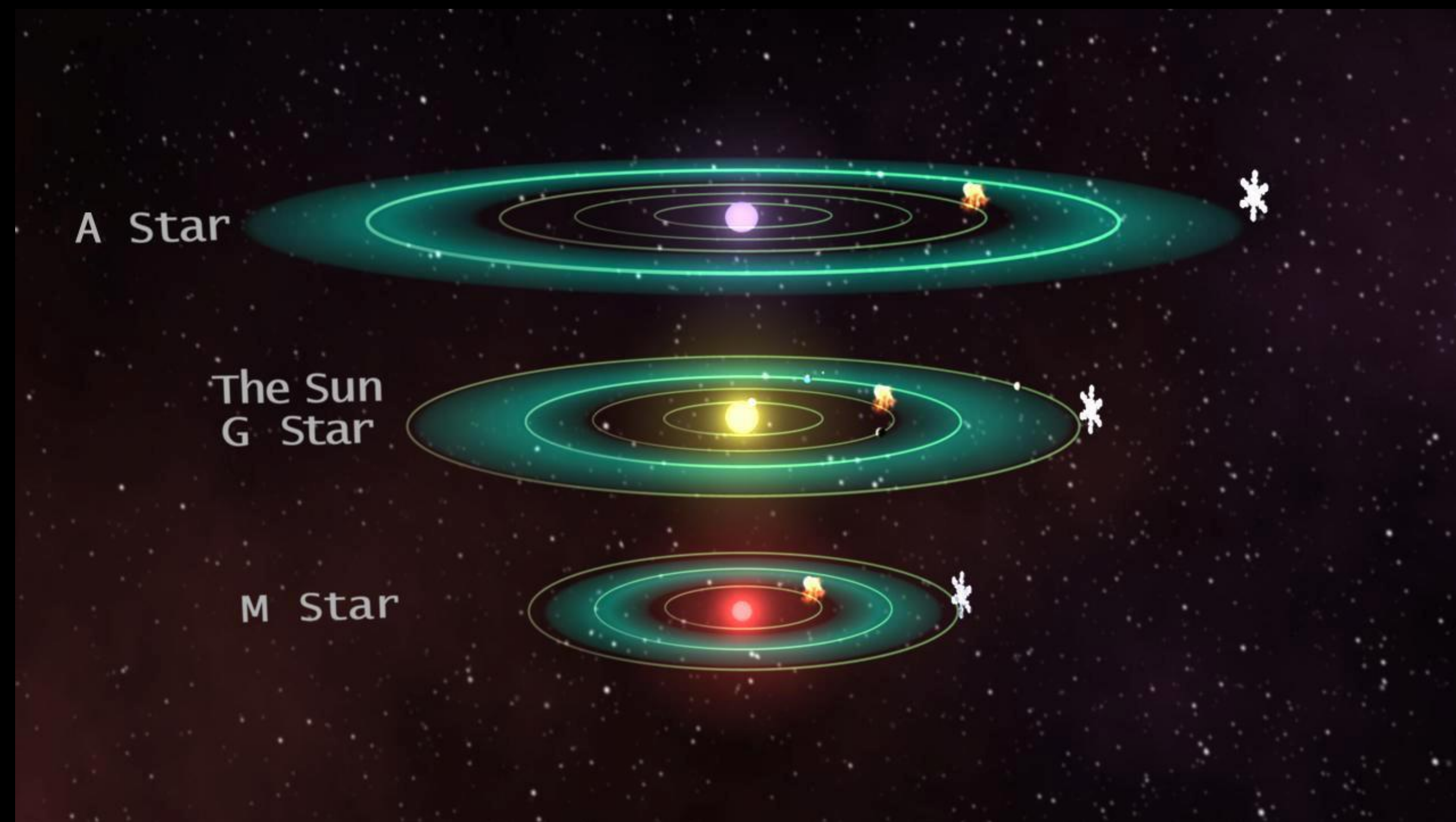


75% of all stars are red
dwarfs



25% of all red
dwarfs have
planets in the
habitable zone

Dressing and Charbonneau, 2015



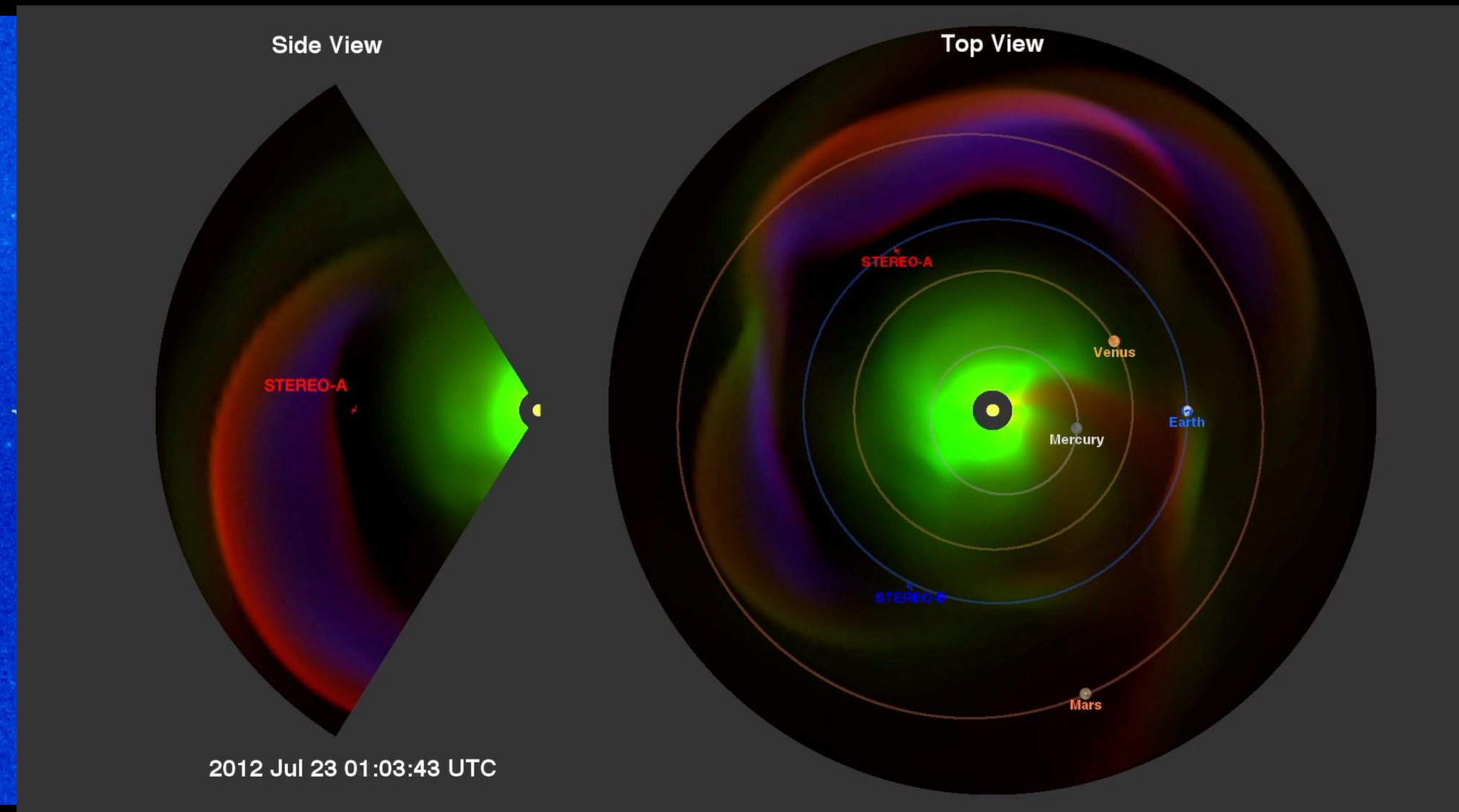
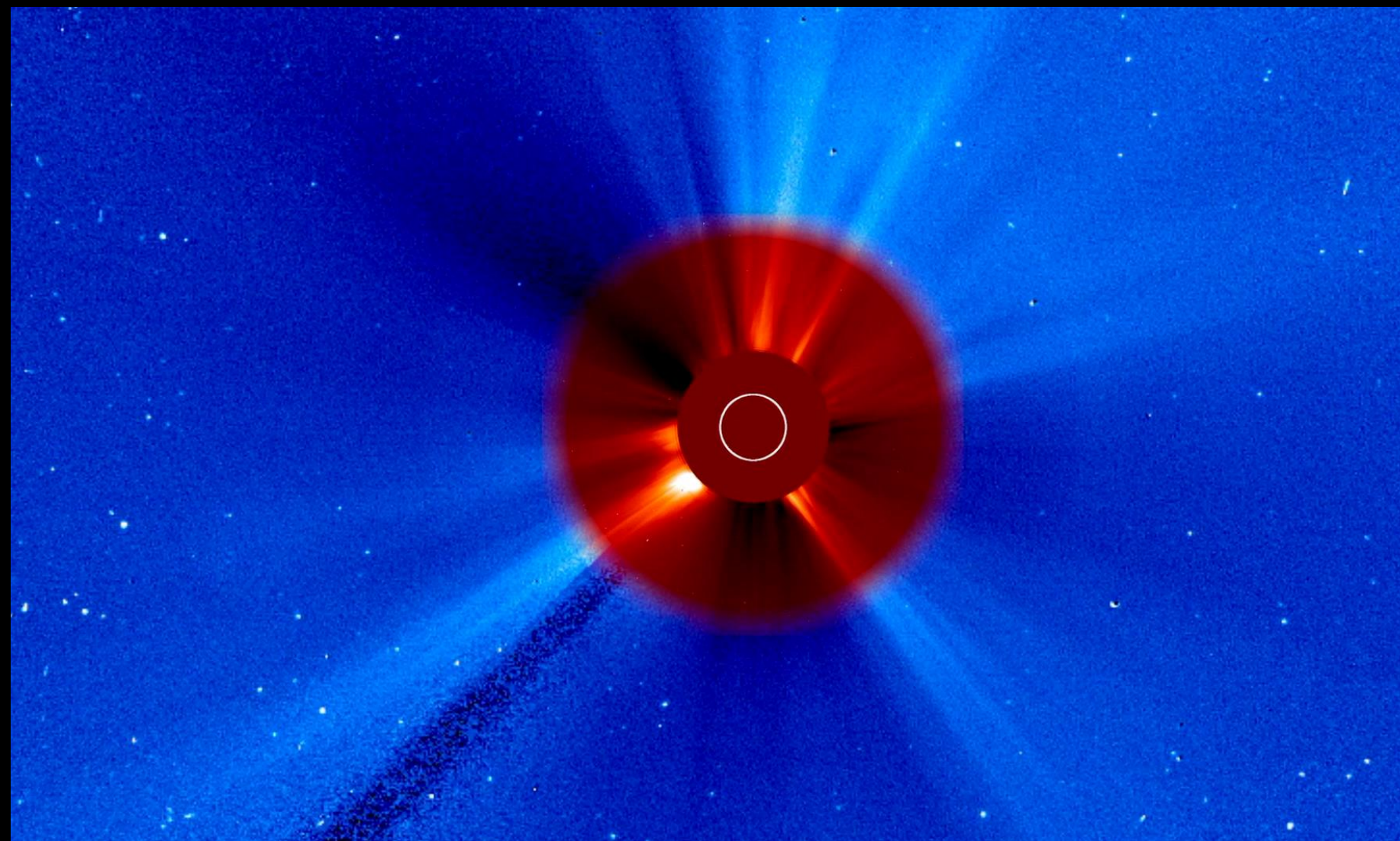
75% of all stars are red dwarfs

25% of all red dwarfs have planets in the habitable
zone

= Most habitable zone planets orbit red dwarfs



FLARING



X class solar flare: May 5 2015

UV RADIATION DRIVES THE PLANETARY ATMOSPHERE

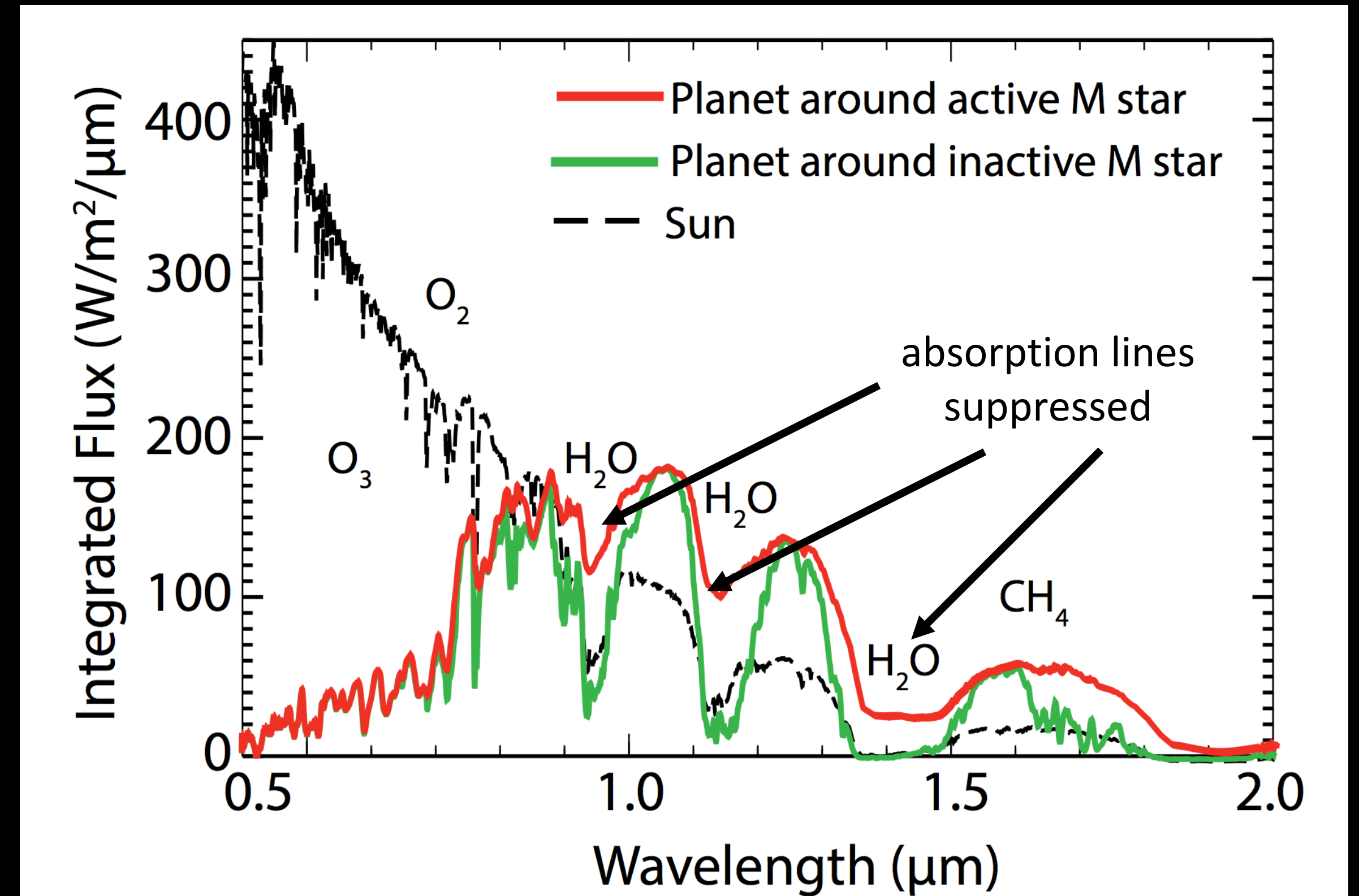
Tracer Molecules Dissociated by UV

H₂O

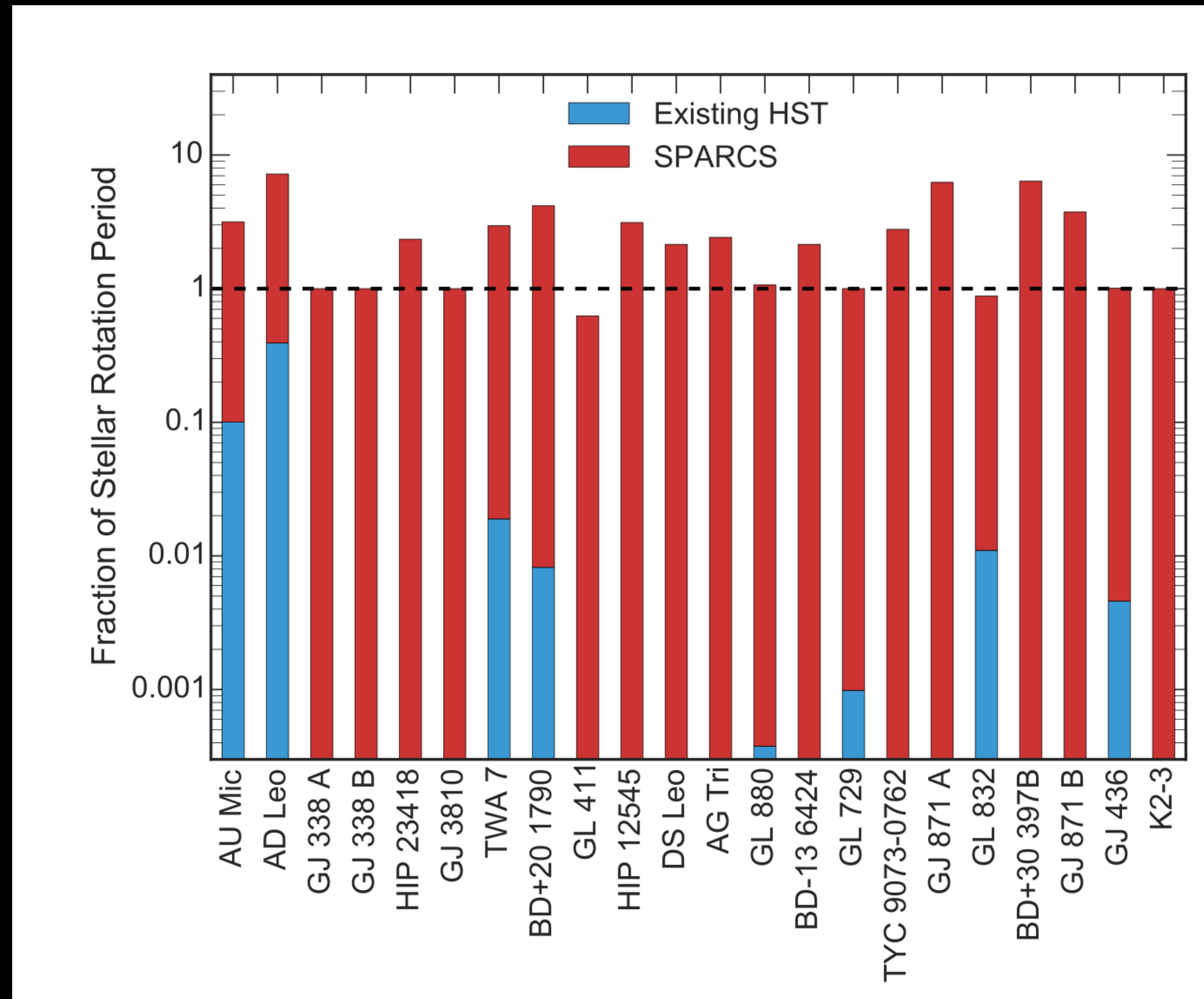
O₃ (indirect tracer for O₂)

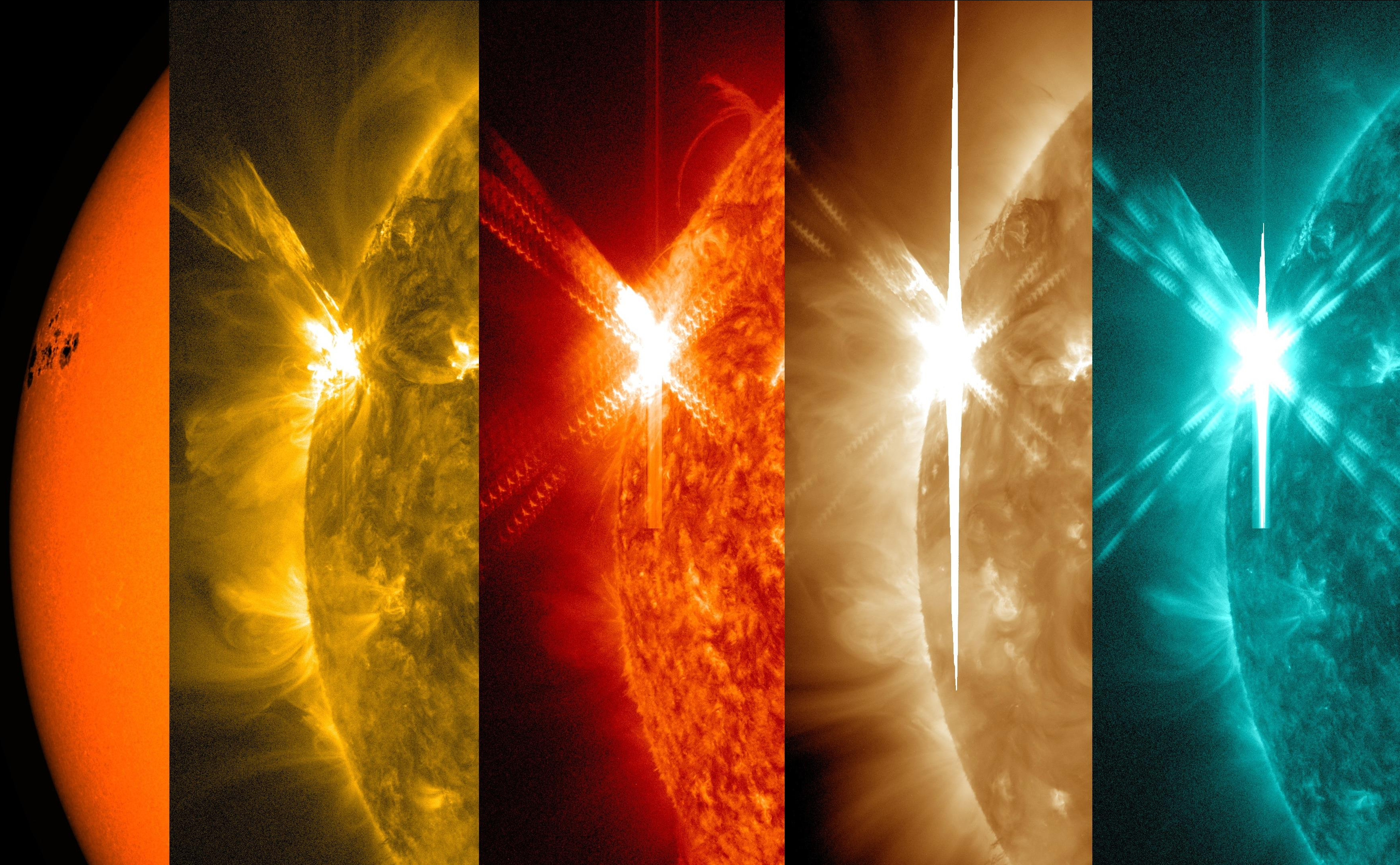
SO₂ (volcanic activity)

NH₃ (key for amino acids)



M DWARF FLARES ARE POORLY STUDIED

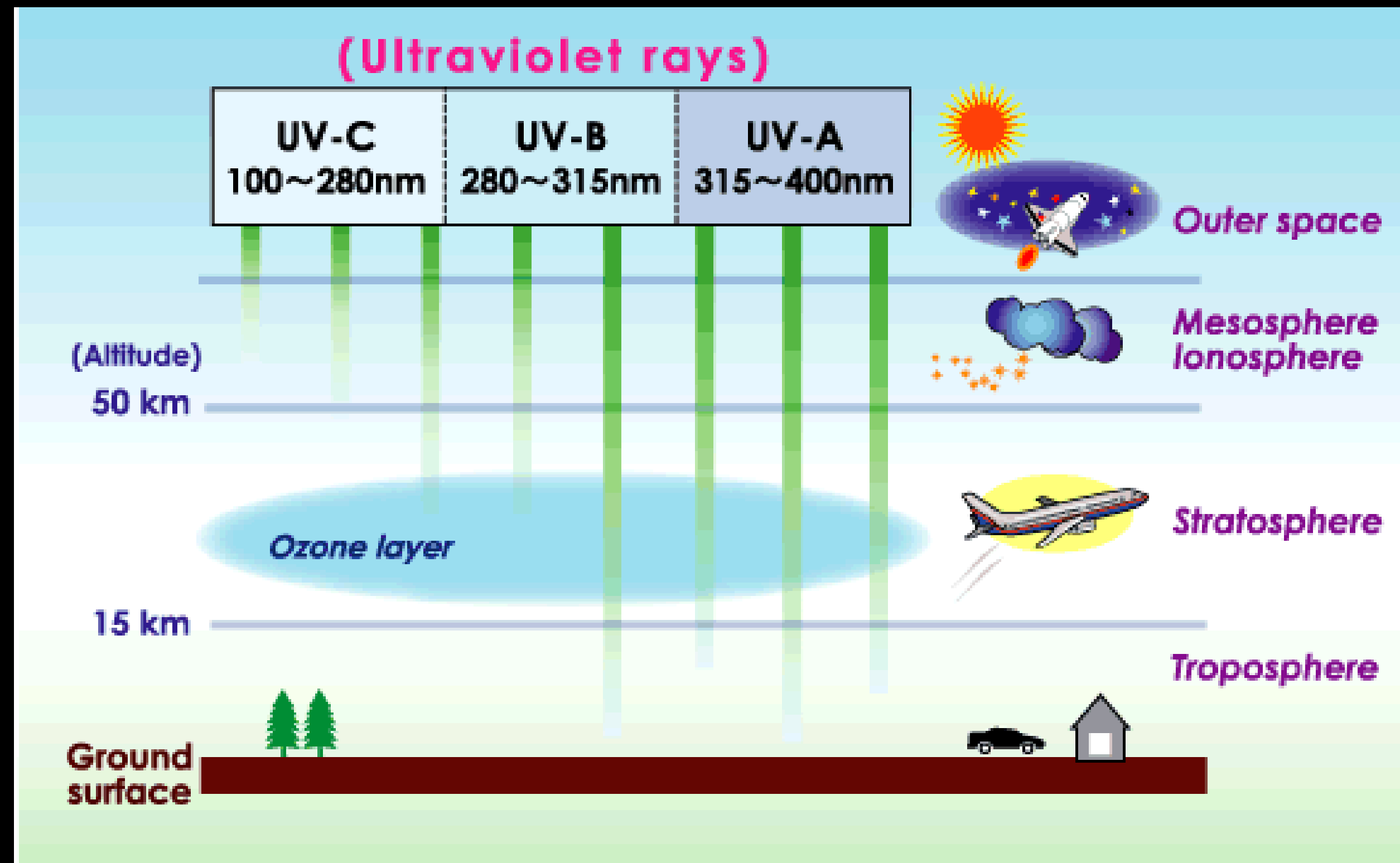




Visible

Ultraviolet

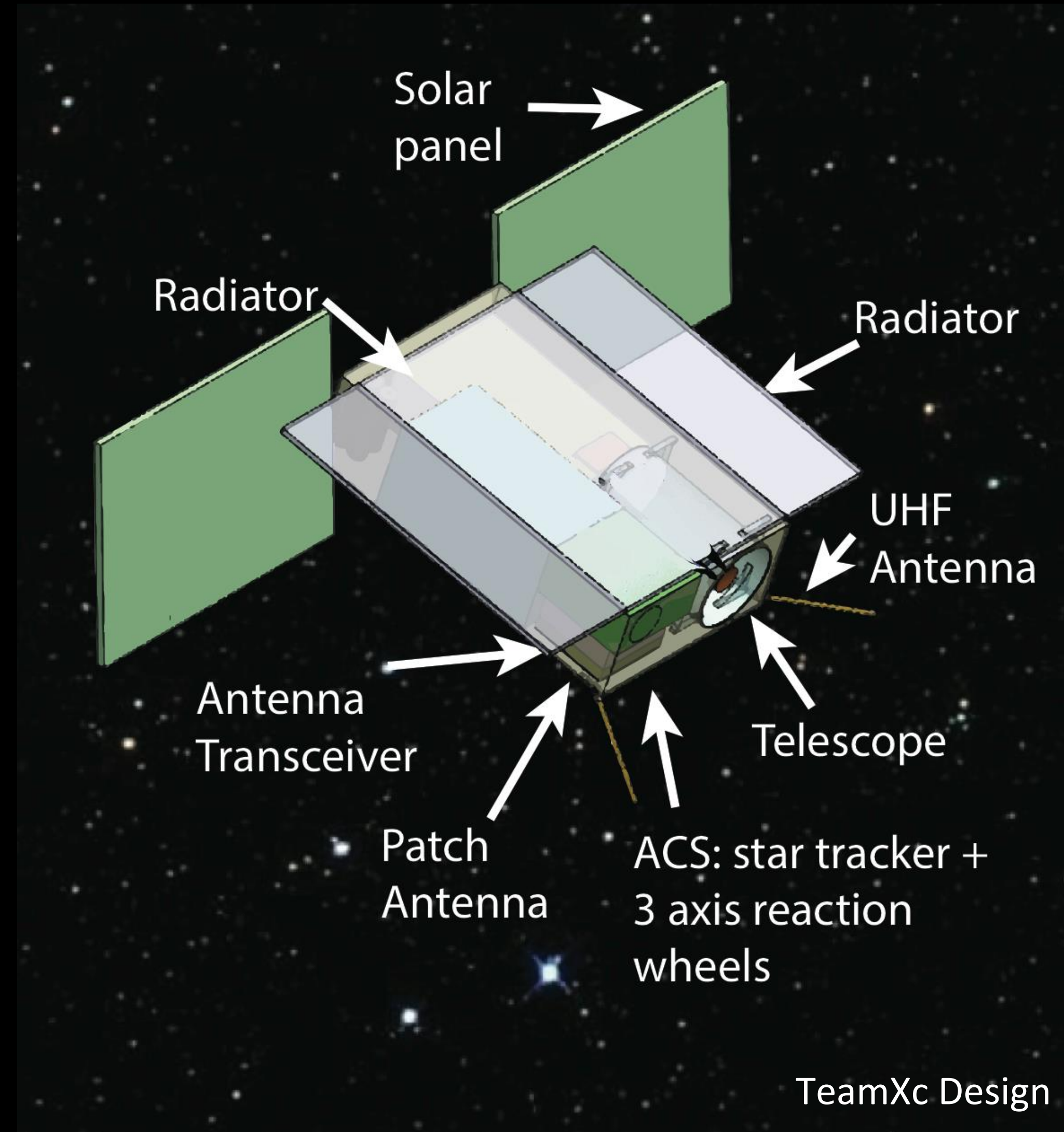
UV IS BEST SEEN FROM SPACE





SPARCS BASIC DESIGN PARAMETERS

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



TeamXc Design



SPARCS INSTRUMENT

Maximum volume envelope:
9cmx9cmx30cm

Mass: 4.96kg

Data: 150 MB/day.

C&DH: Onboard image processing

Power: 10W

Thermal:

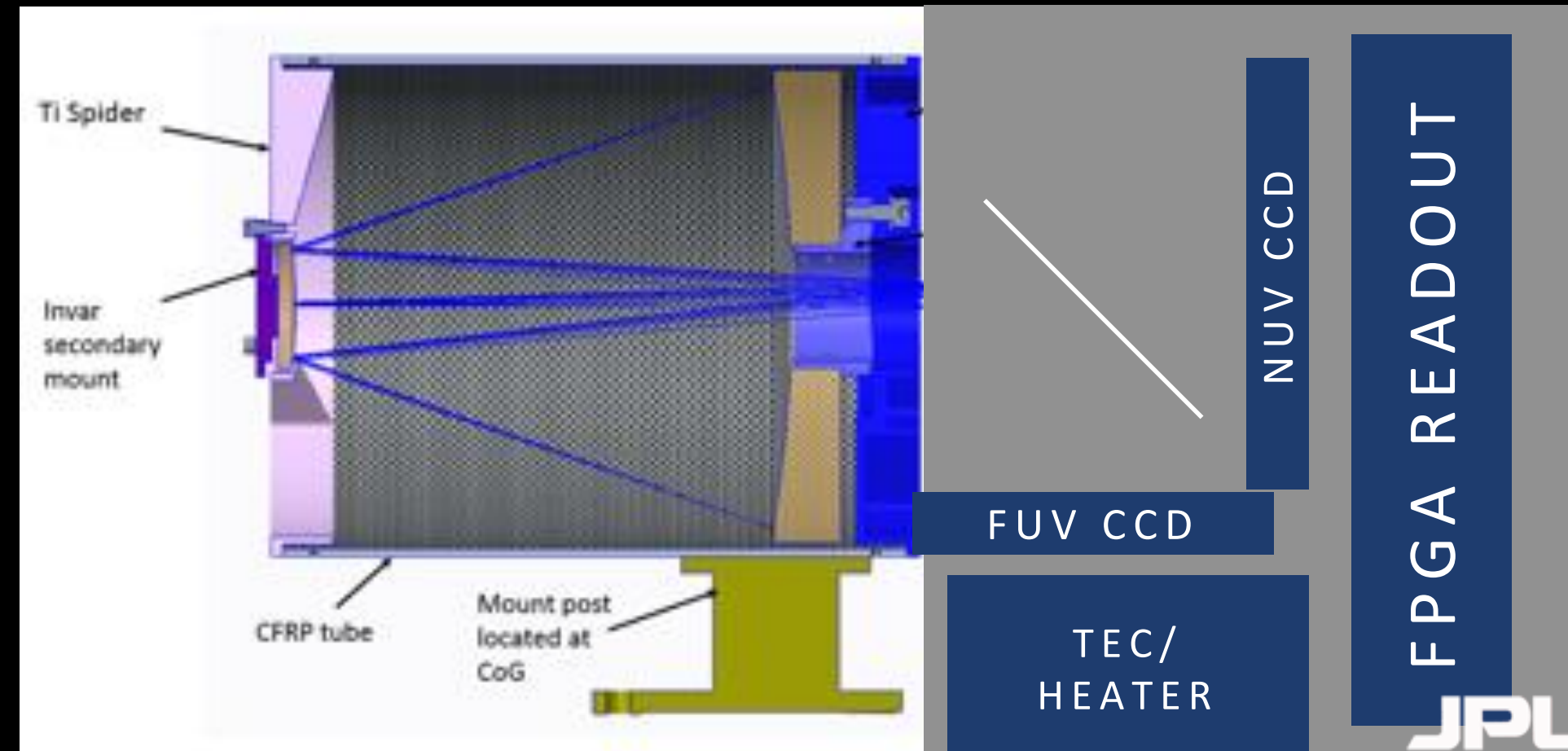
CCD science: 238K

CCD bakeout: 320K

Pointing Jitter Requirement: 7" 1 sigma

9cm telescope

Two band
UV camera

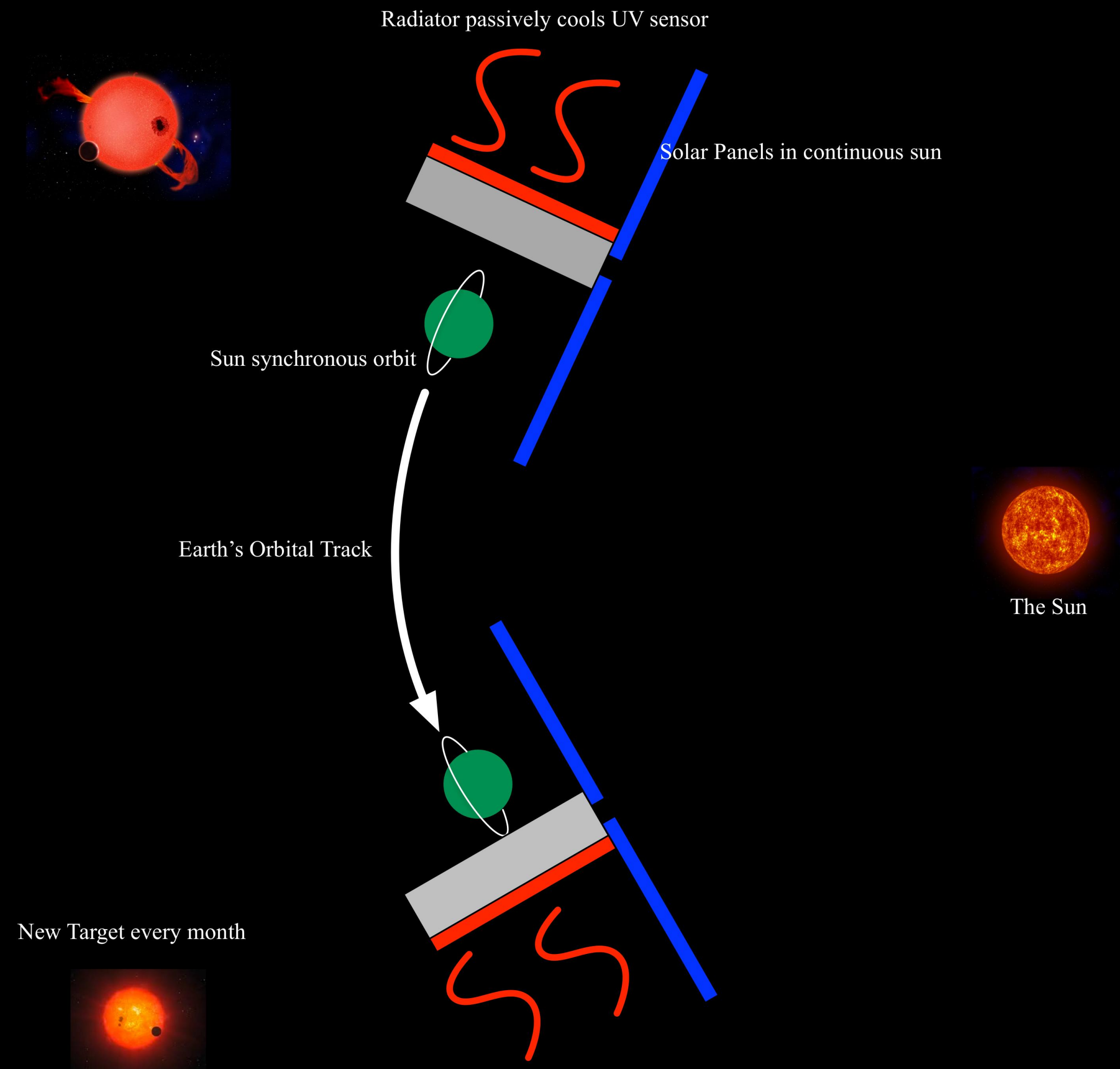


13cm

10cm

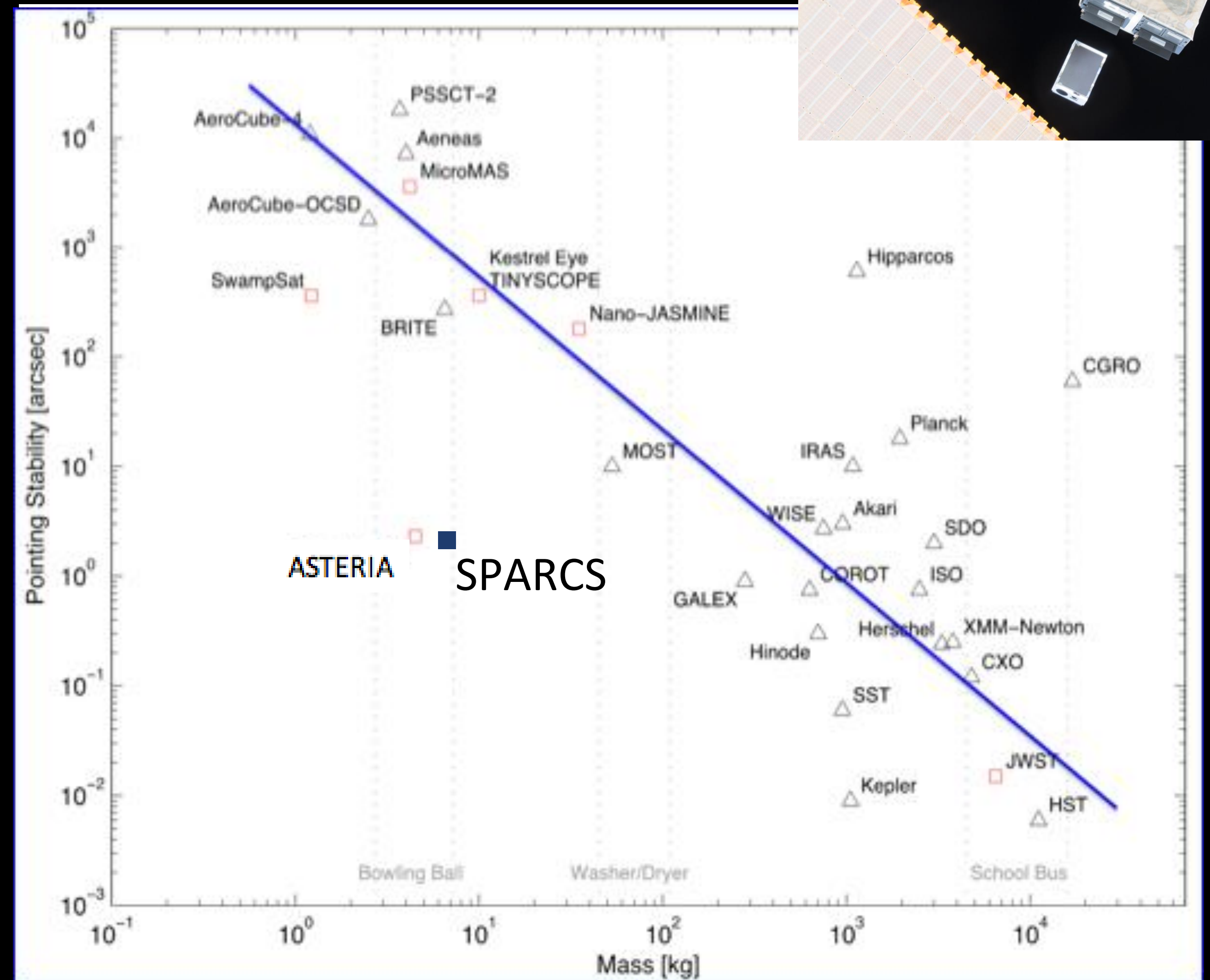
SPARCS CONCEPT OF OPERATIONS

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



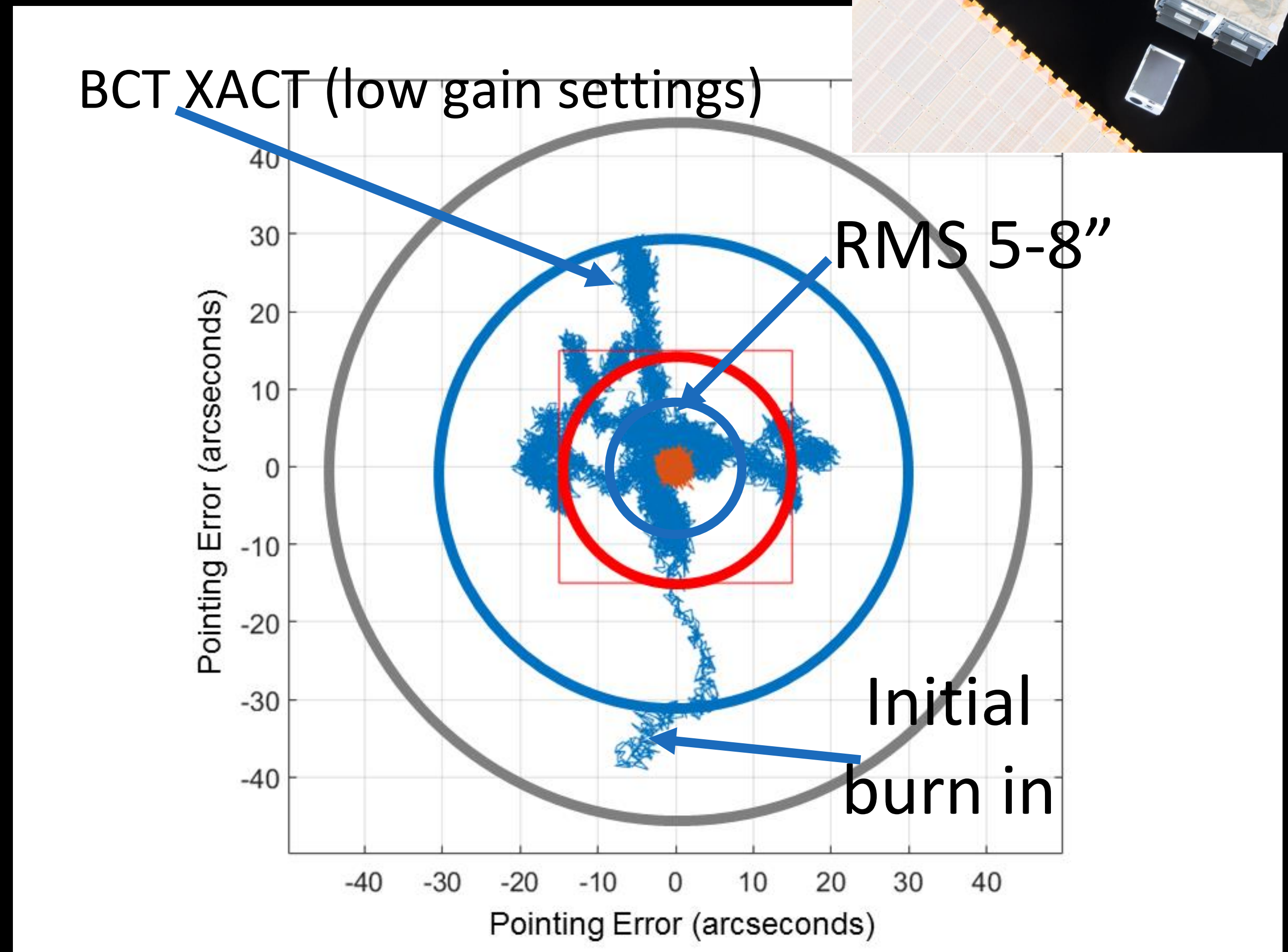
CHALLENGES

- Pointing (need 10" 1sigma)
- Orbit (need 6pm SS)
- Thermal control (cold and hot)
- UV sensor contamination control



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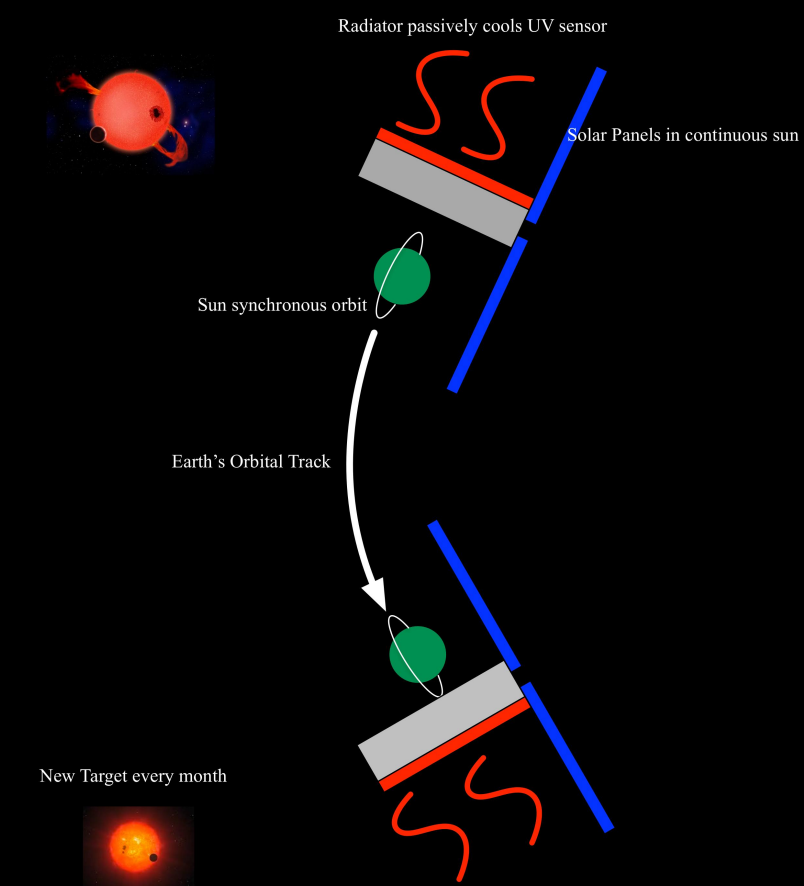
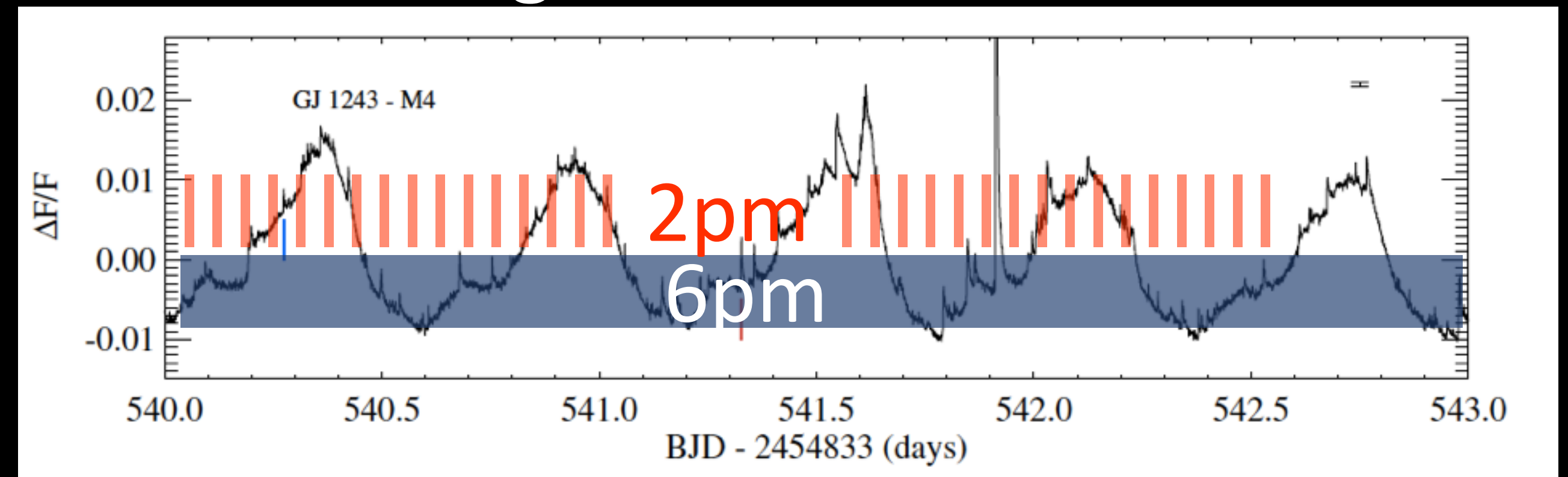


Asteria pointing difference

CHALLENGES

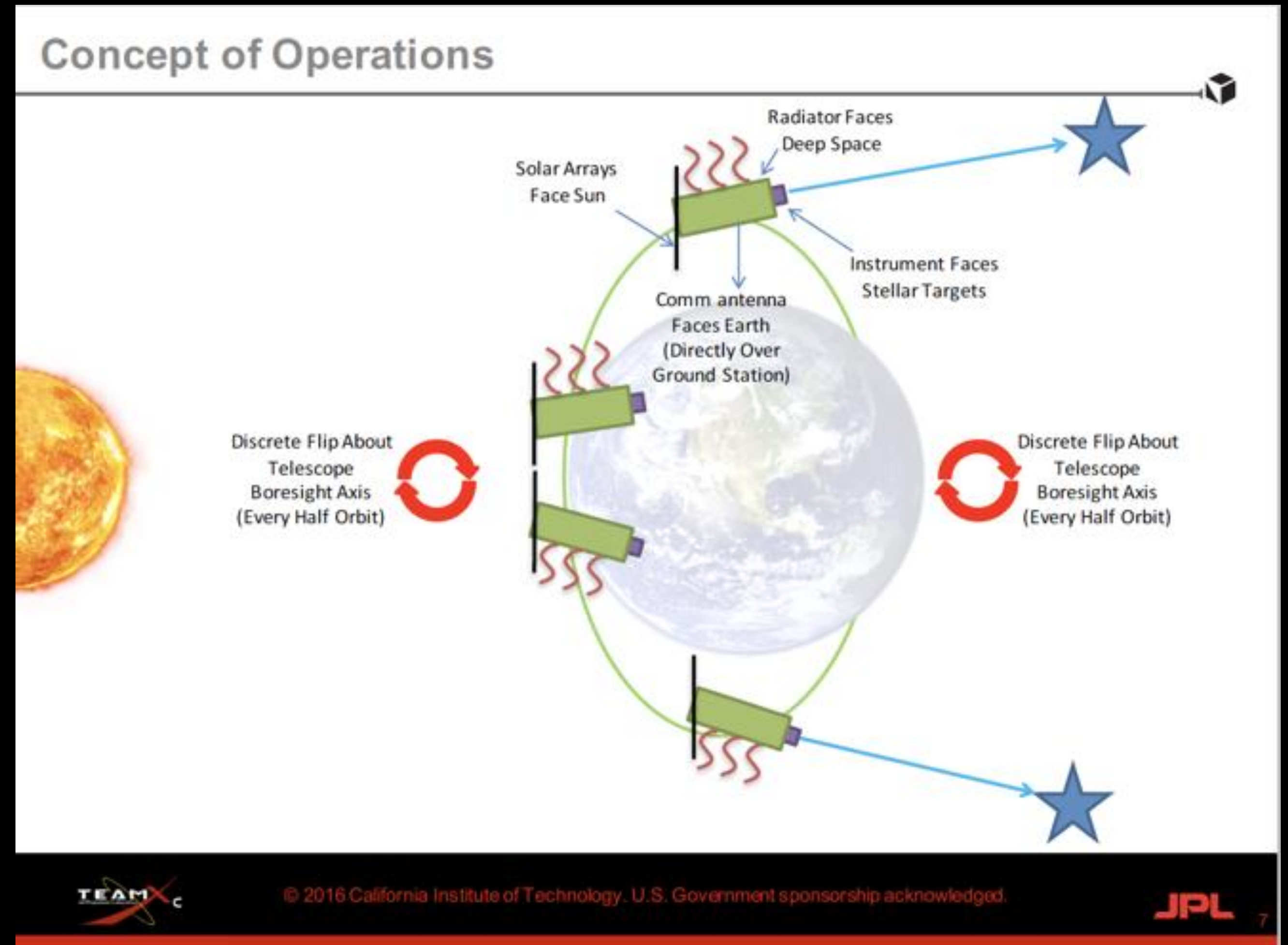
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Orbit coverage

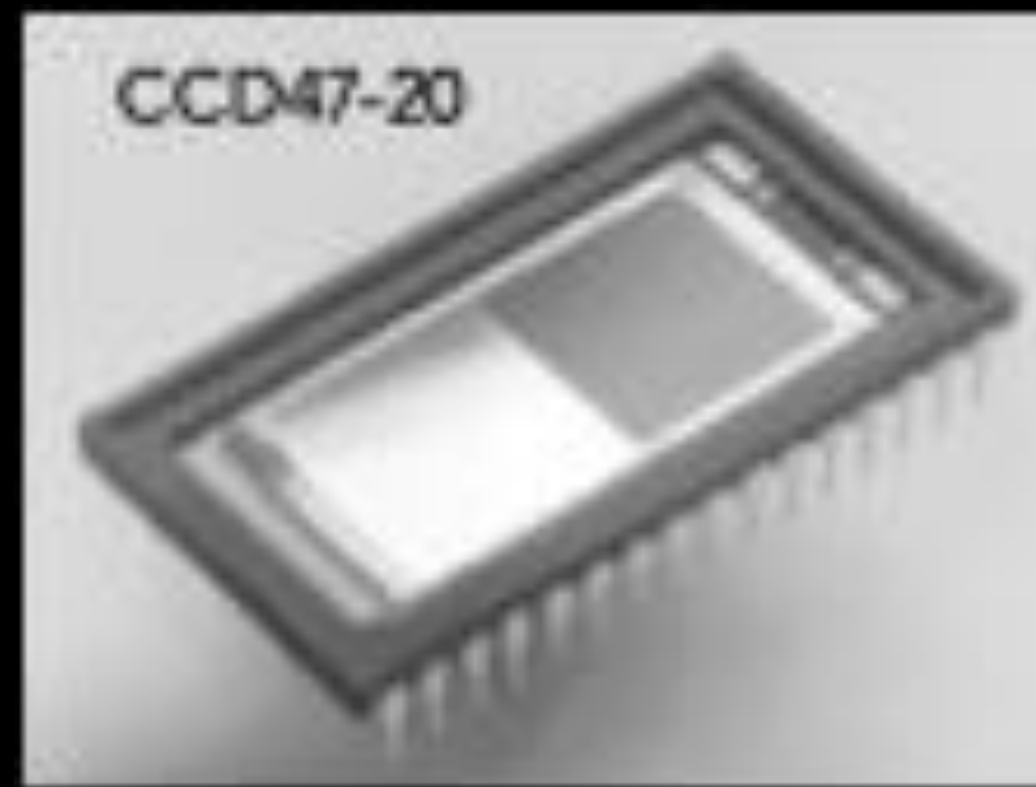


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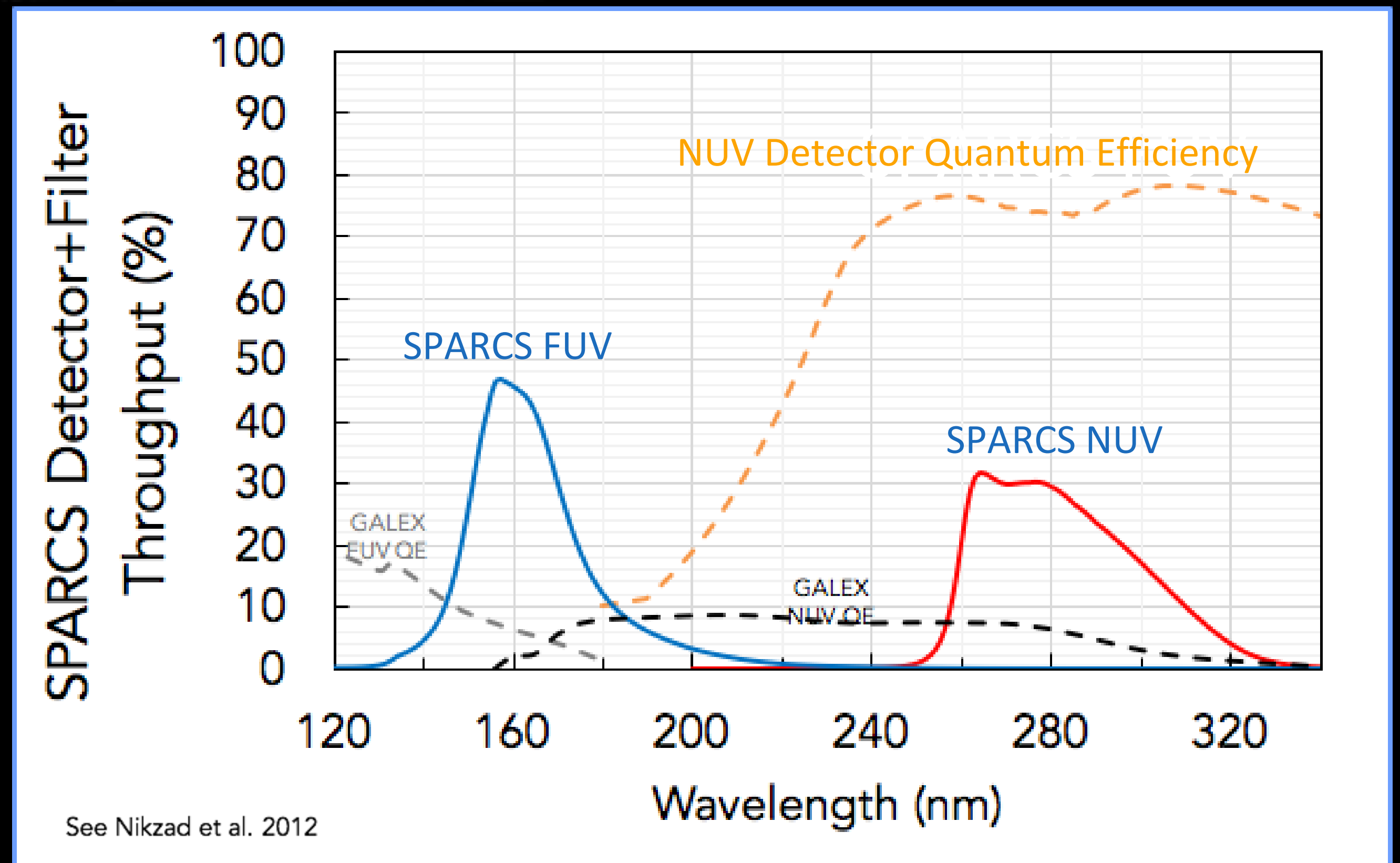
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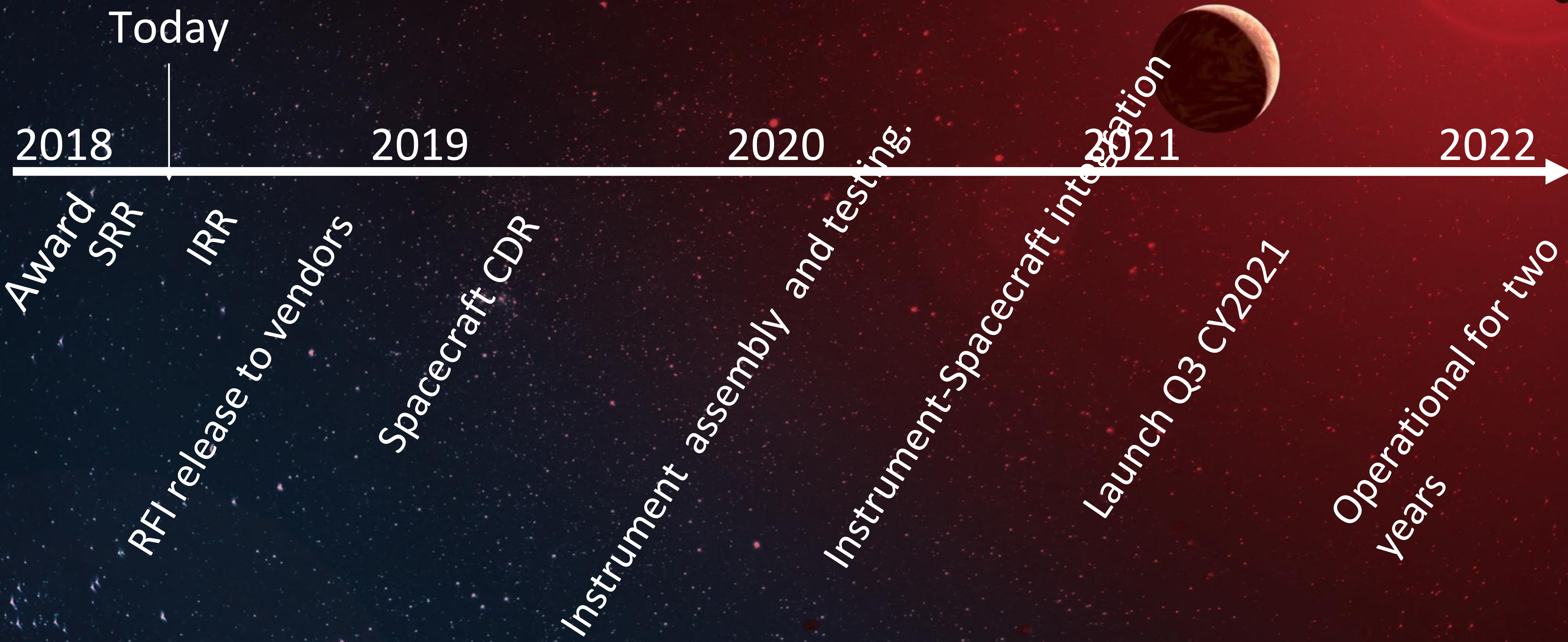


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SCHEDULE





THANK YOU!

