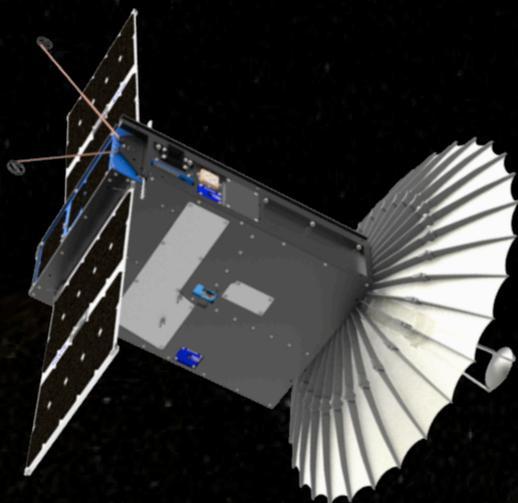


RainCube

**RainCube, a Ka-band precipitation
radar in a 6U CubeSat**



**Eva Peral, Principal Investigator
Shannon Statham, Project Manager
Presented by Matthew Lebsock**

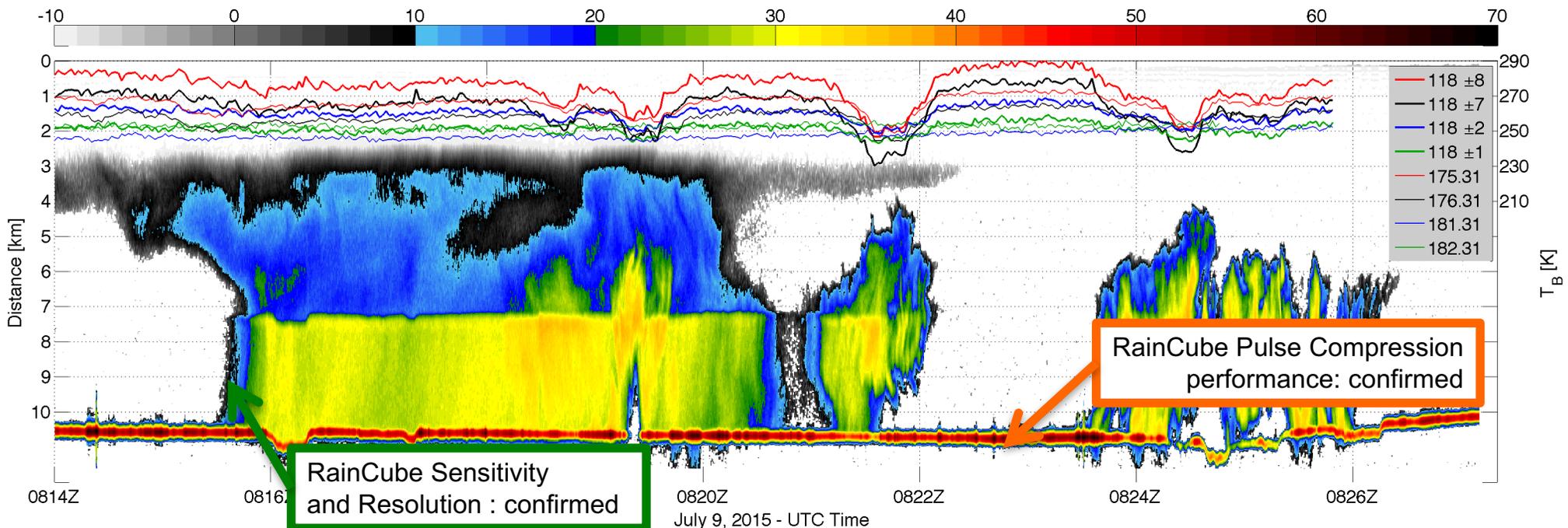
Jet Propulsion Laboratory,
California Institute of Technology, CA, USA

RainCube is a ***technology demonstration*** mission to enable ***Ka-band*** precipitation radar technologies on a low-cost, quick-turnaround platform.

- **Selected by ESTO through the InVEST-15 solicitation**
 - 6U CubeSat, with expected launch in 2018
 - Deployed from ISS with planned 3-month mission
- **2 key mission objectives**
 - Demonstrate new technologies in Ka-band on a CubeSat platform
 - Miniaturized Ka-band Atmospheric Radar for CubeSats (miniKaAR-C)
 - Ka-band Radar Parabolic Deployable Antenna (KaRPDA)
 - Enable precipitation profiling radar missions for Earth Science

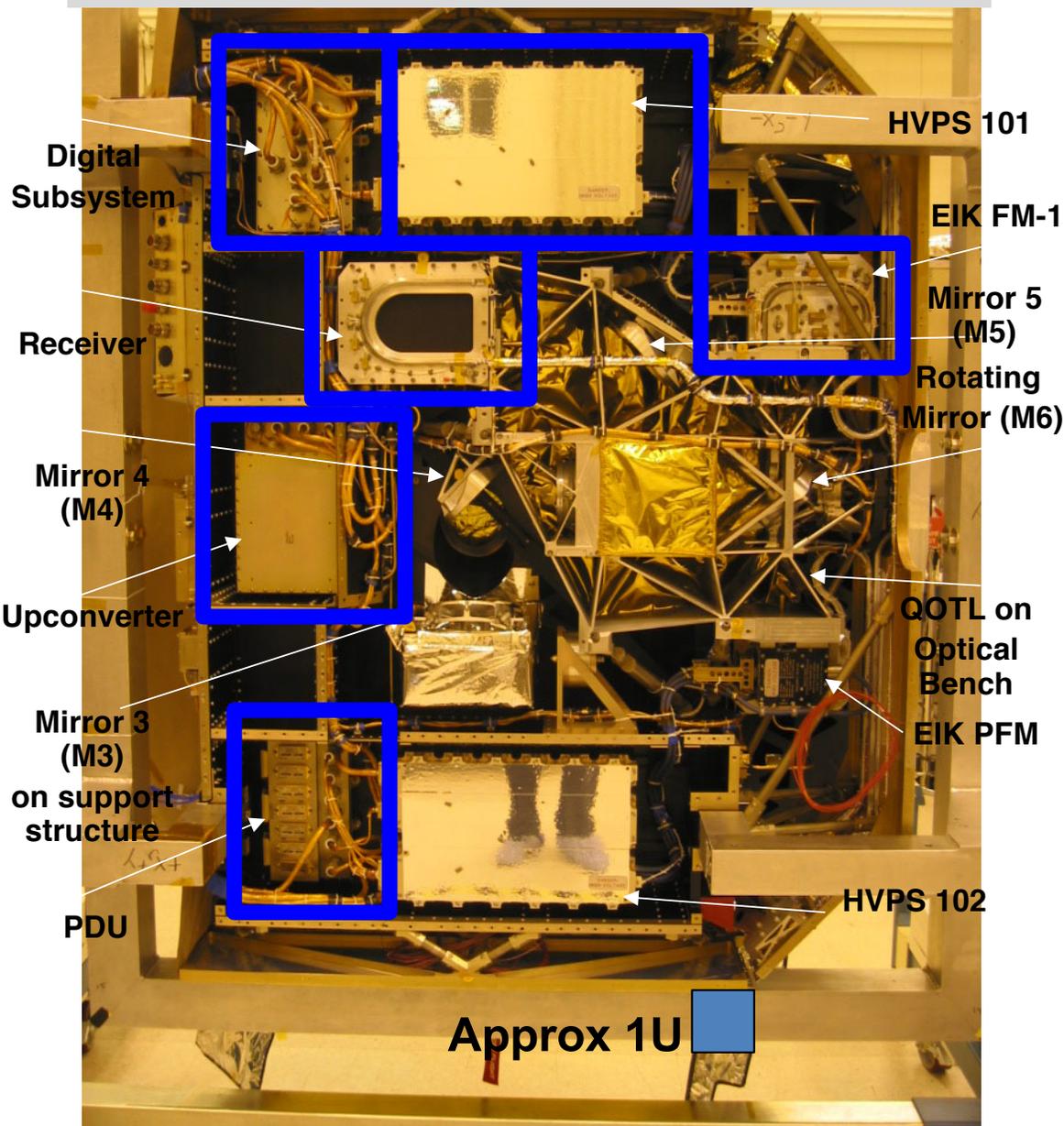
A novel atmospheric radar architecture

- **RainCube will demonstrate a precipitation profiling radar with reduced size, mass, and power**
 - Pulse compression → reduced transmit power
 - Offset IQ modulation from baseband to Ka band → fewer components & reduced power
 - Digital signal processing → optimal response
- **Critical elements were tested in a July 2015 airborne demonstration**



How small is RainCube. . .

CloudSat's Cloud Profiling Radar (CPR)



RainCube (miniKaAR-C)



The radar instrument (miniKaAR-C) w/o antenna (all boxes in blue in CPR) occupy in RainCube less than 2.5U

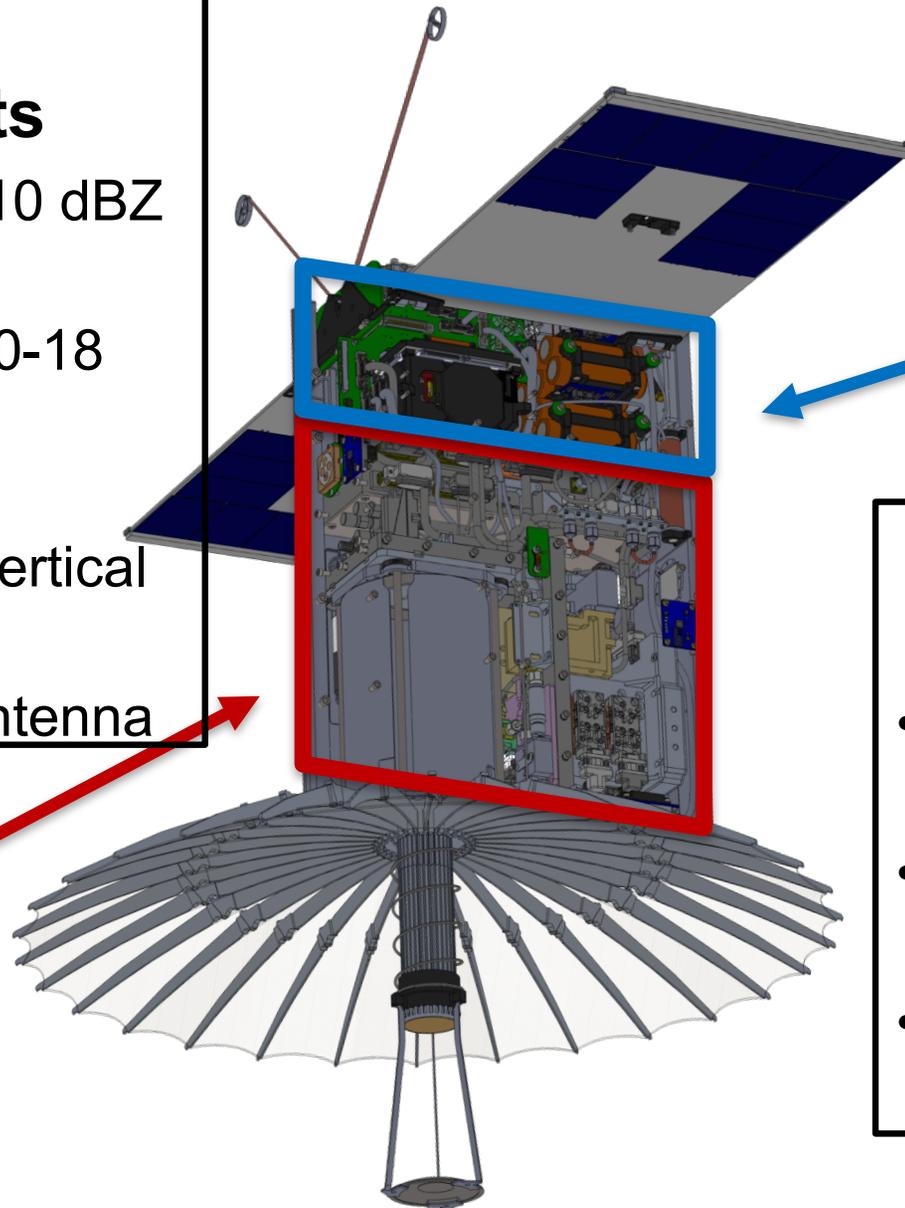
These two images are approximately to scale

Tyvak is providing the spacecraft bus

Key Radar Requirements

- 20dBZ sensitivity (10 dBZ CBE)
- Vertically profile in 0-18 km altitudes
- 10 km horizontal resolution, 250 m vertical resolution
- 0.5m deployable antenna

**Radar
(4U)**

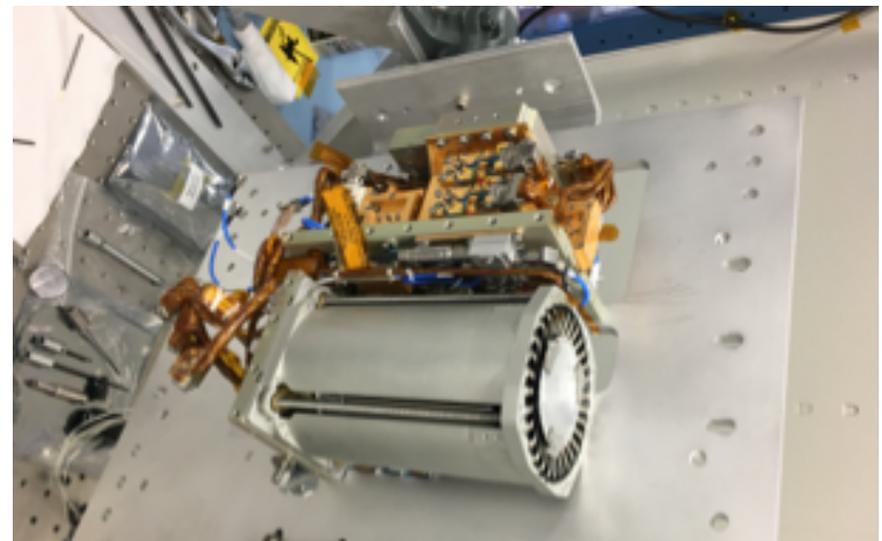
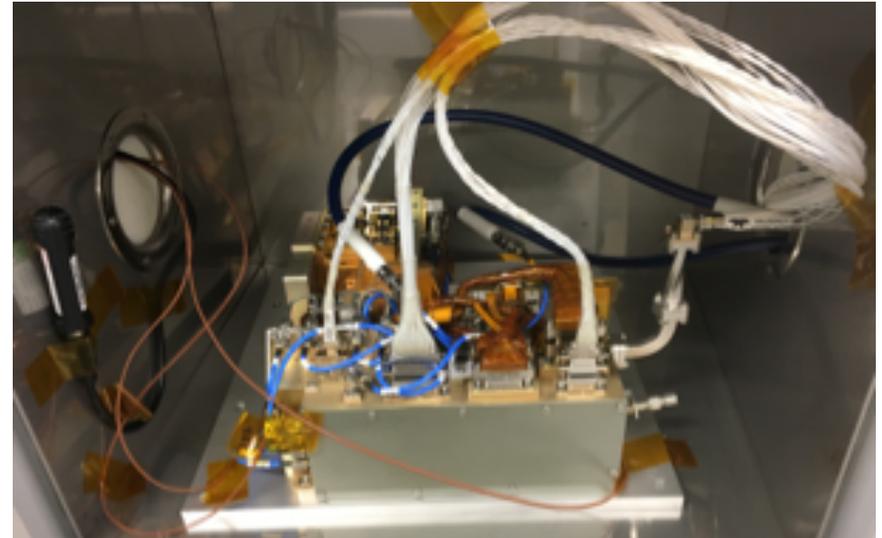
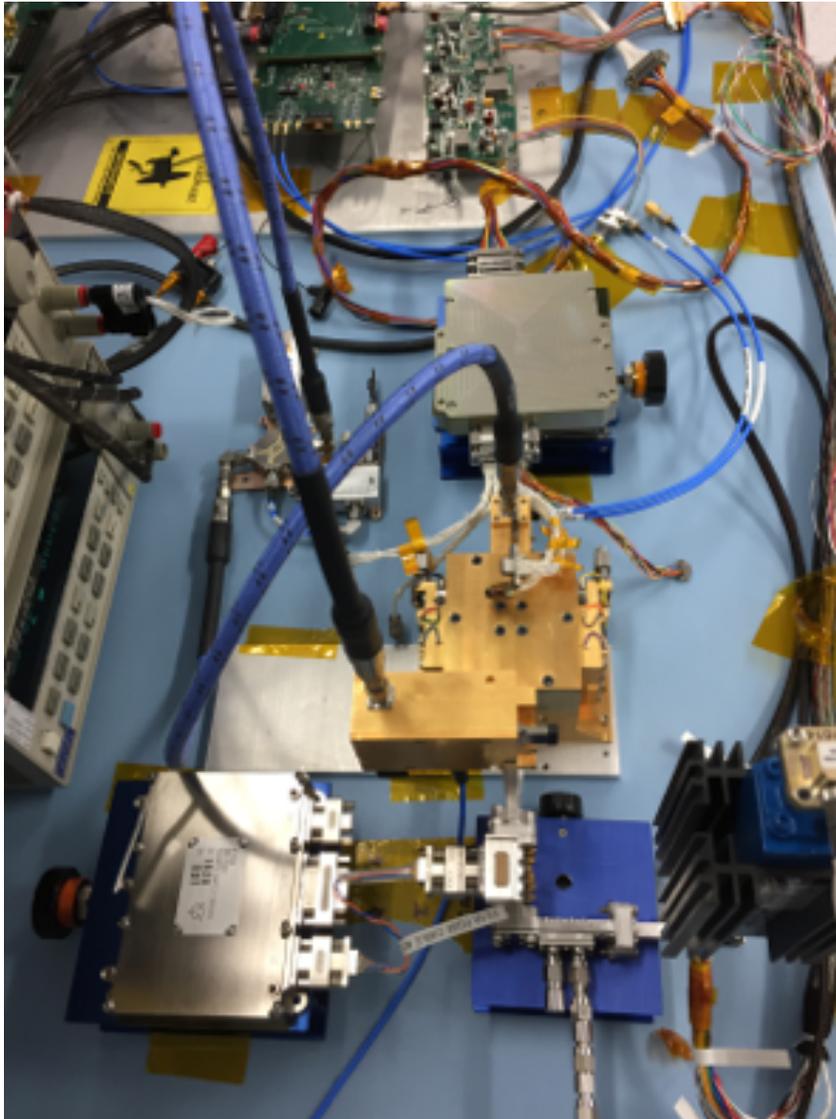


**Bus
(2U)**

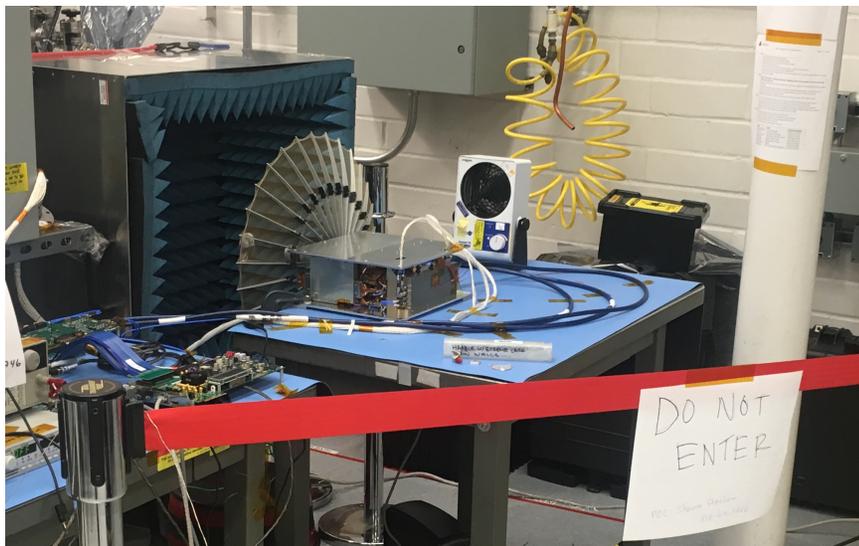
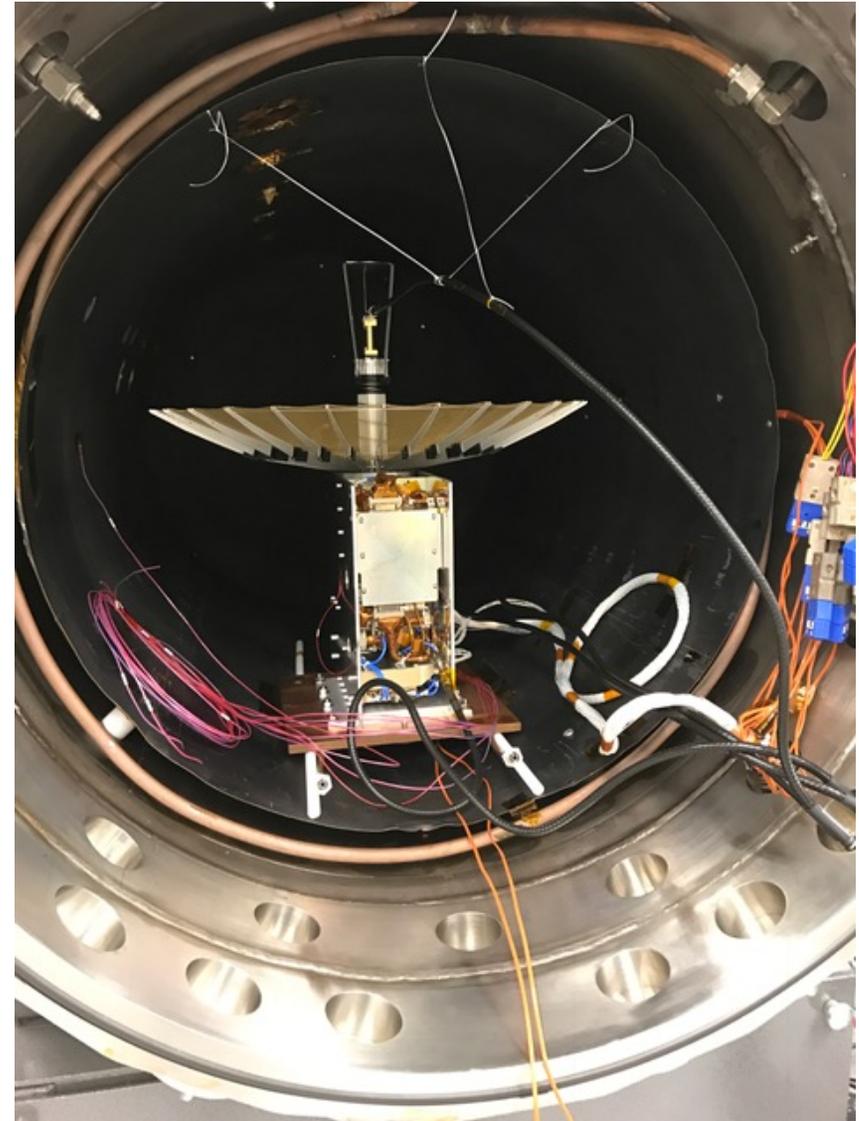
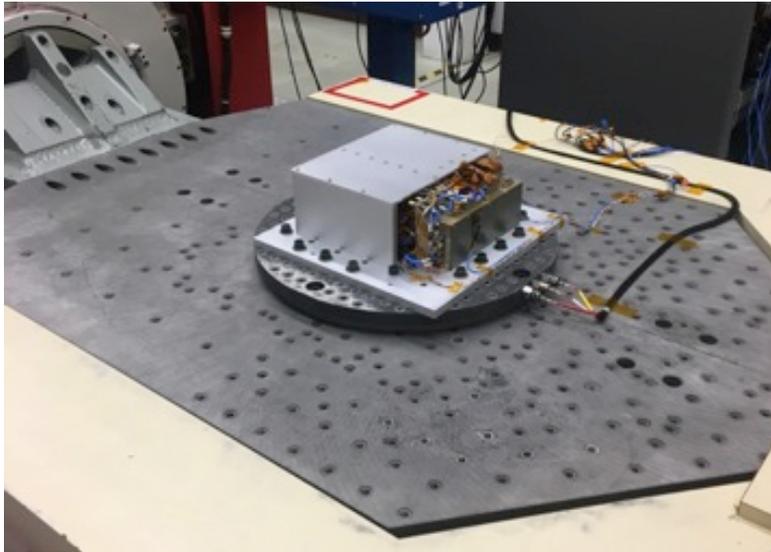
Key Bus Requirements

- Maintain a 25% radar duty cycle
- Operate through continuous orbits
- 12.1 Gb/week of payload data

Radar assembly



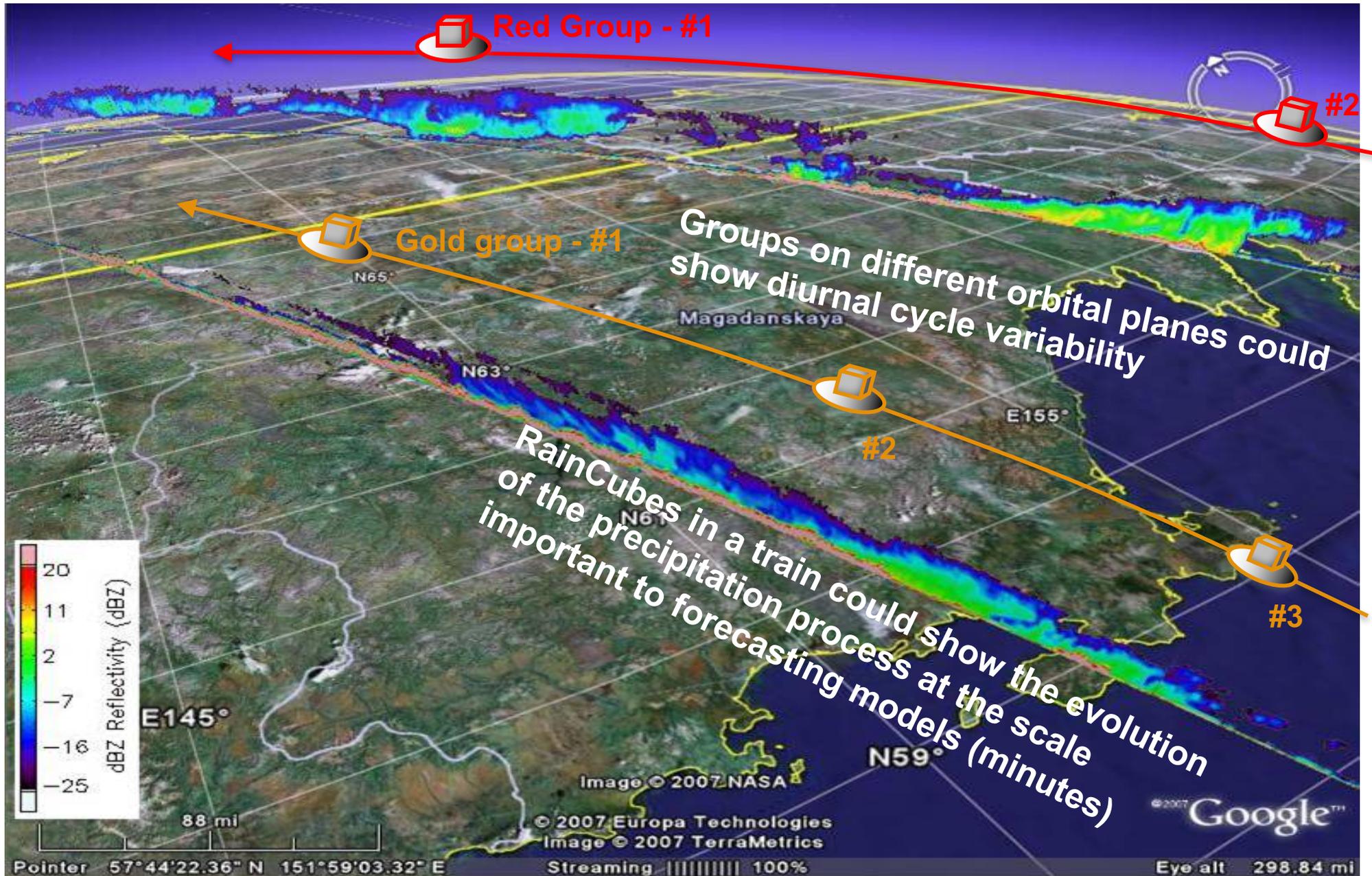
Radar environmental testing



Antenna deployment

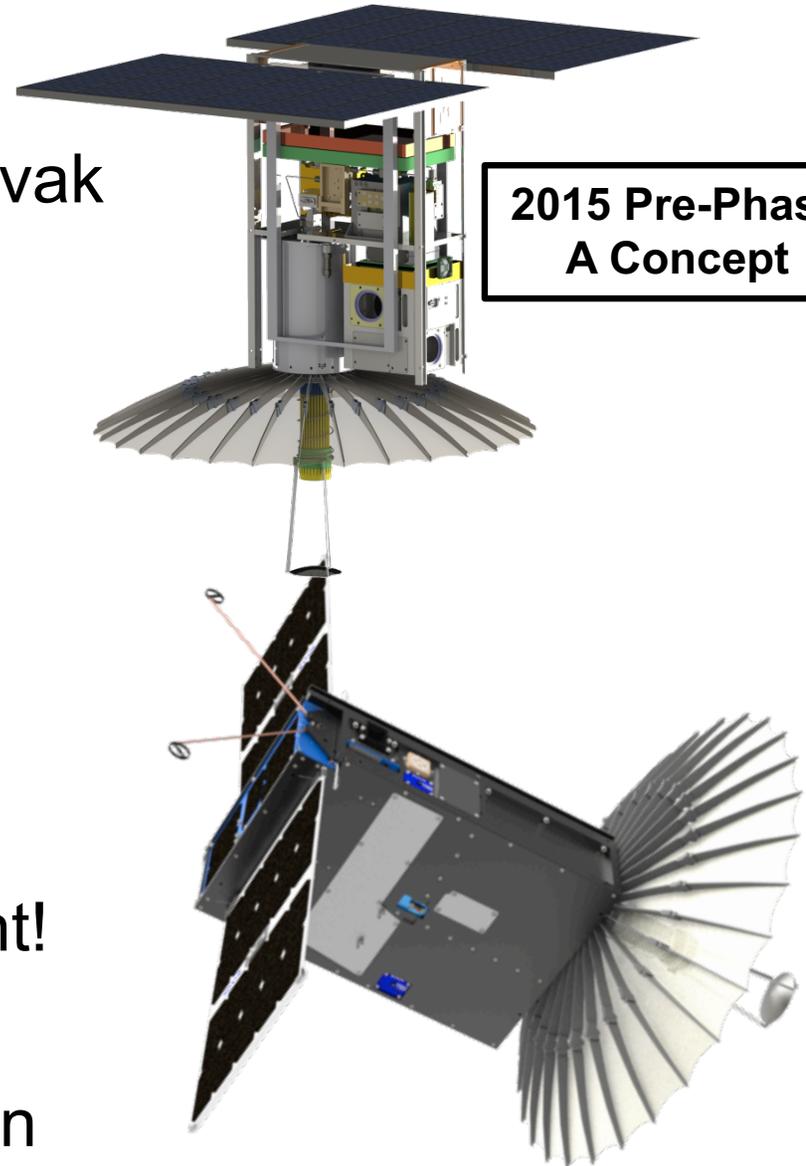


Science motivation



Upcoming milestones

- **June '17:** Radar delivery to Tyvak and begin of system I&T
- **Sept. '17:** Mission readiness review and delivery to storage
- **Mar '18 (est.):** Launch
- **May '18 (est.):** ISS deployment!
- **July '18 (est.):** Primary mission complete



2015 Pre-Phase
A Concept

2017 Final Design