

# Cluster II Re-entry

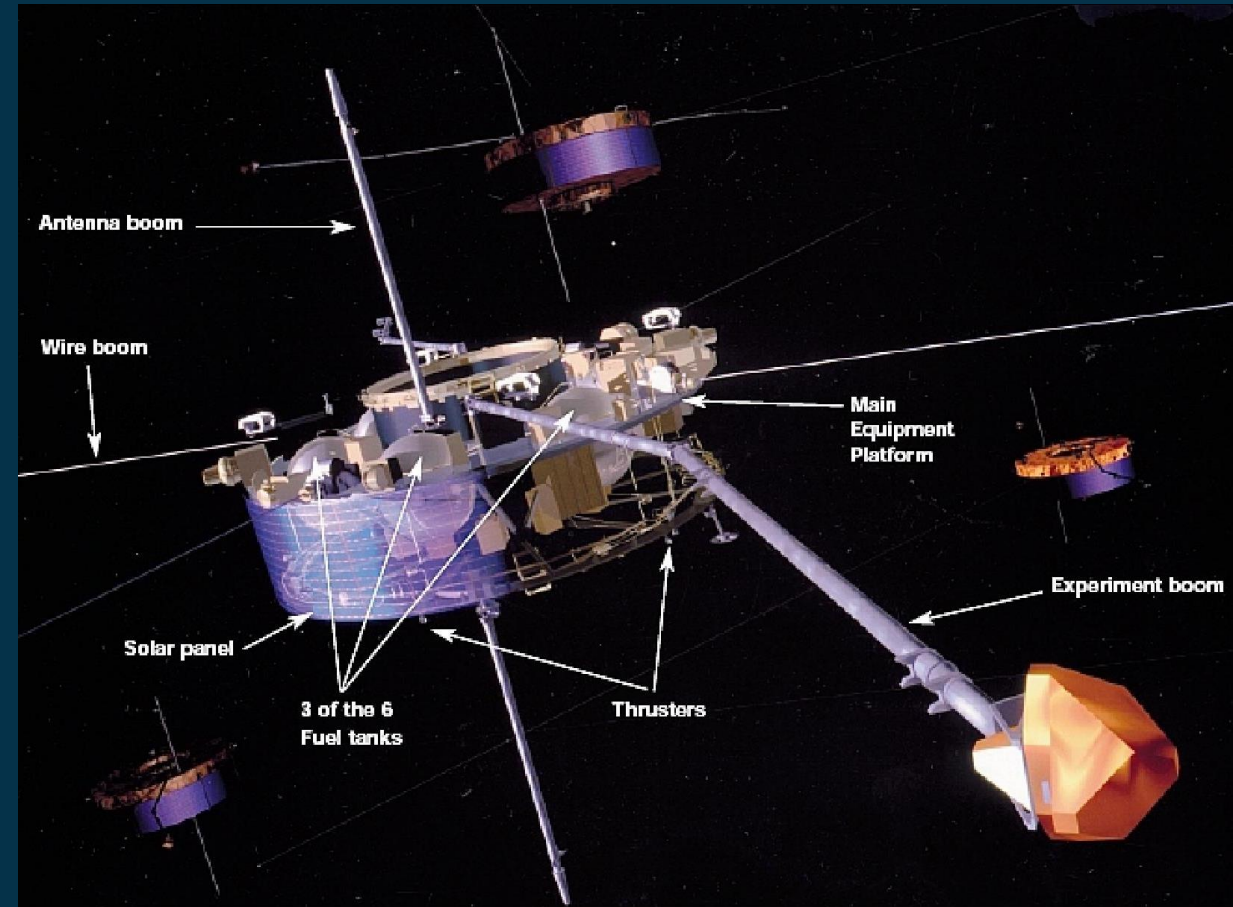
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Bruno Sousa

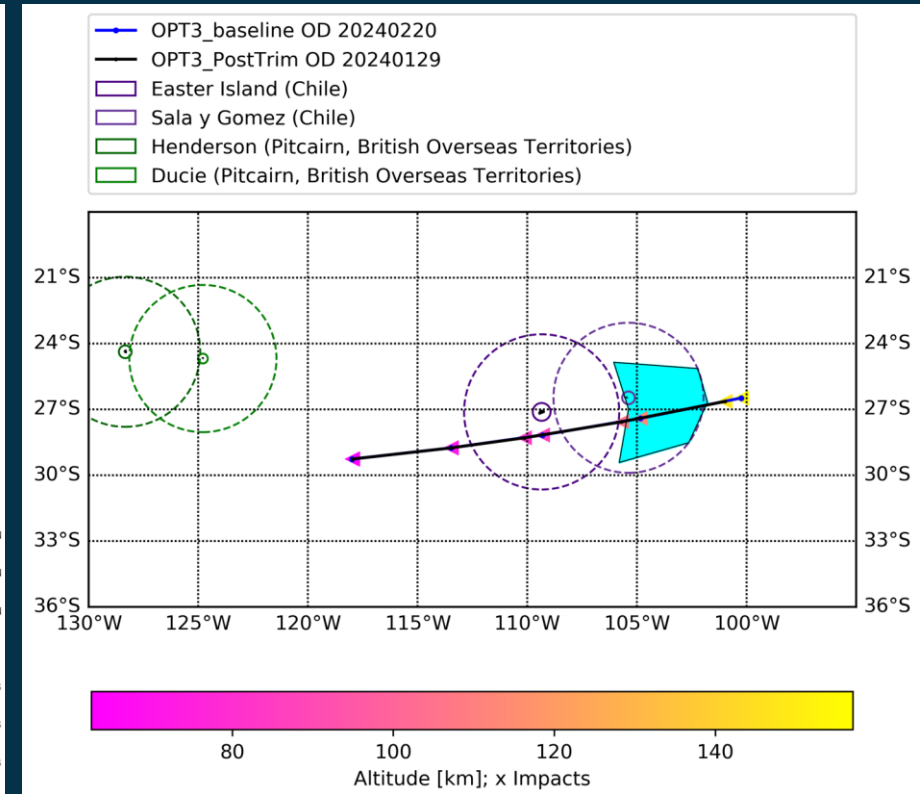
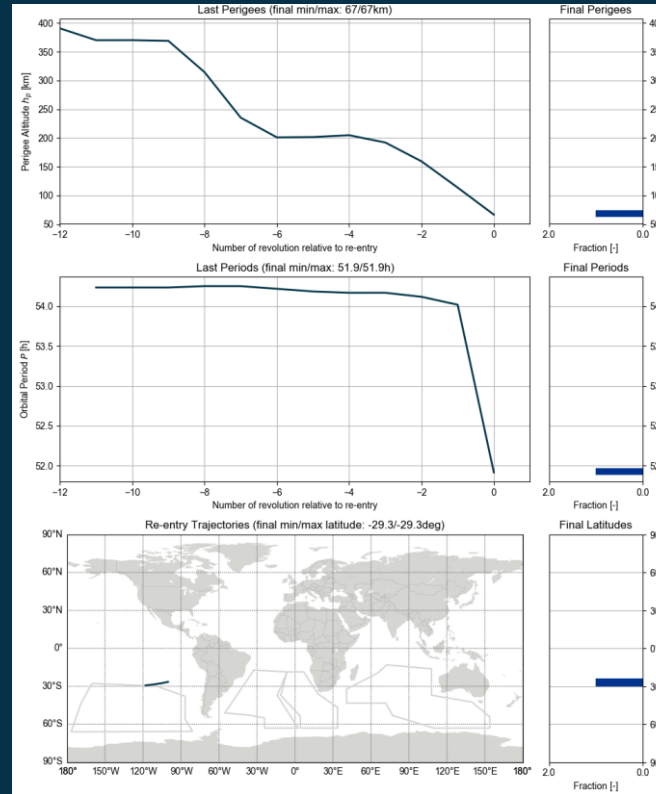
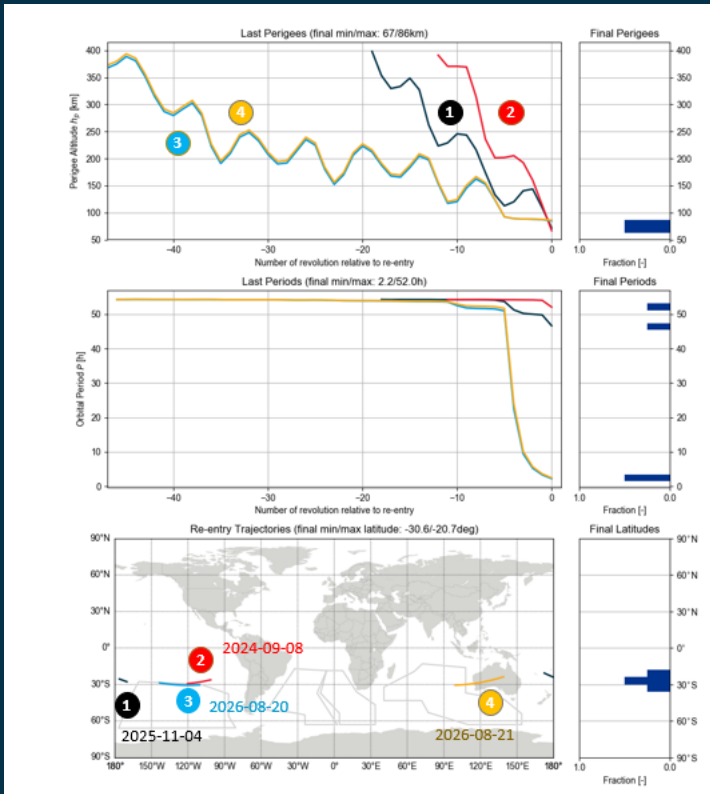
15/01/2025

# Mission description

- 4 identical satellites, flying in formation in HEO
- Each carries 11 instruments: Field sensors and Particle detectors
- Solar and Plasma physics
- Launched in 2000, operational for 24 years
- Remaining 3 currently idle and targeted for re-entry in 2025-2026
- Average fuel remaining in each satellite: 4 Kg

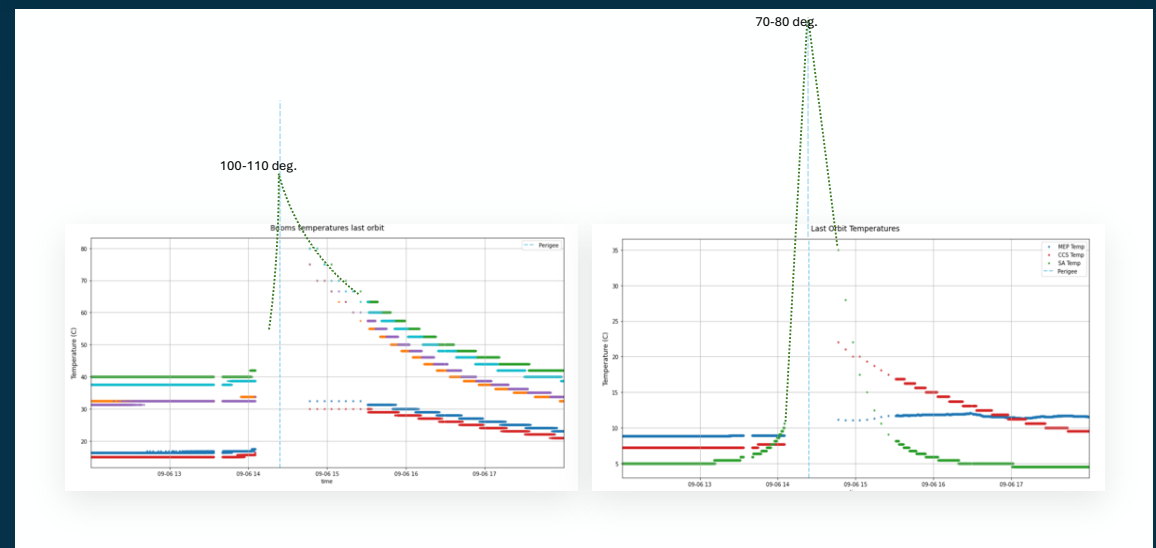
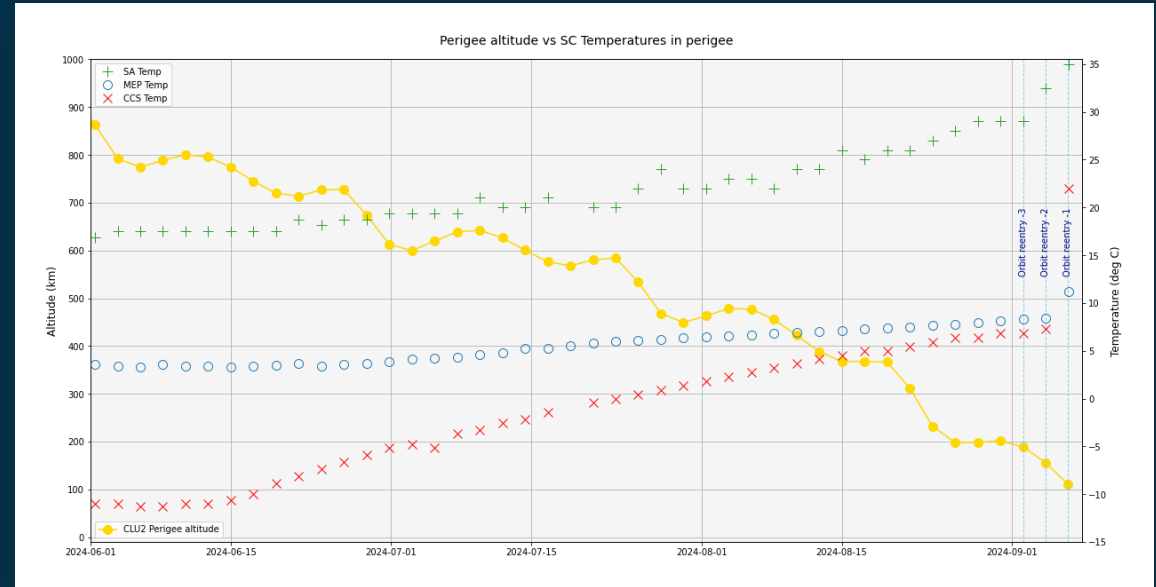
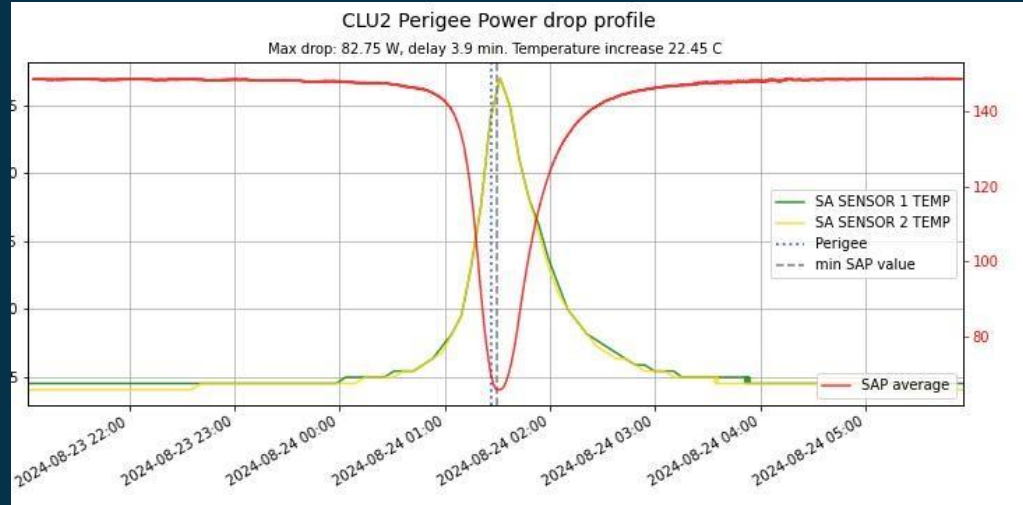


# EoL strategy – Targeted re-entry from HEO



- No circularization – minimize risk to people and property on ground
- No debris stays in orbit – minimize risk to other missions

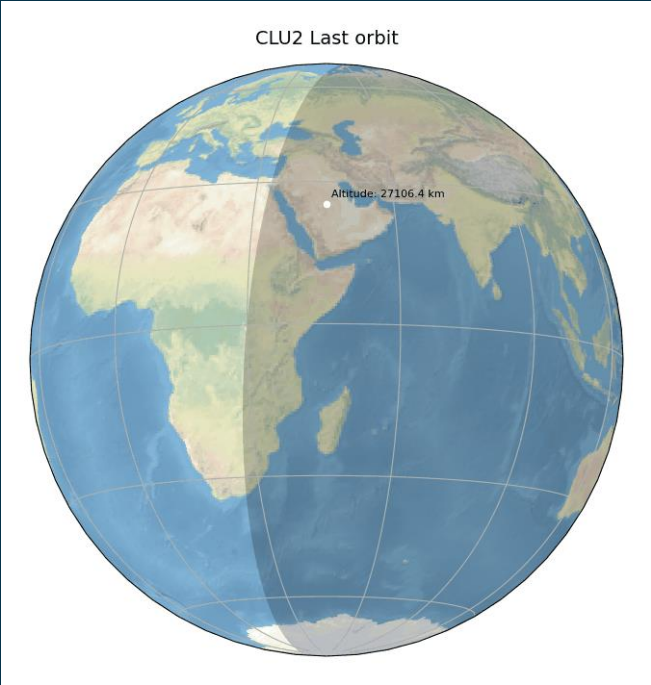
# Power drops and temperature rises

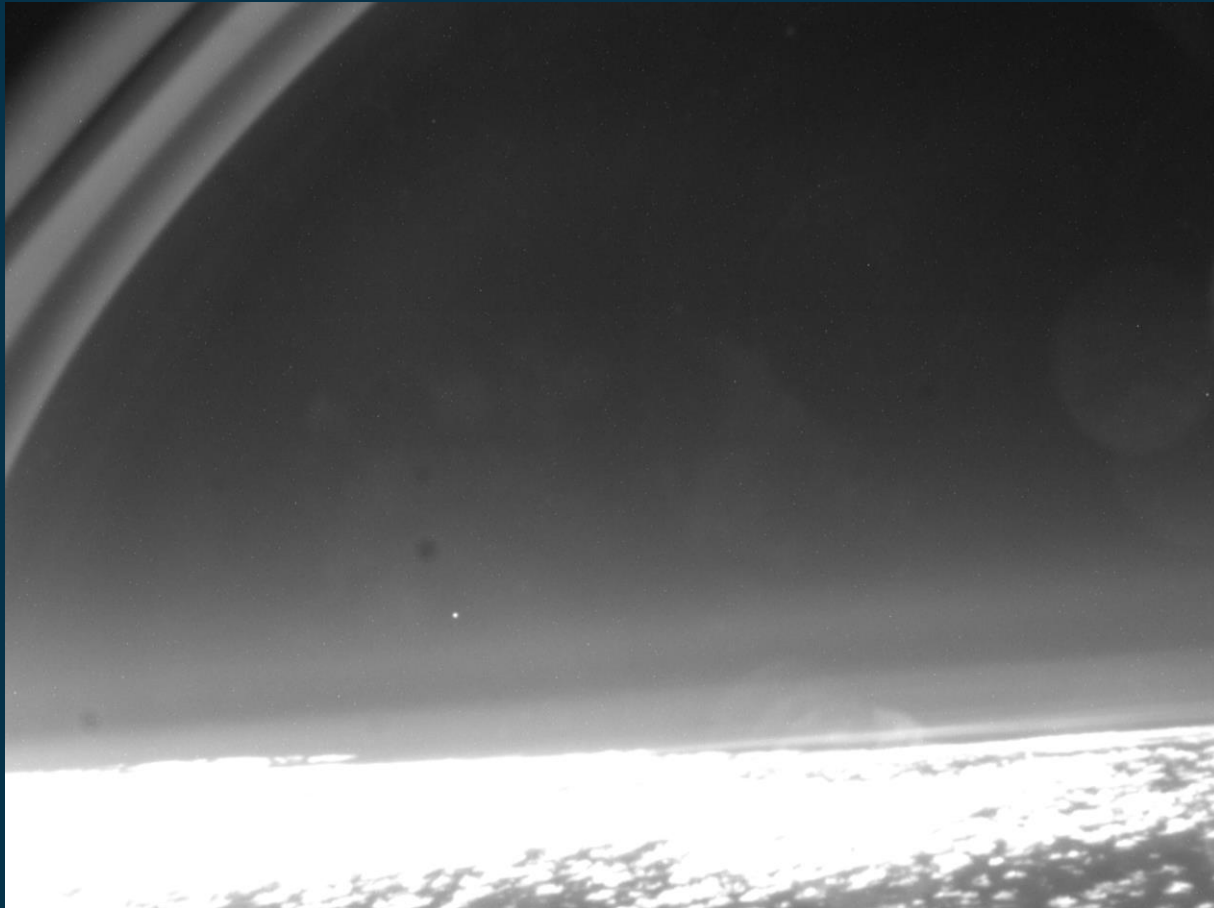


# Safe Mode at the perigee before last orbit



# Last moments of the satellite





- Orbital Data – updated until the last orbit – upon request to FDYN (D. Sieg)
- Spacecraft Telemetry (temperatures, spin rates, solar power, etc) – up until 20 mins before re-entry – above 500 kms altitude – upon request to FCT (B. Abascal)
- Scientific measurements from the airborne campaign – Request to Space Debris Office (S. Lemmens)

- Cluster II - Salsa DRAMA Model and material list
- ESA Re-entry predictions
- ESA ODs
- Temperature Profile recorded in last pass
- Ukranian sensors measurements
- OGS sensor measurements and images
- Swiss OGS sensors measurements
- AGO70 sensor measurements
- Other ground based sensors measurements images
- ROSIE campaign data:
  - From imaging cameras: L0: cameras raw data, L1: object Az/EI coordinates and apparent brightness, L2: state vector and absolute brightness
  - From spectral measurements: radiance/irradiance detected
  - L2: timeline of the event and occuring species "
  - ROSIE Cluster II - Salsa rebuilding FR
  - TM
  - 10kg Cd battery wind tunnel testing
  - HW demise data - ESTIMATE/PRODUCERS