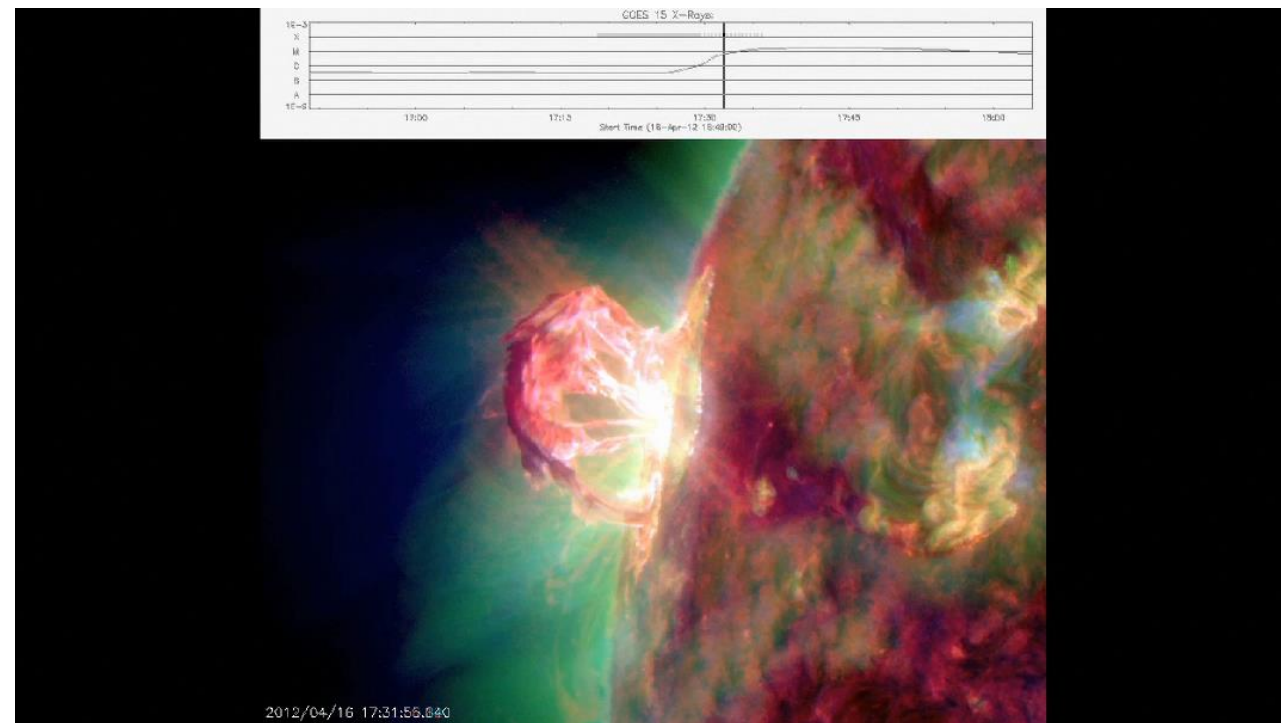
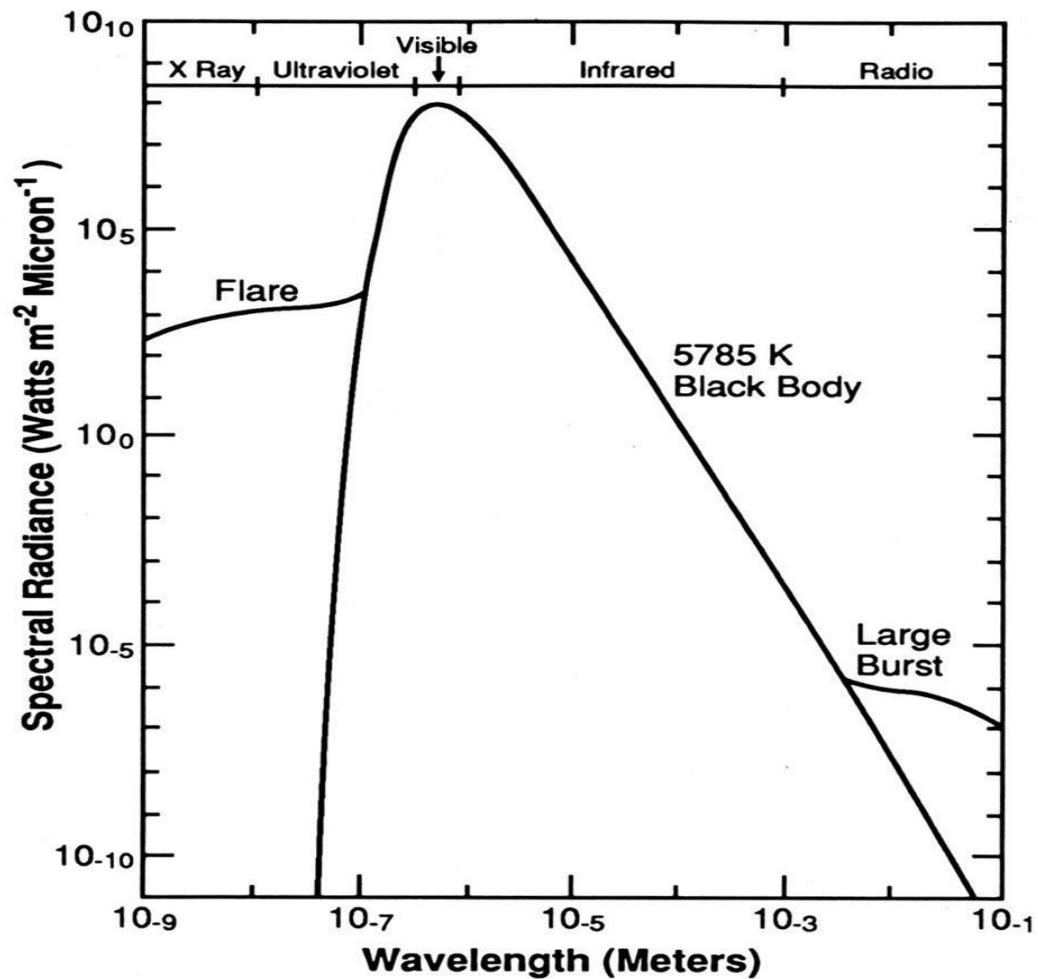


Frontier Missions: ICON & GOLD

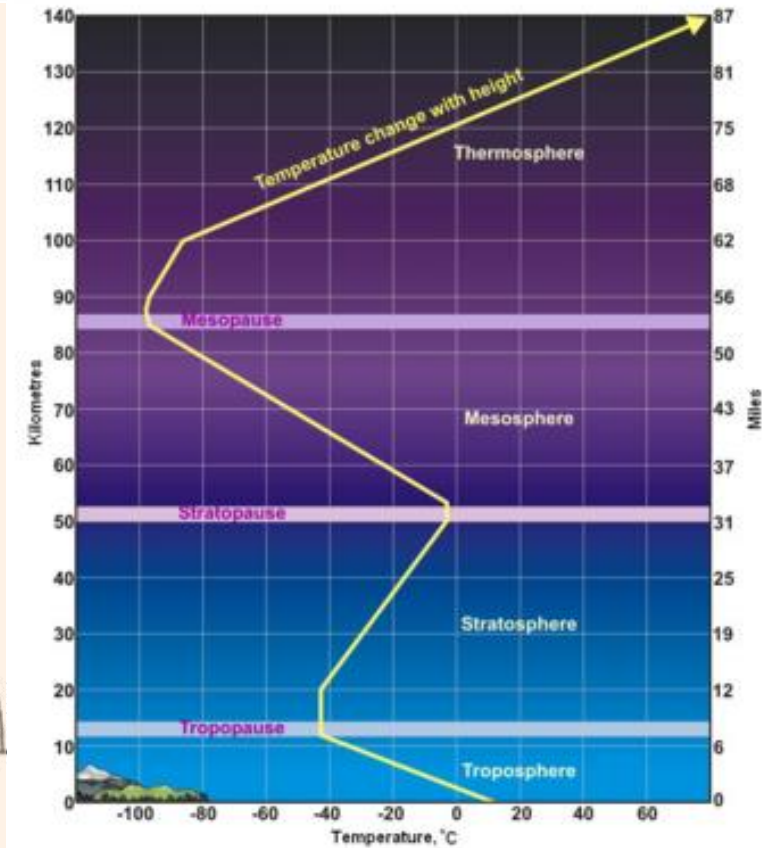
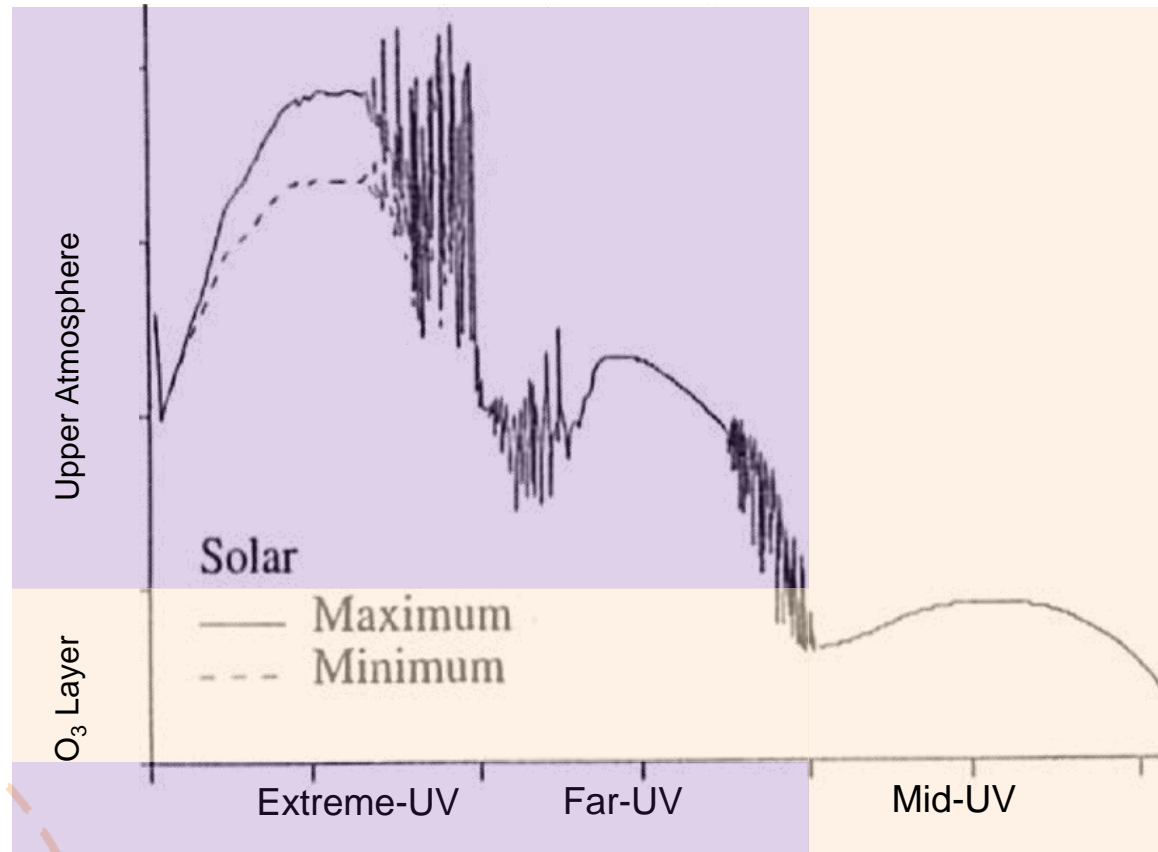
Scott England: englands@vt.edu



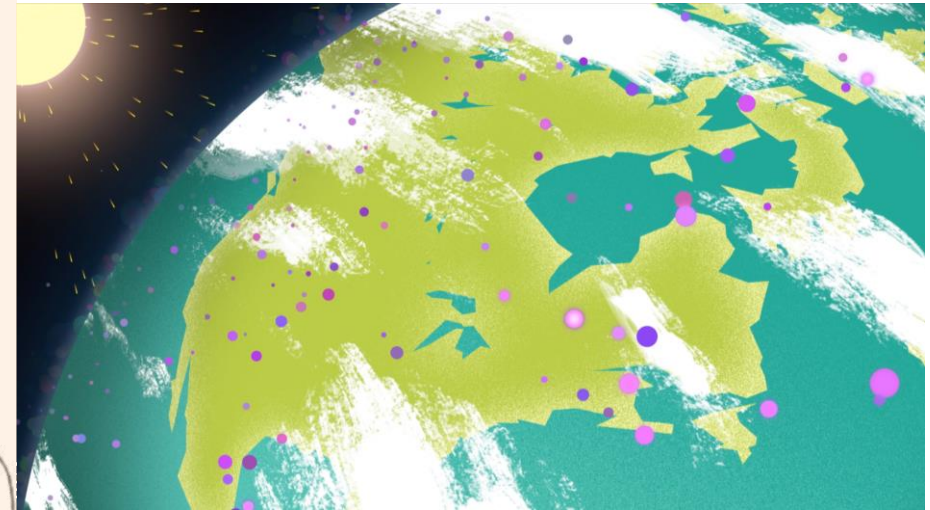
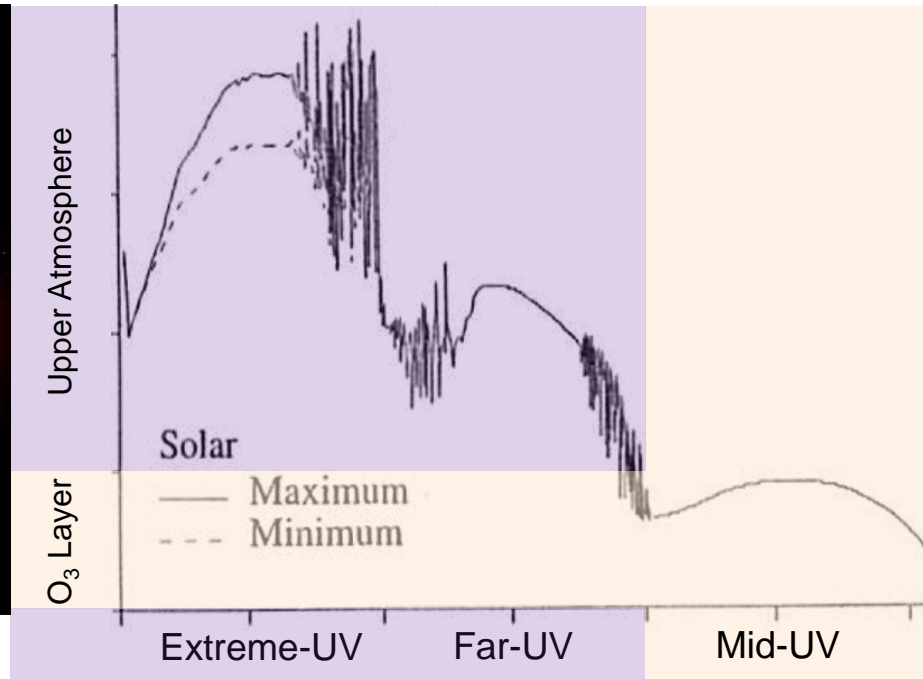
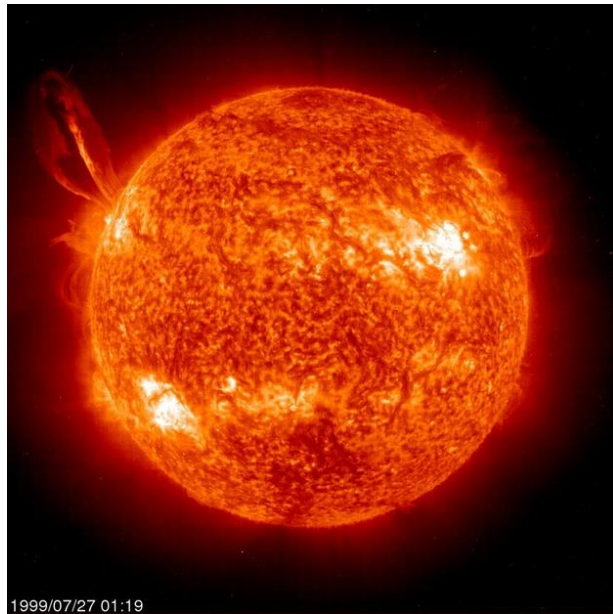
The Solar Spectrum



An Atmosphere Structured by Absorption



Solar Ultraviolet and Our Atmosphere



The Upper Atmosphere – its Role & Importance



At the Karman line, space begins, but the atmosphere doesn't end.

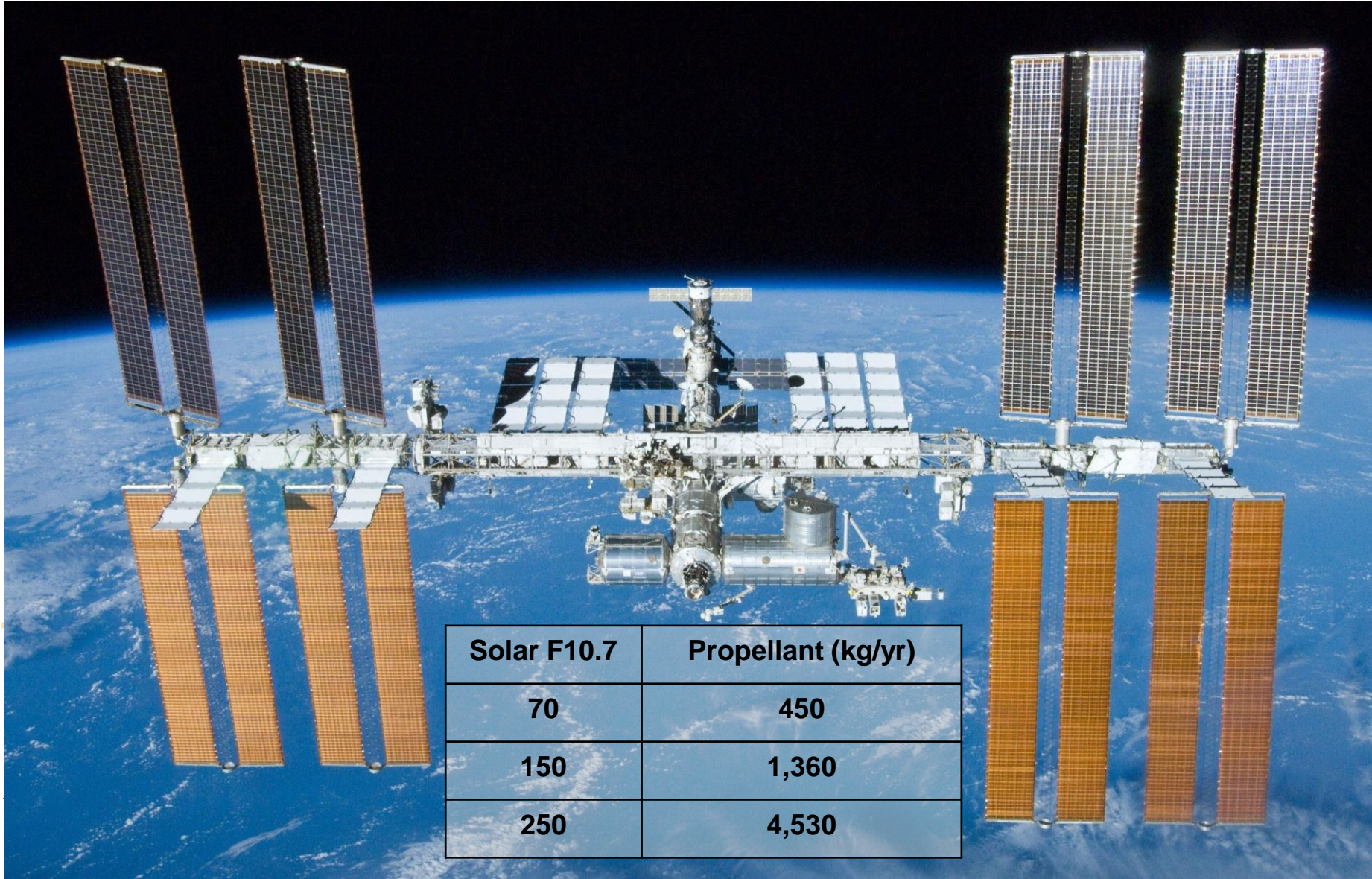
The upper atmosphere continues to 500 – 800 km, overlapping low Earth orbit.

Atmospheric density and O impact spacecraft

The variable solar EUV is absorbed here.

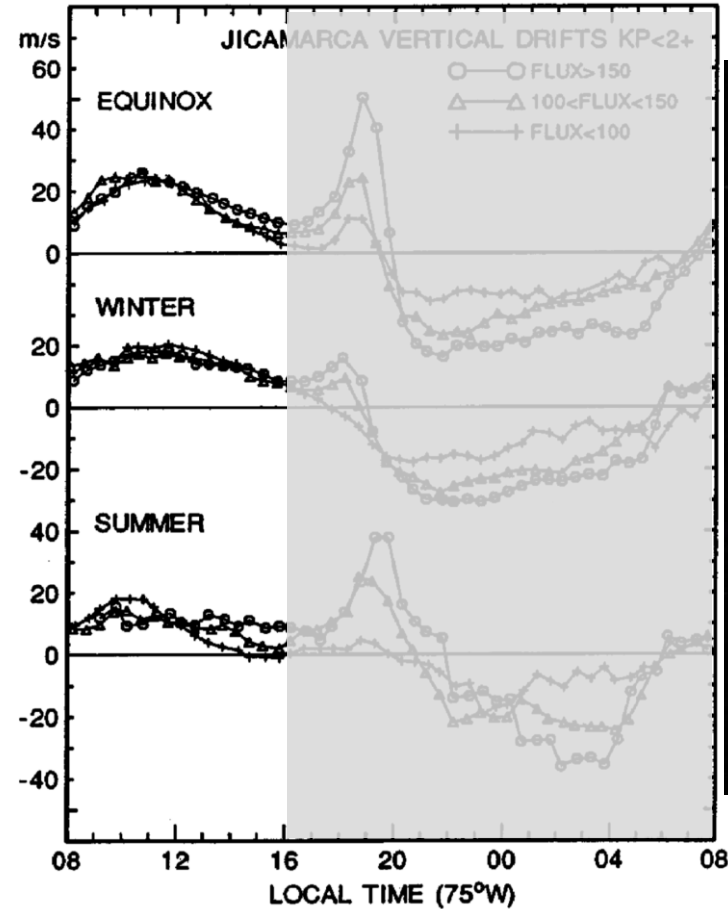
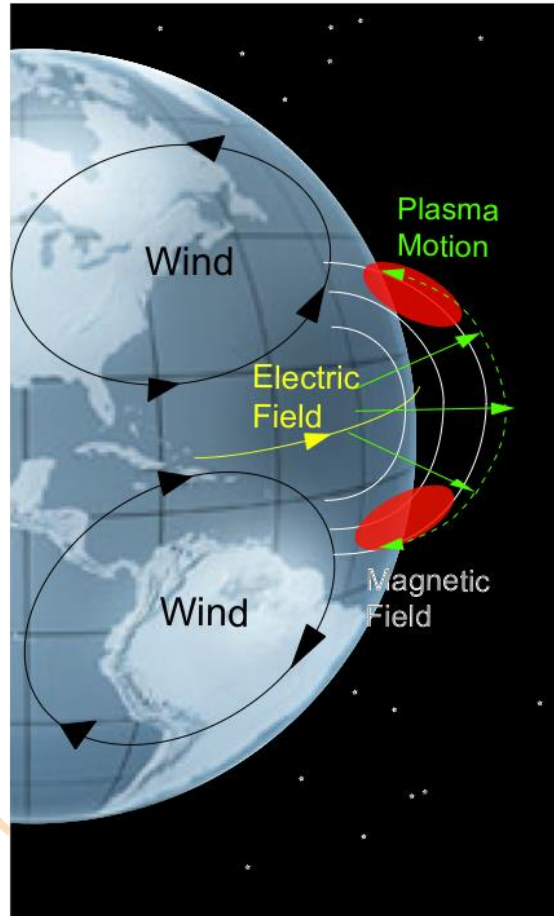
Solar EUV also generates ionization, which impacts spacecraft surface charging and radio propagation.

International Space Station – Probably the most expensive object ever made

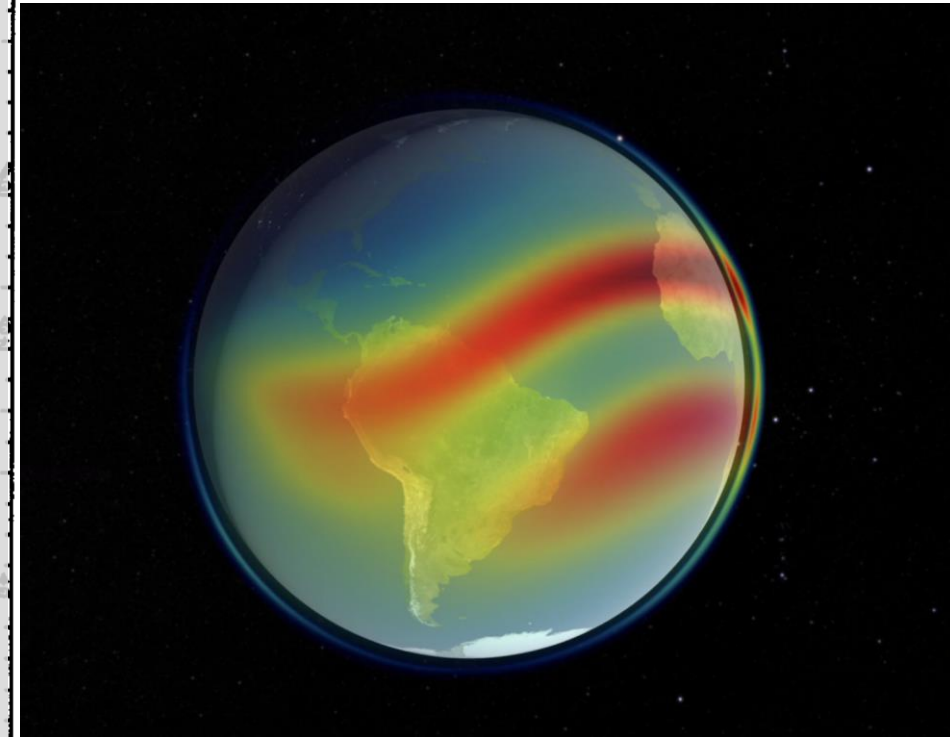


Solar F10.7	Propellant (kg/yr)
70	450
150	1,360
250	4,530

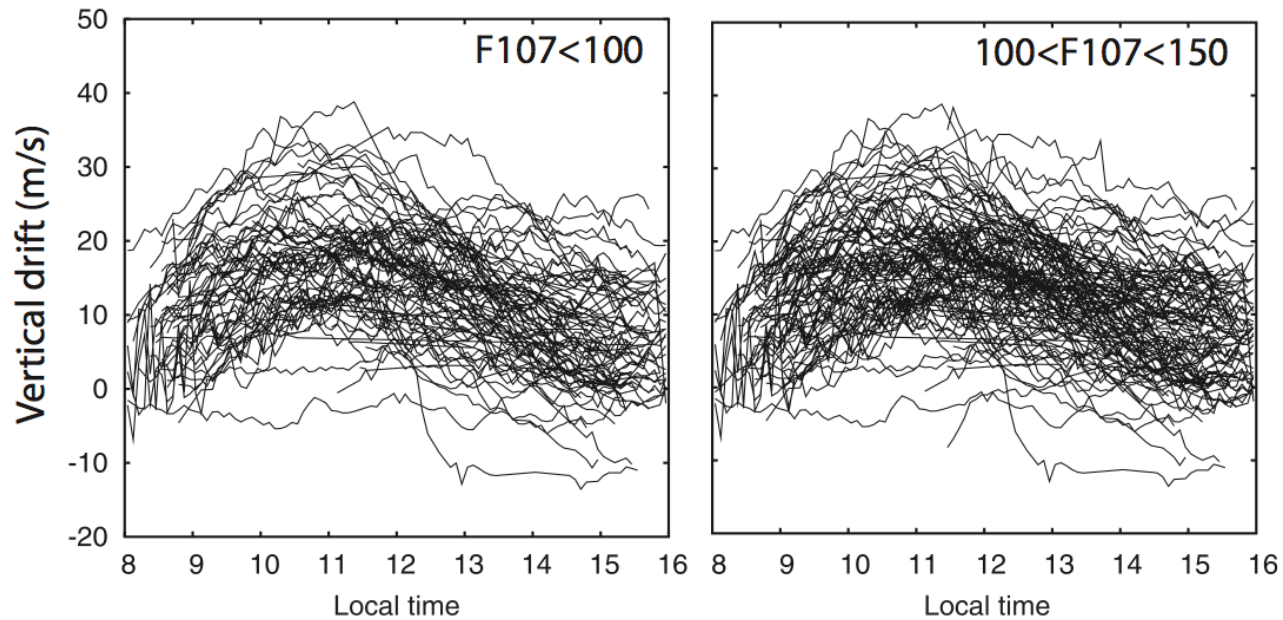
The dayside ionosphere – Textbook edition



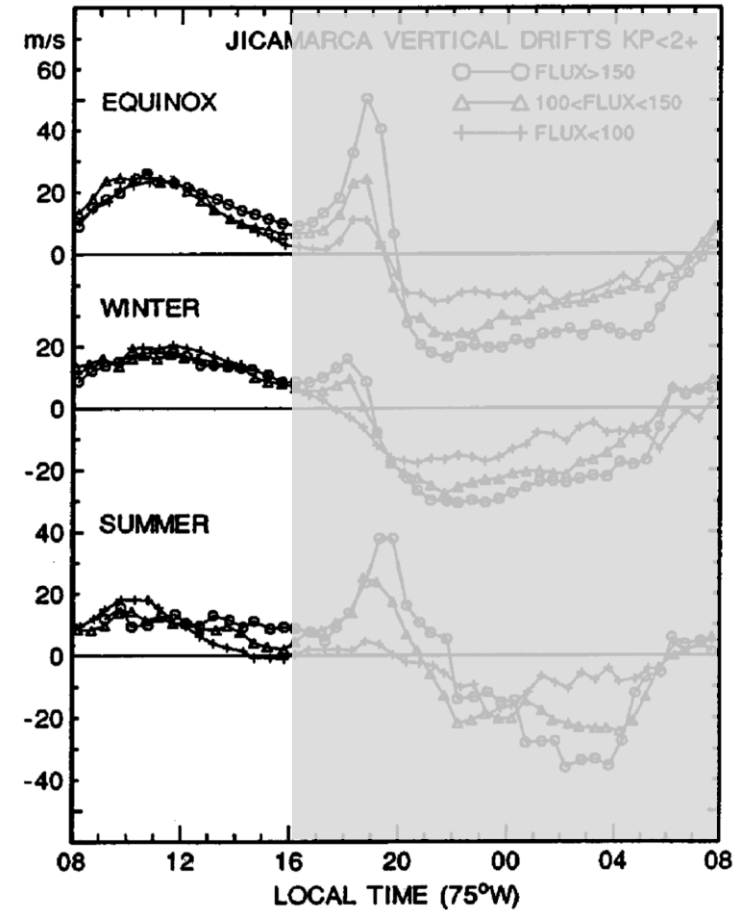
Fejer, 1991



The dayside ionosphere – Reality edition



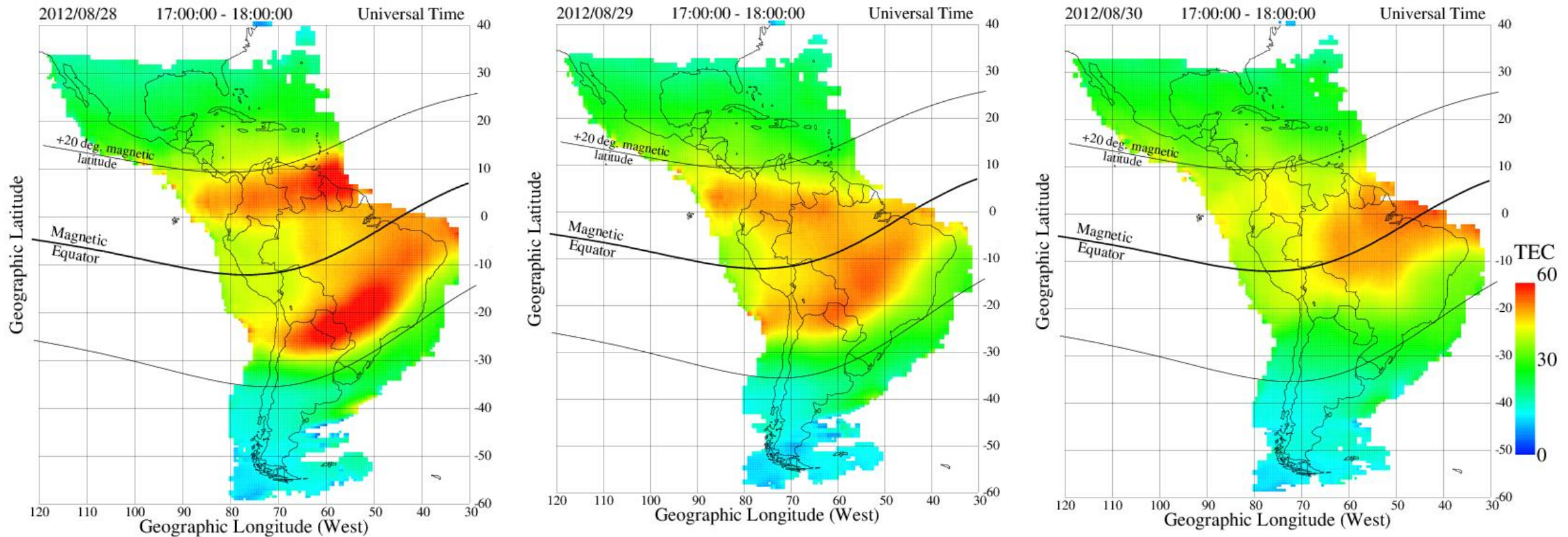
Alken *et al.*, 2009



Fejer, 1991

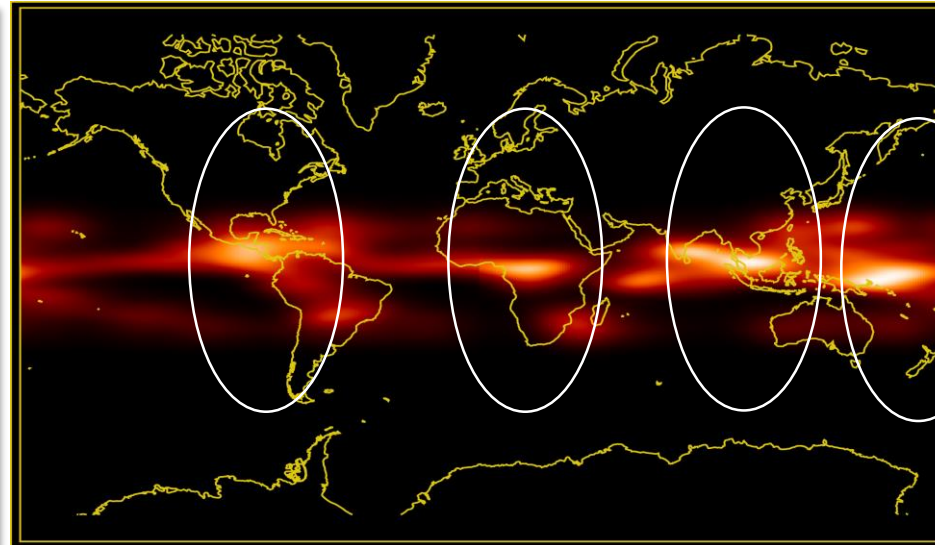
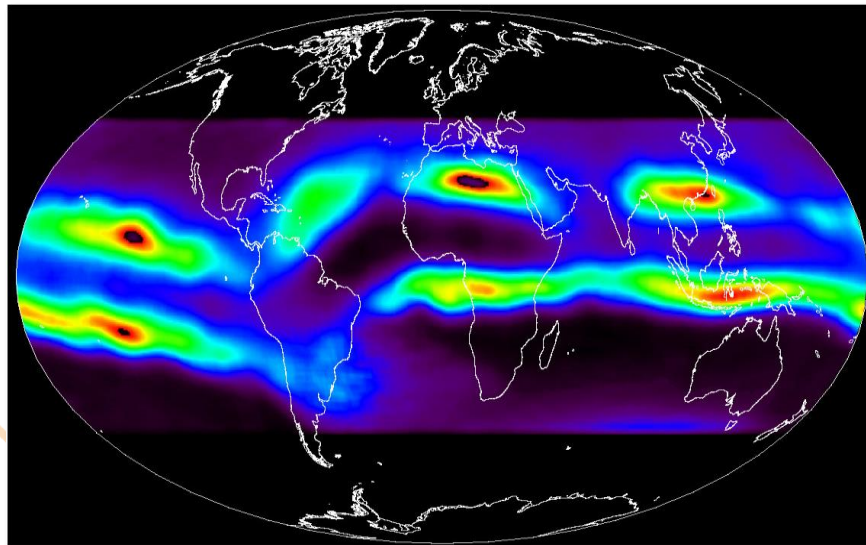
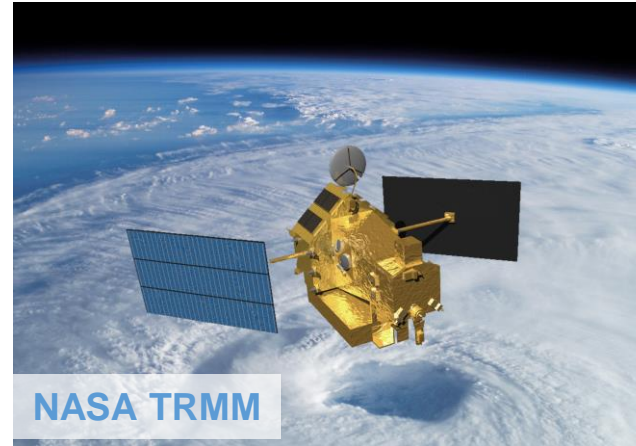
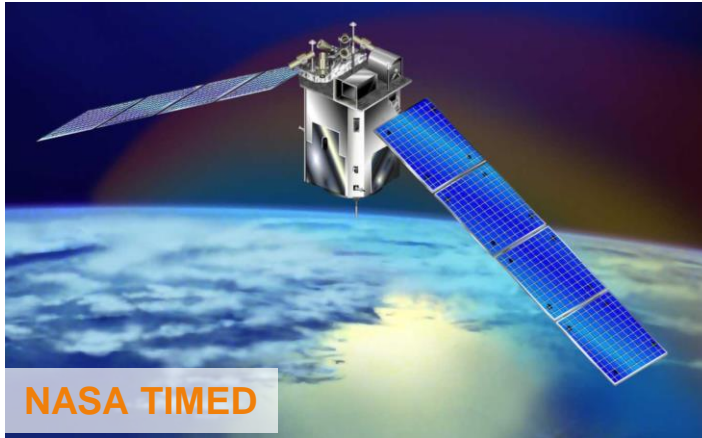


Unpacking the Variability

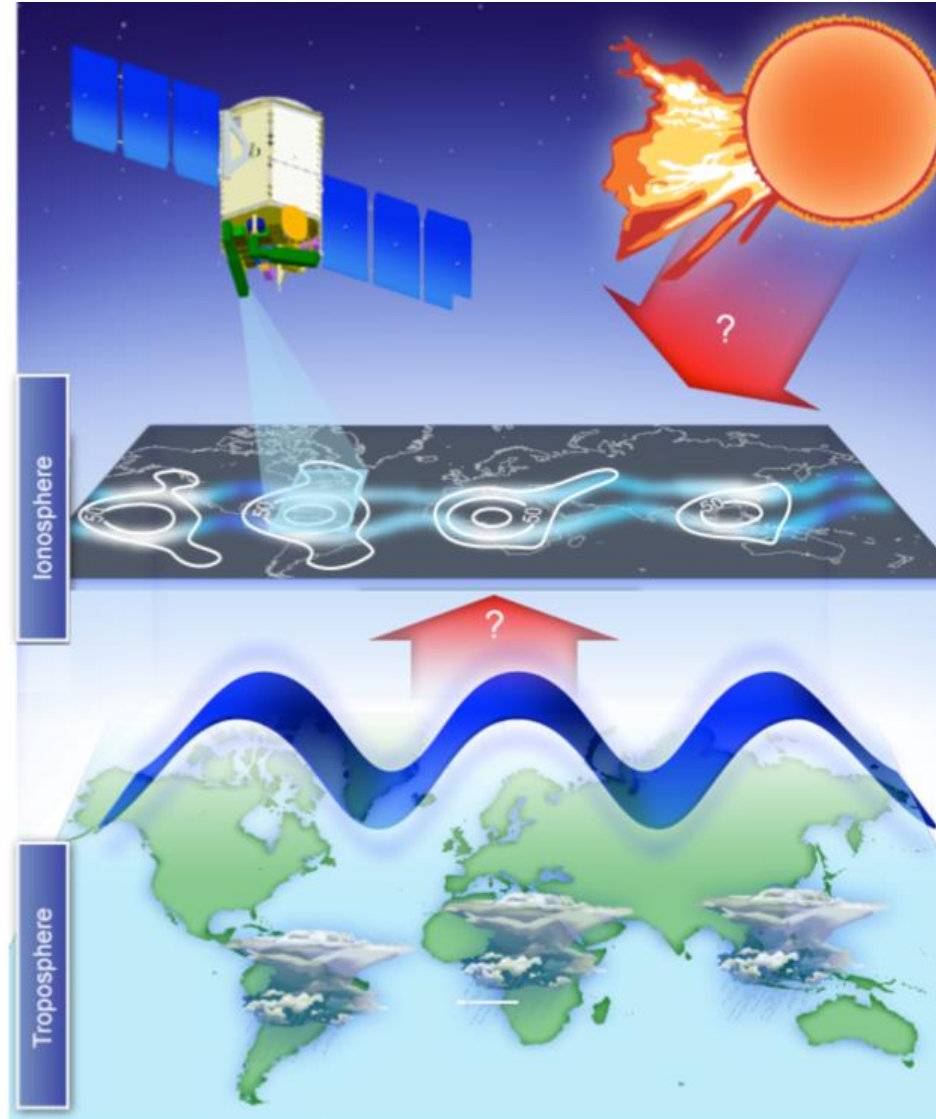




Waves From the Atmosphere Below

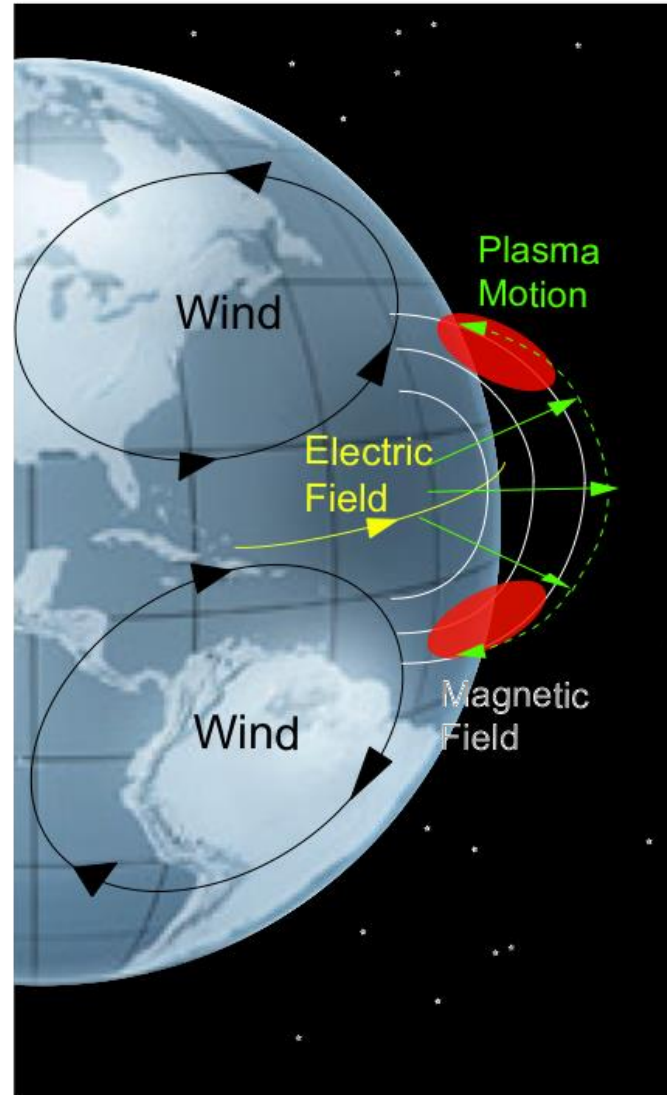


The Upper Atmosphere – Where Terrestrial Weather Meets Space Weather



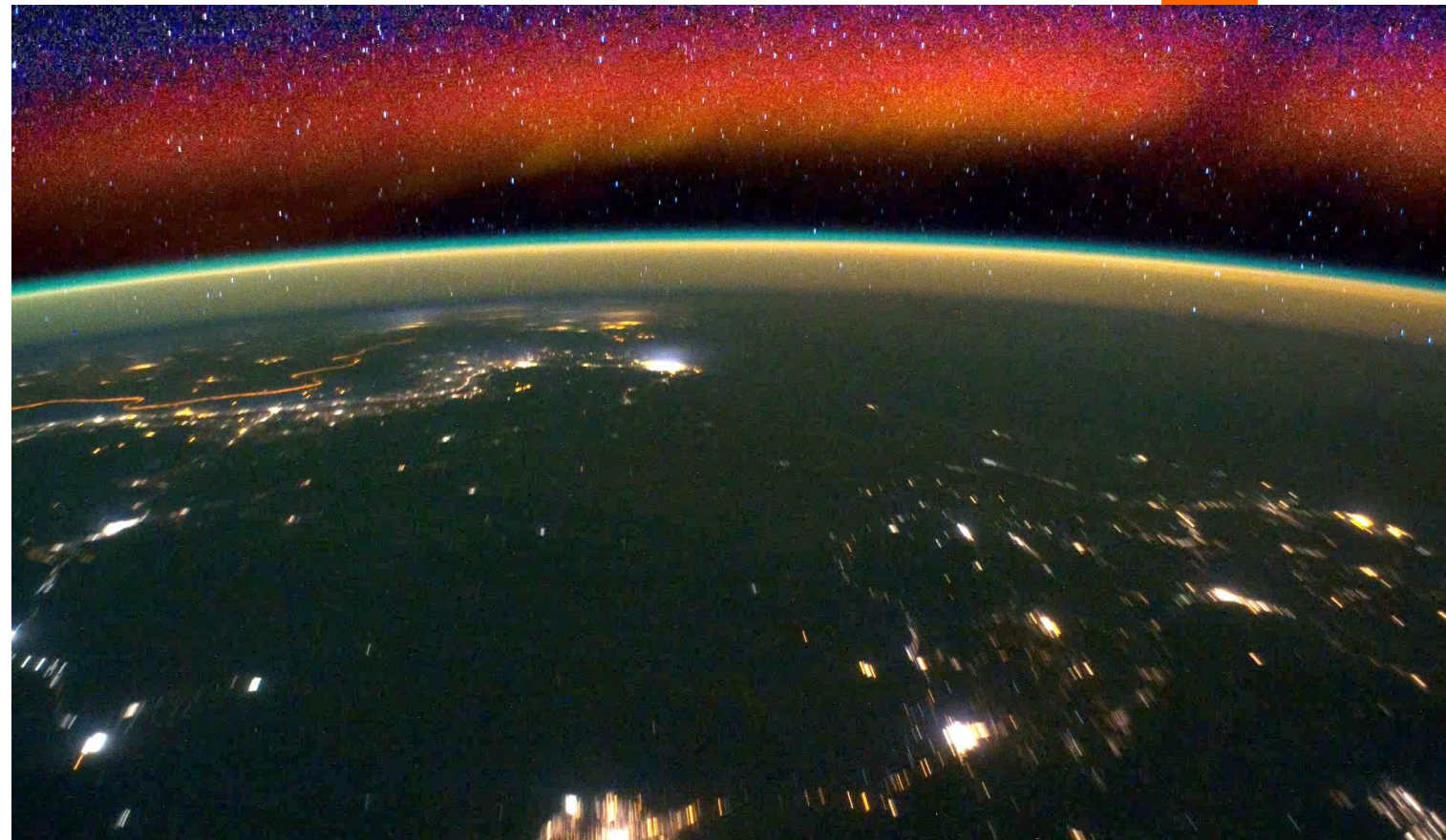
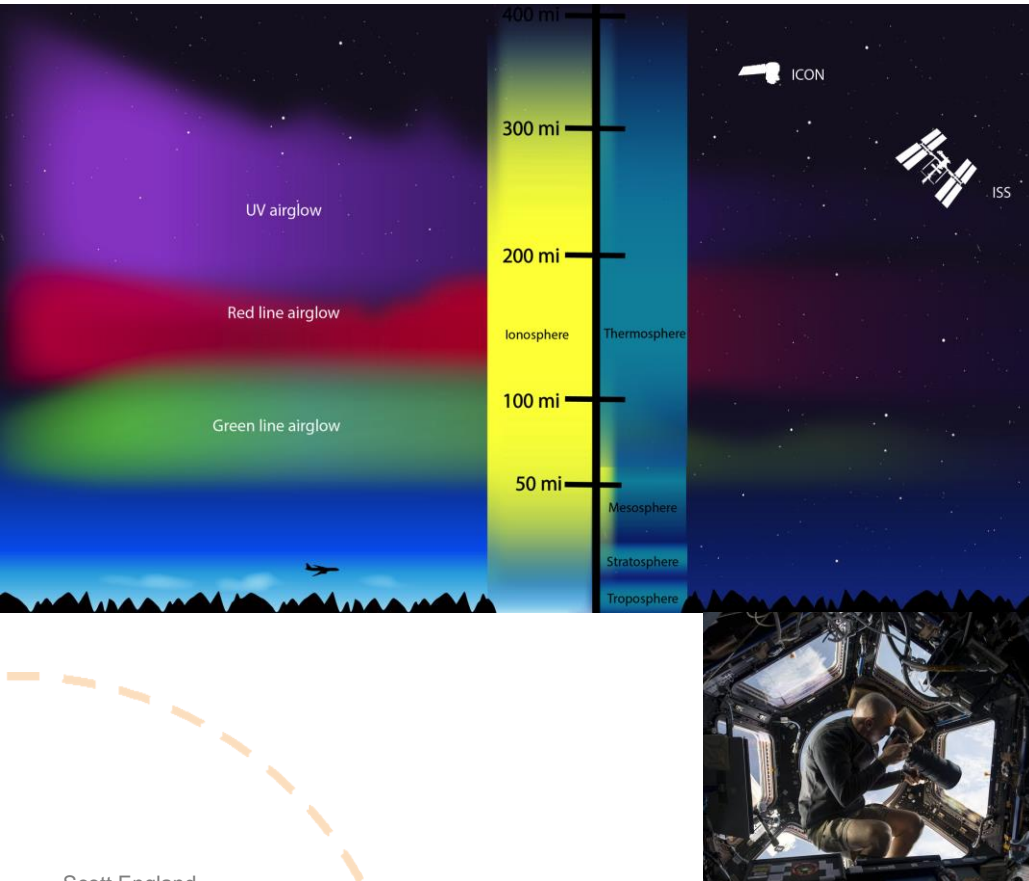


What is Needed & Challenges





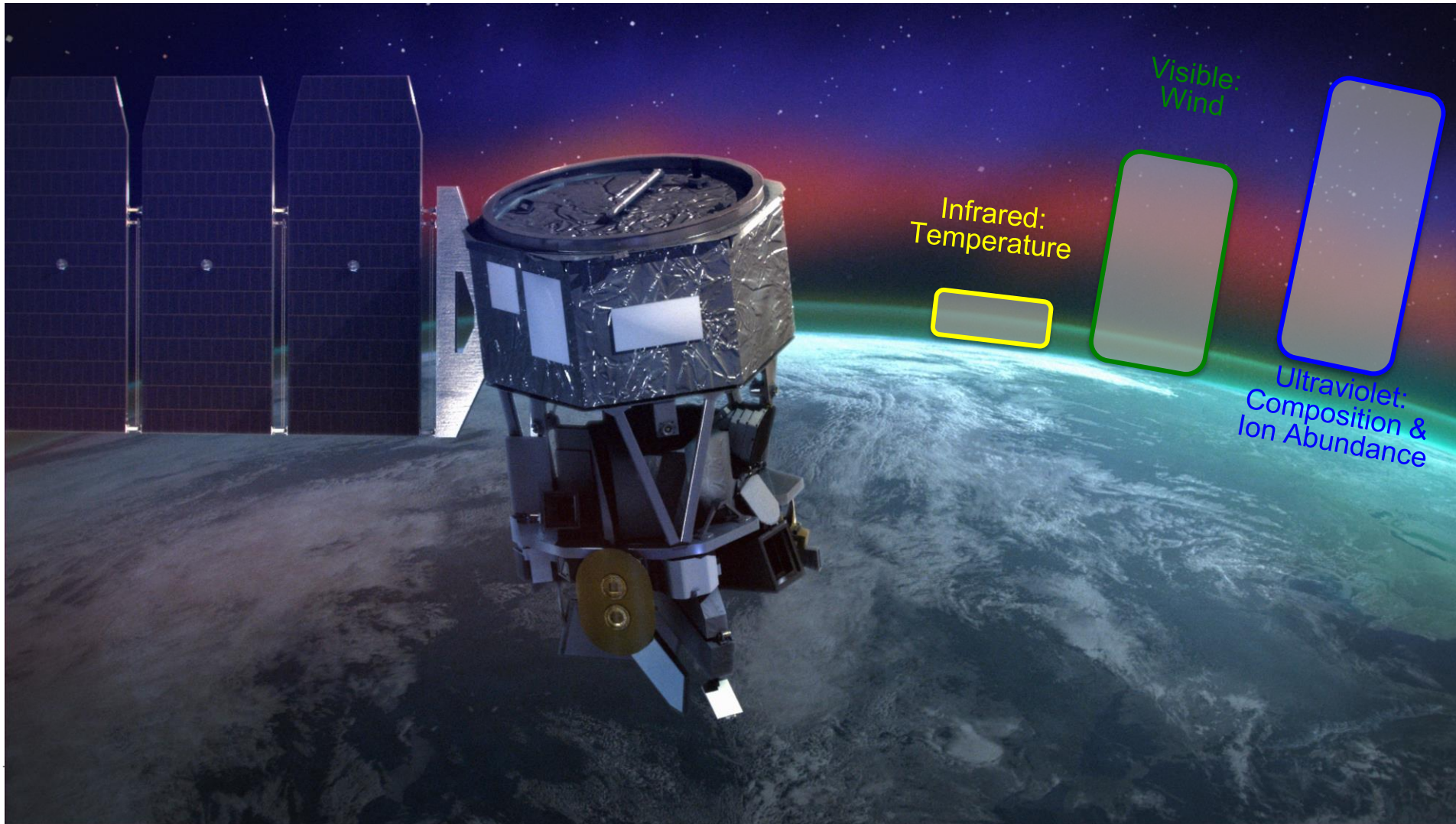
Airglow



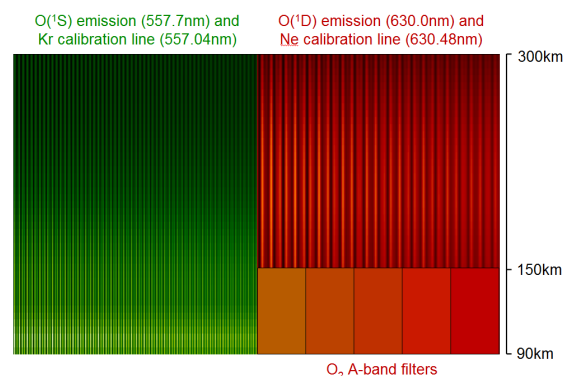
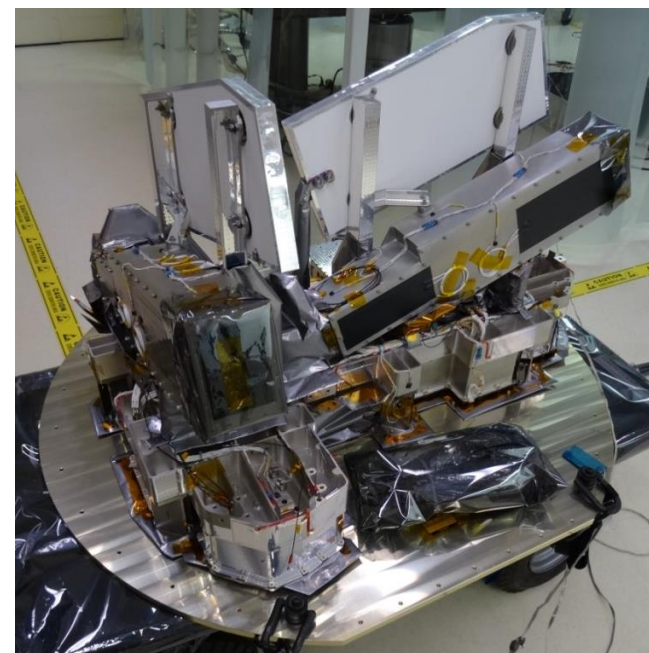
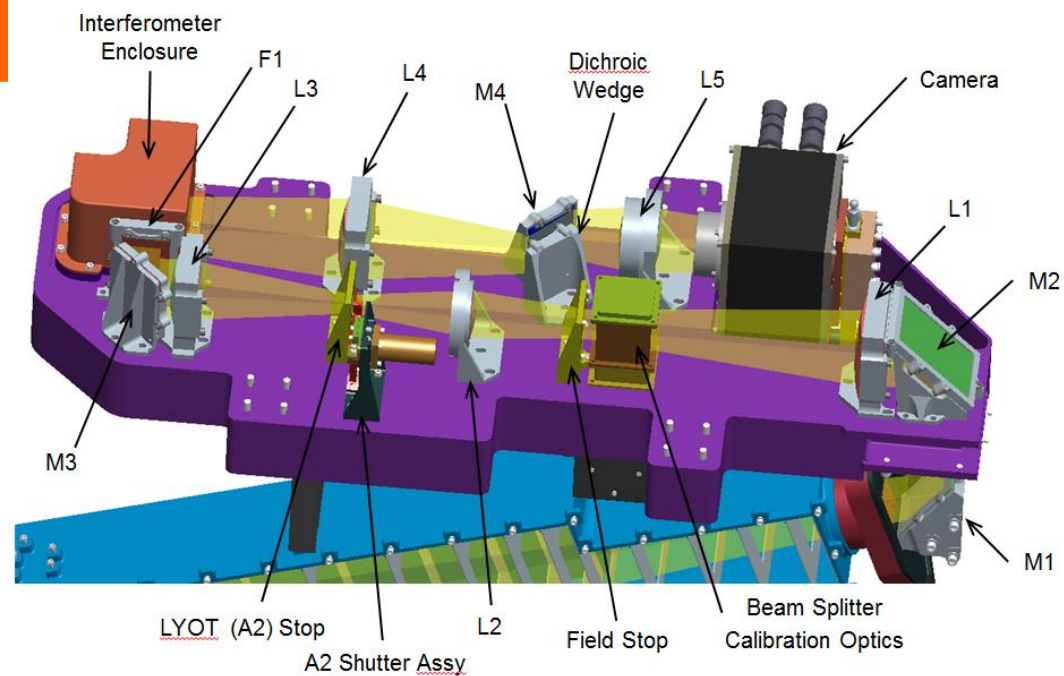
Developing Missions – ICON Instrumentation

ICON
Ionospheric Connection Explorer

GOLD
Global-scale Observations of the Limb and Disk



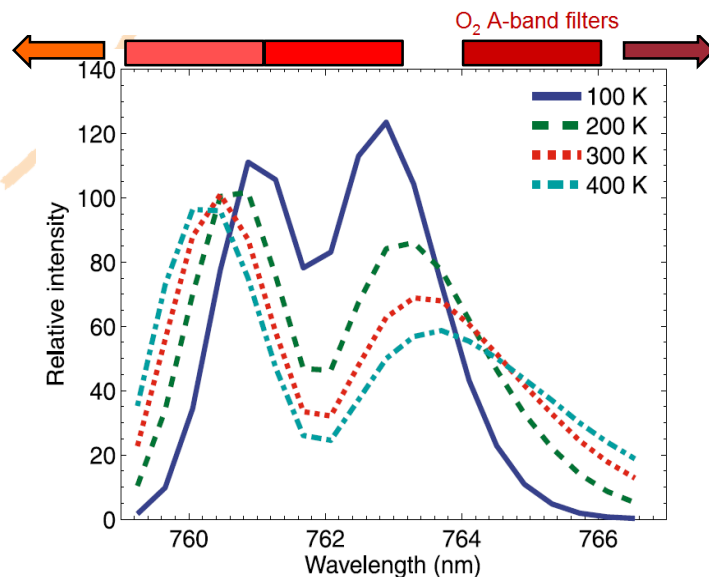
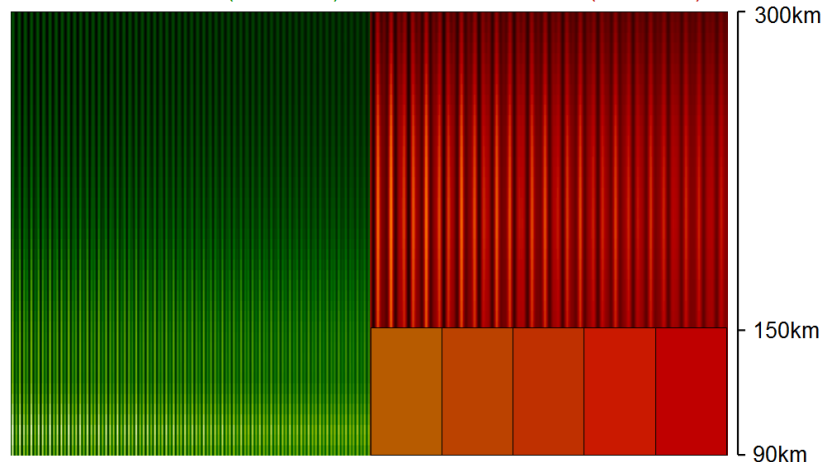
Michelson Interferometer for Global Heterodyne Thermospheric Imaging, NRL



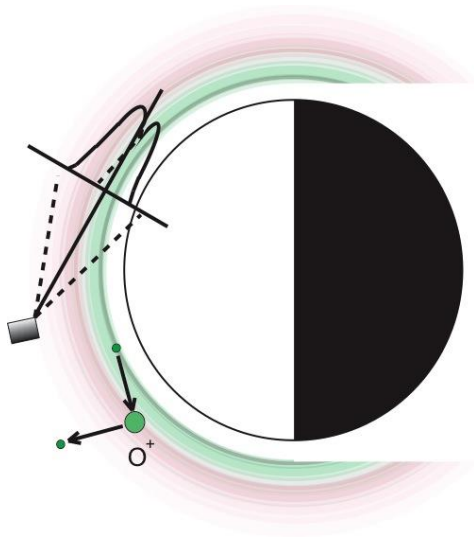
Michelson Interferometer for Global Heterodyne Thermospheric Imaging, NRL



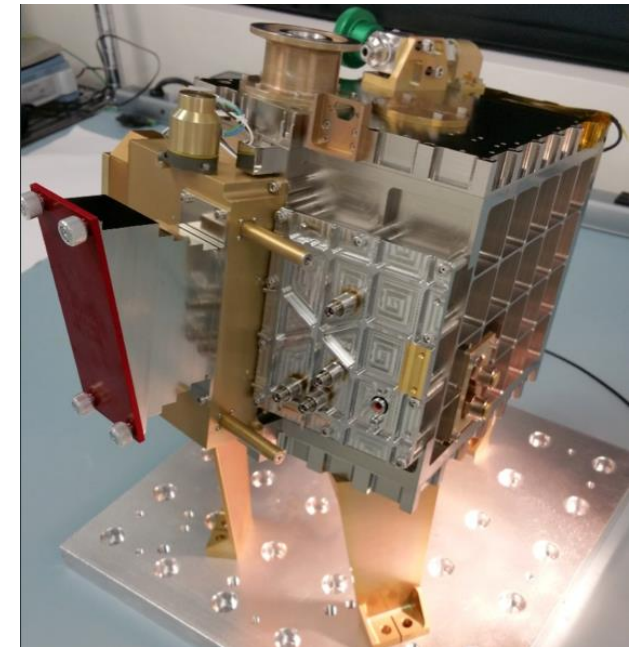
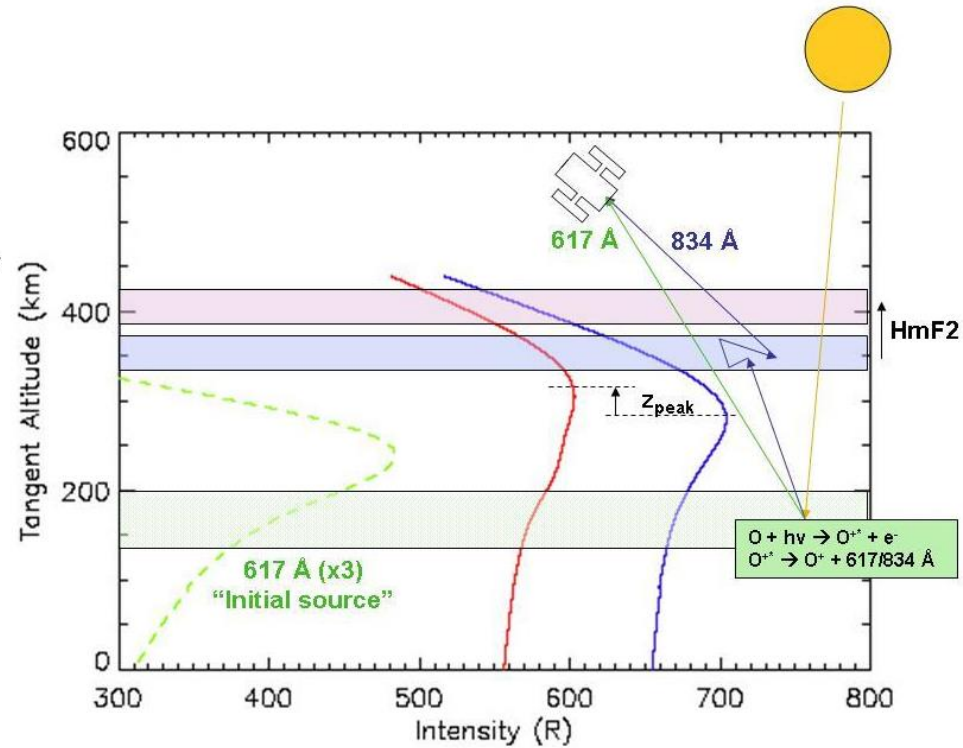
O(¹S) emission (557.7nm) and Kr calibration line (557.04nm) O(¹D) emission (630.0nm) and Ne calibration line (630.48nm)



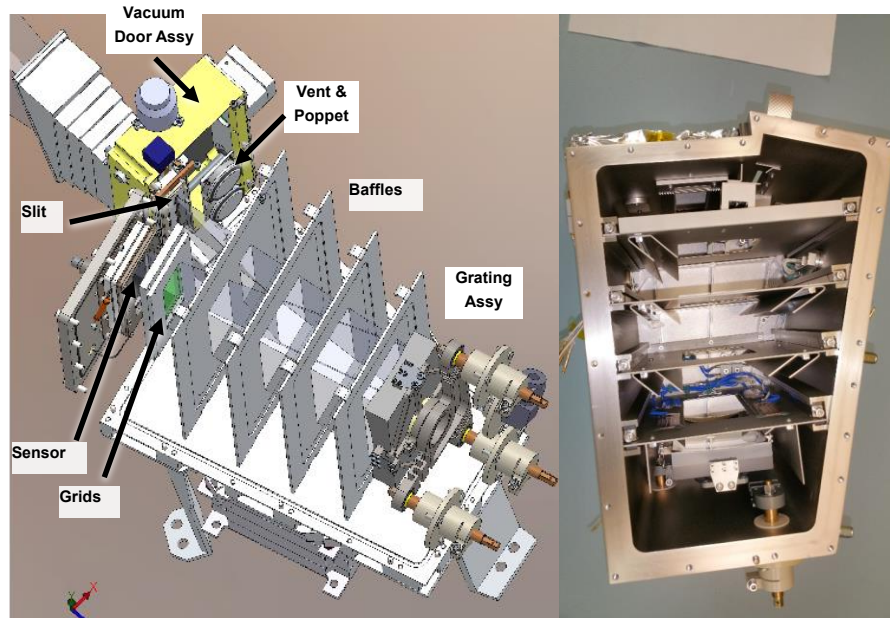
Extreme UV imaging spectrograph, UCB



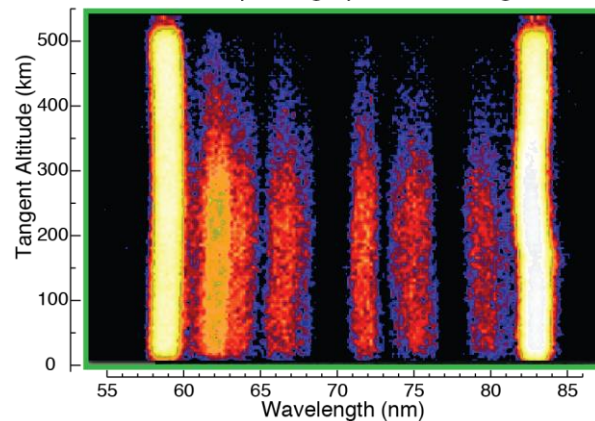
834 and 617
834



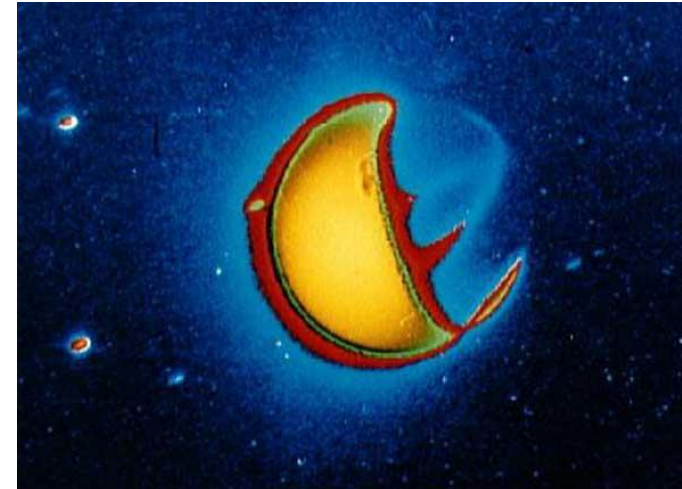
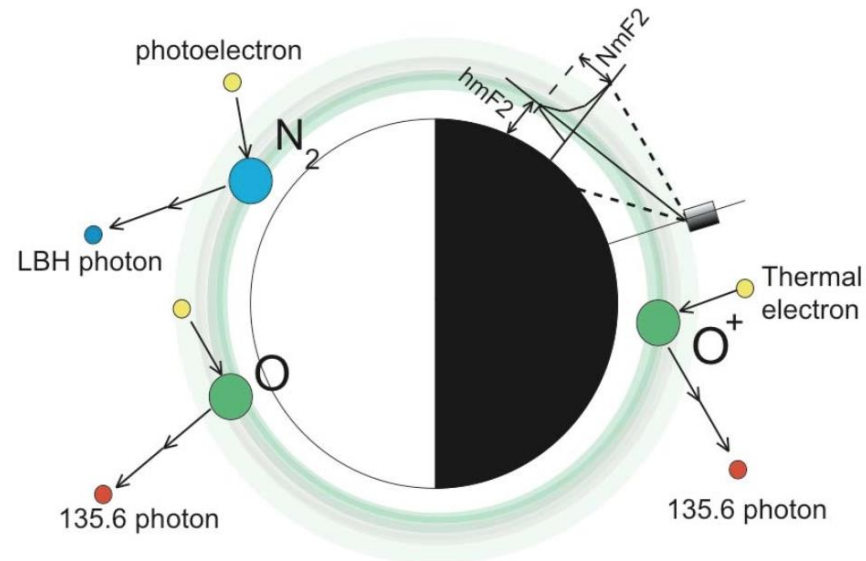
Extreme UV imaging spectrograph, UCB



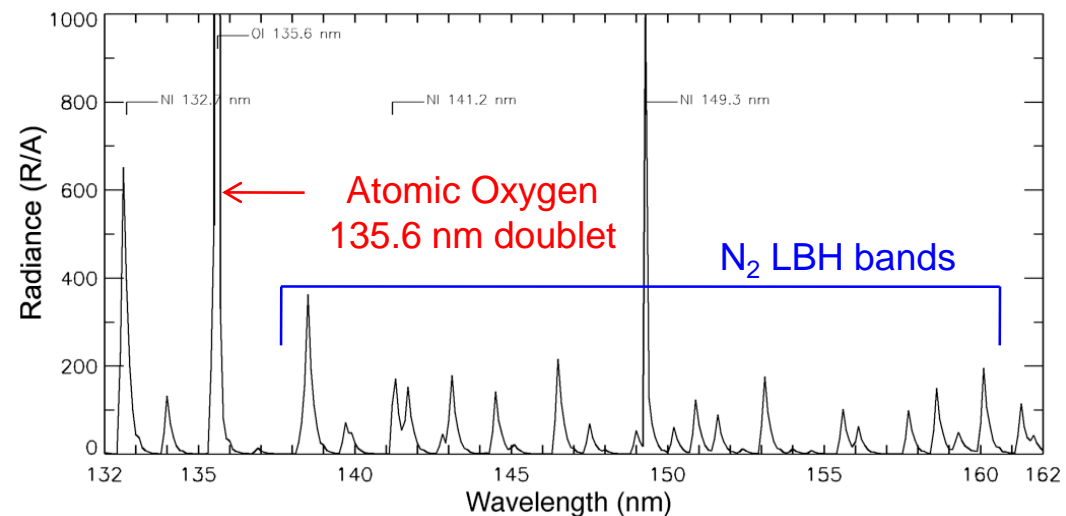
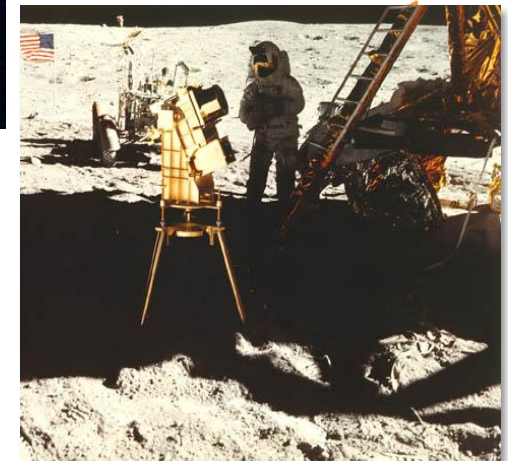
ICON Spectrographic Limb Image



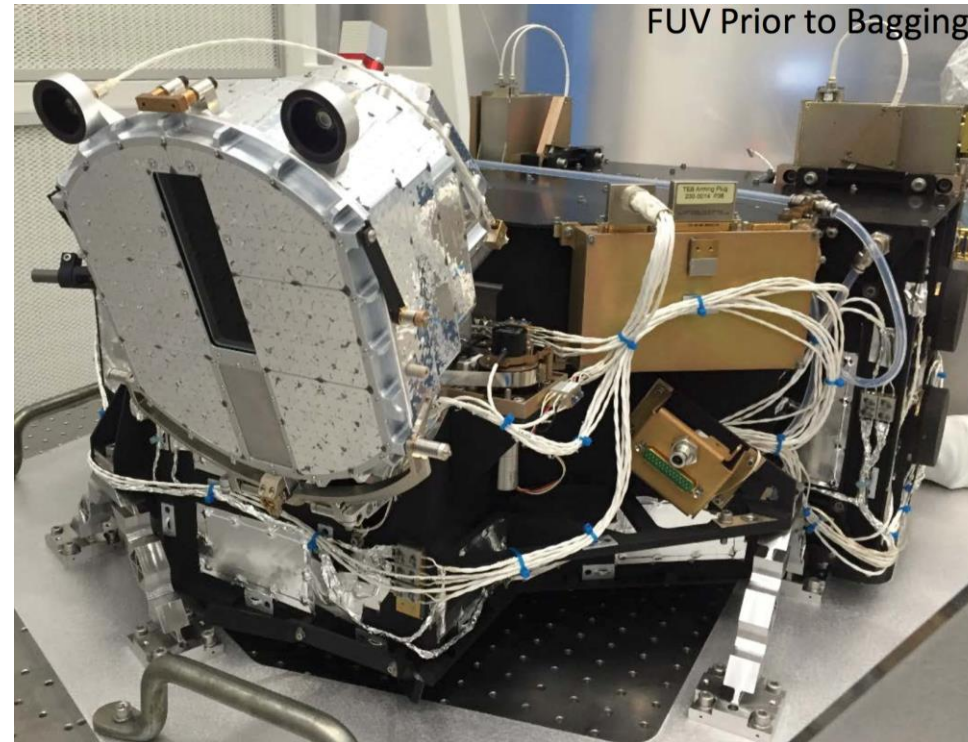
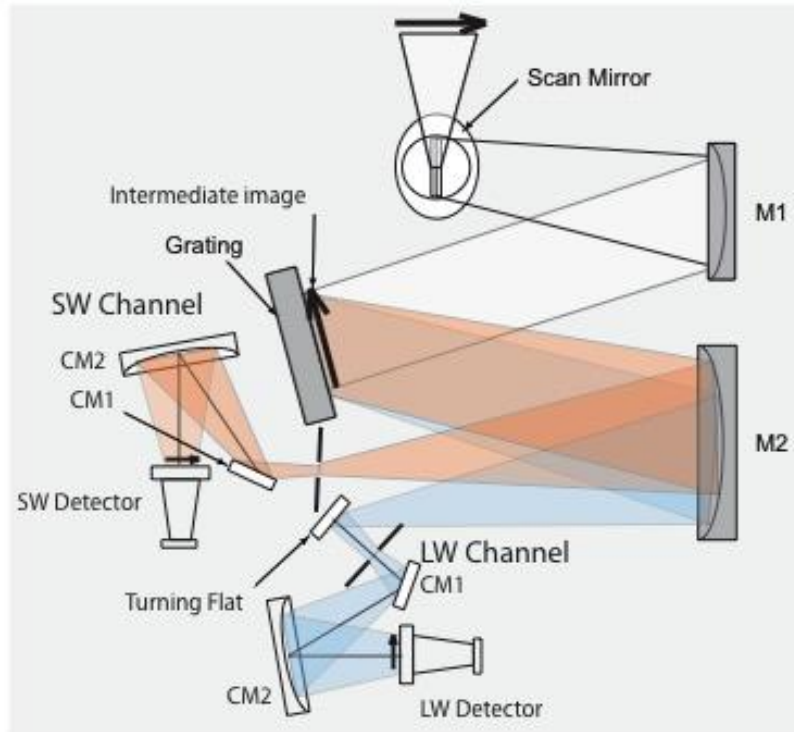
Far UV spectrographic imager, UCB



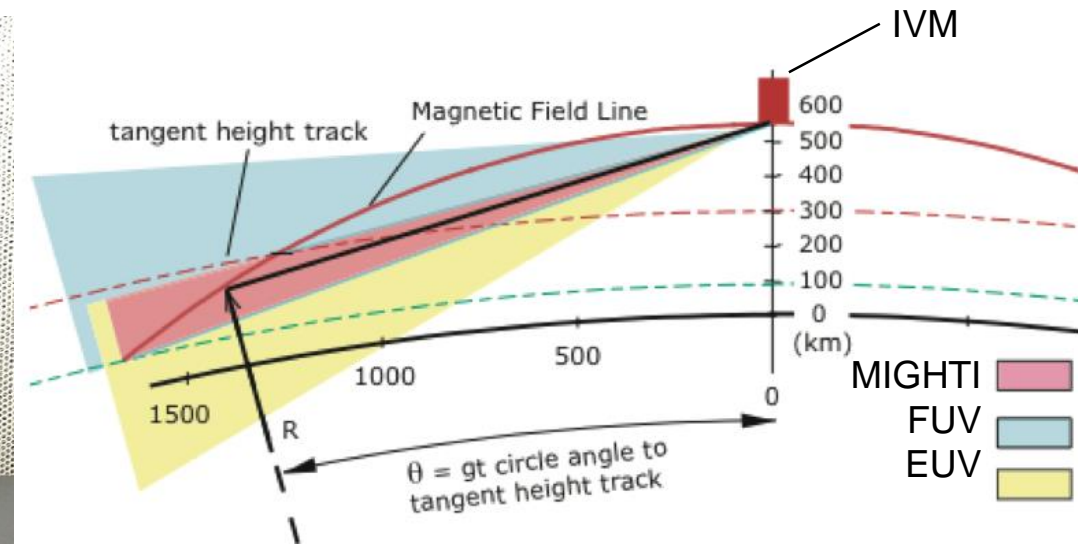
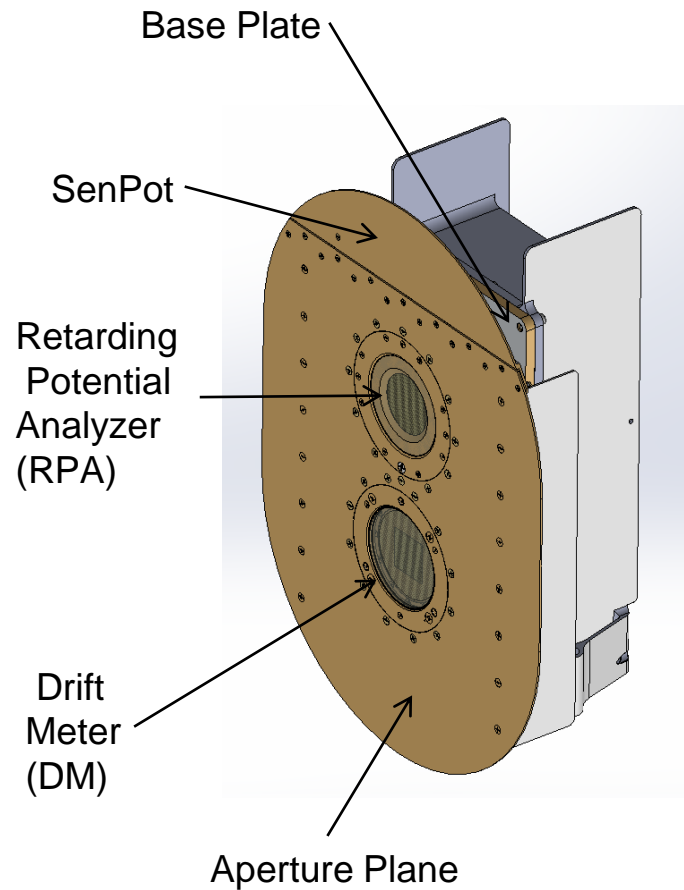
Earth in 135.6 nm Far UV
Apollo 16, S-201, April 1972,
John Young



Far UV spectrographic imager, UCB

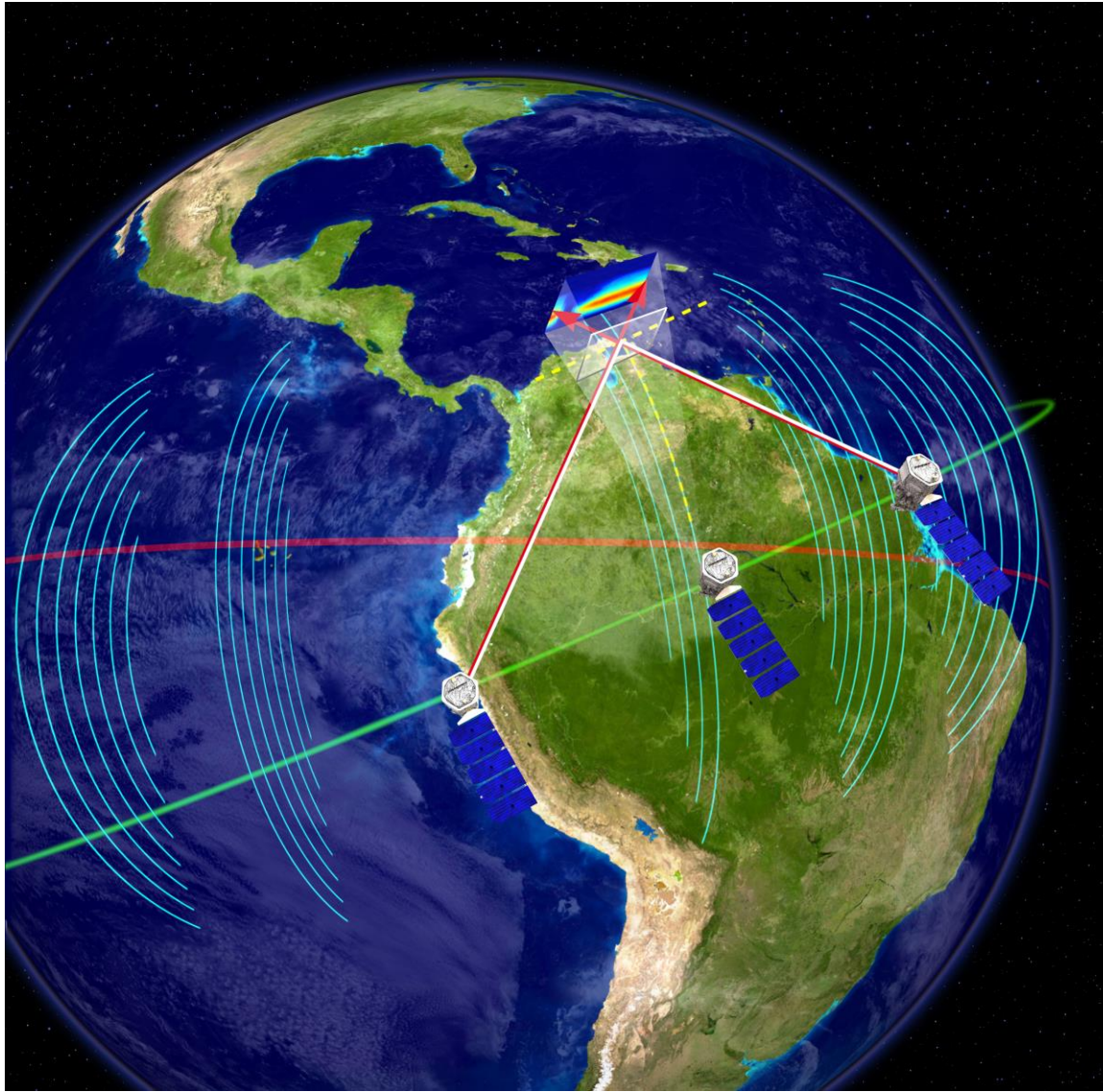


Ion Velocity Meter, UTD

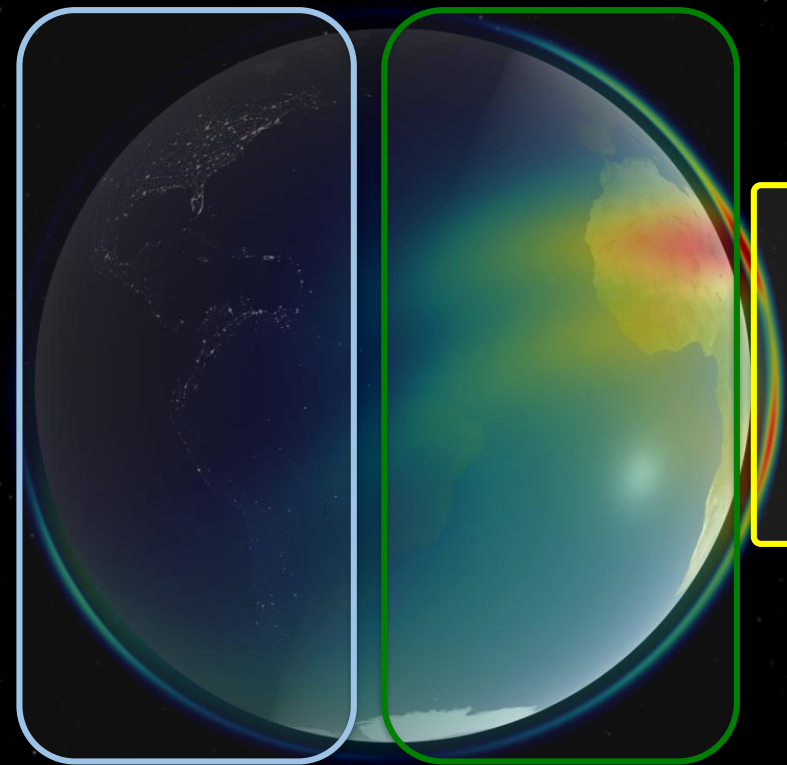




Developing Missions – Mission Plan



Developing Missions – GOLD Instrumentation



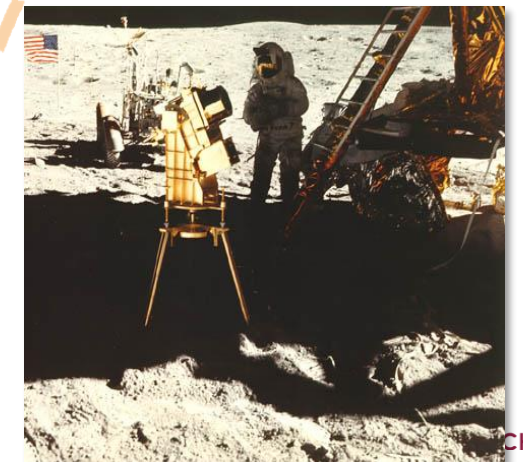
Absorption of Starlight:
Atmospheric Density

Ultraviolet Nighttime:
Ion Abundance

Ultraviolet Daytime:
Composition & Temperature



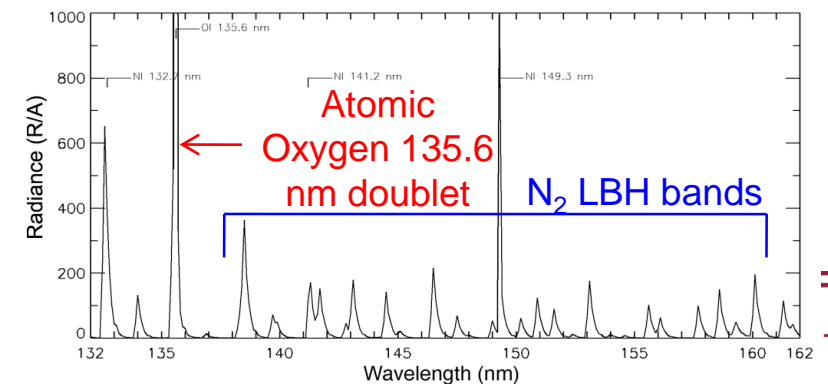
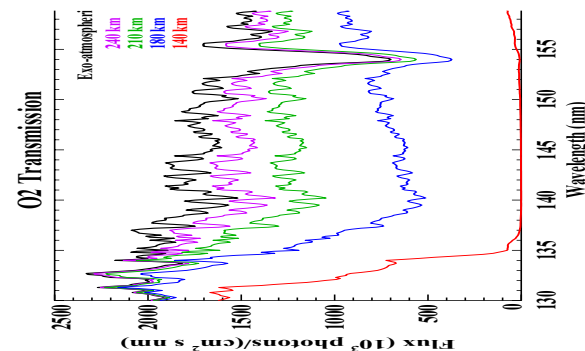
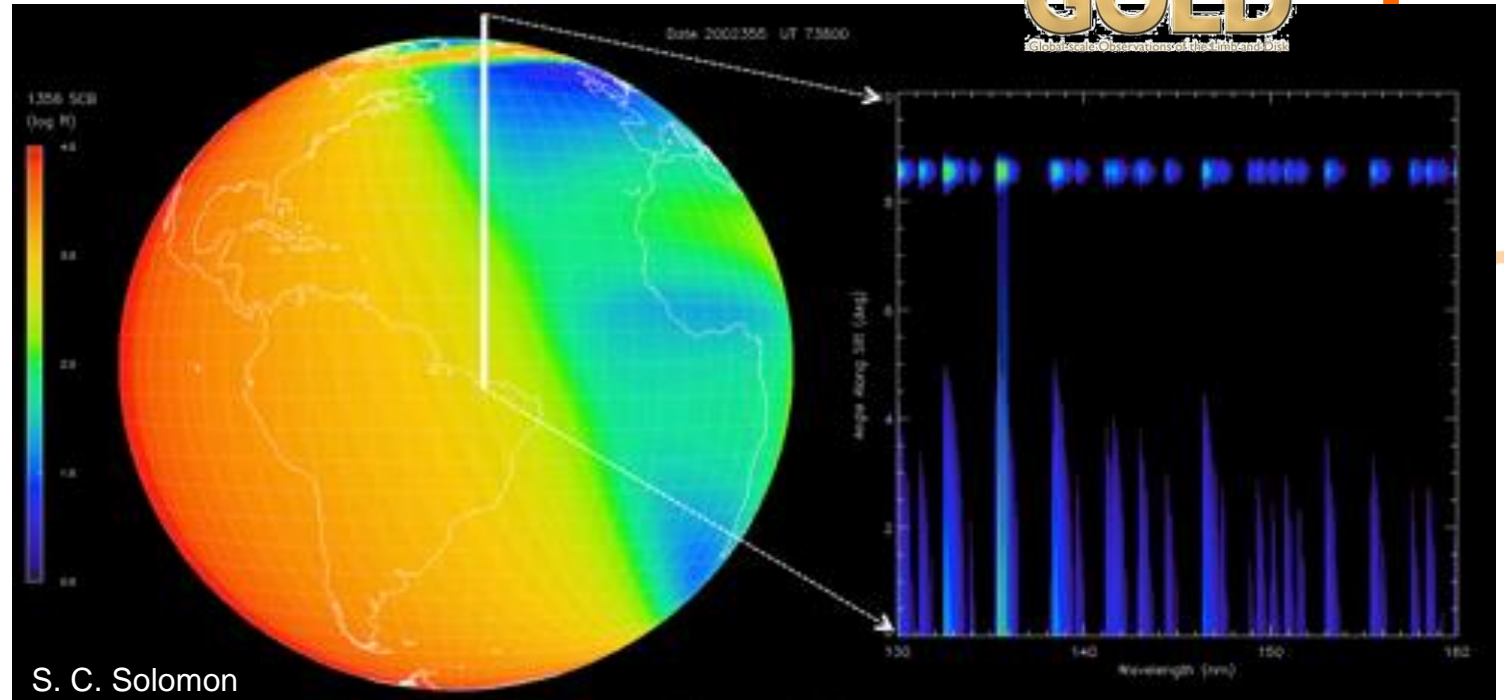
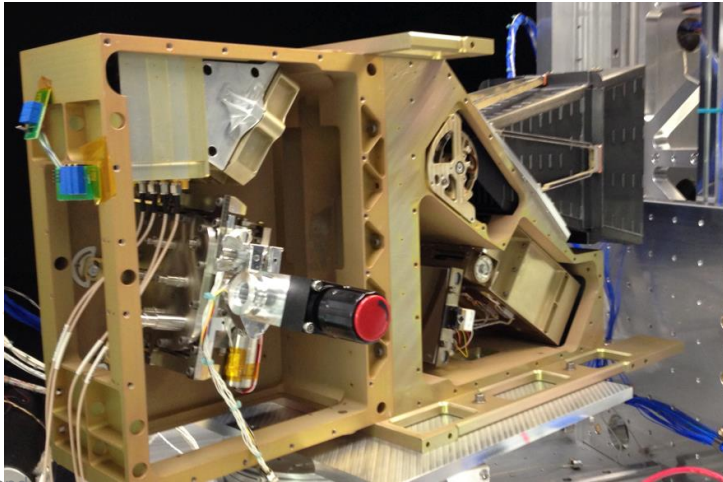
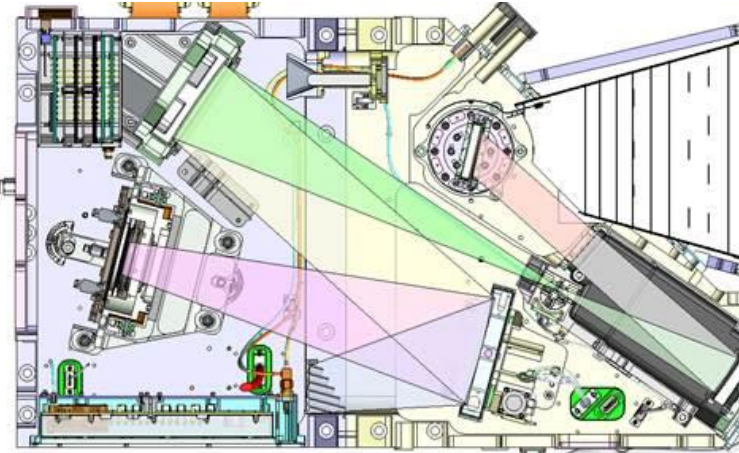
Earth in 135.6 nm Far UV
Apollo 16, S-201, April 1972



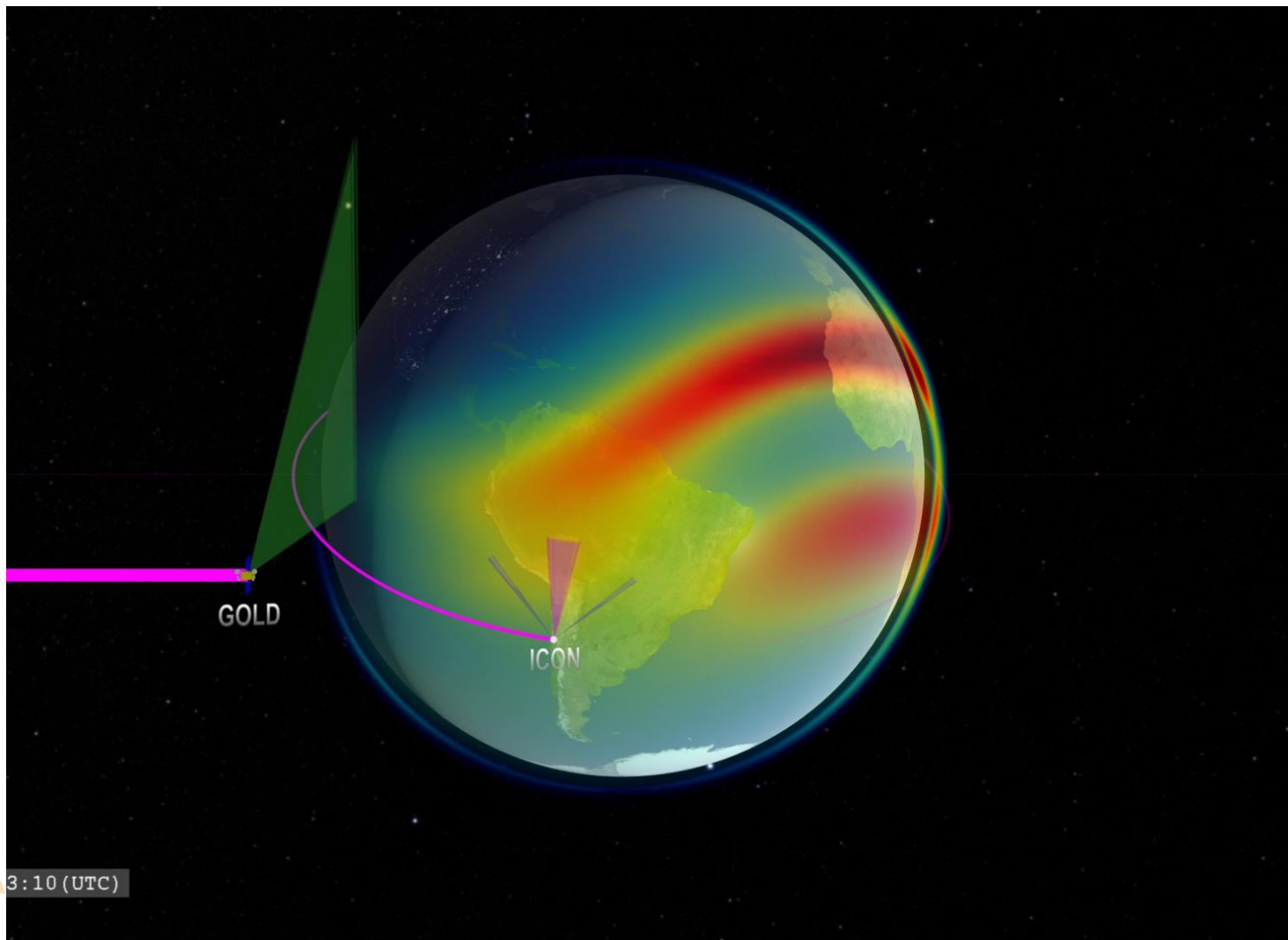
GOLD Imaging Spectrograph



ICON
Ionospheric Connection Explorer



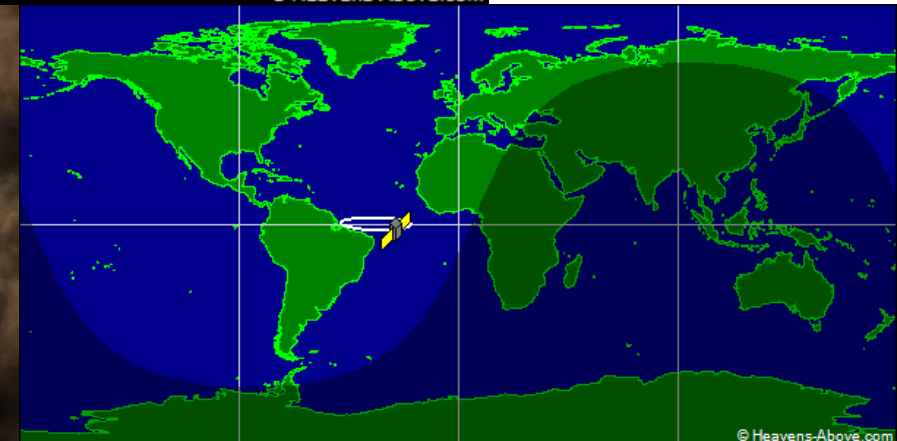
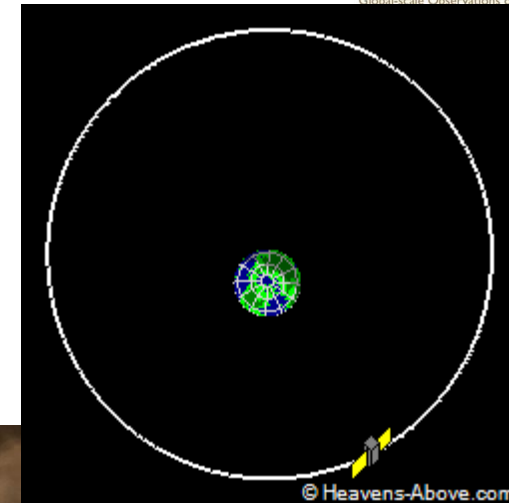
ICON & GOLD as a Combined Observatory



GOLD Launch & Current Location

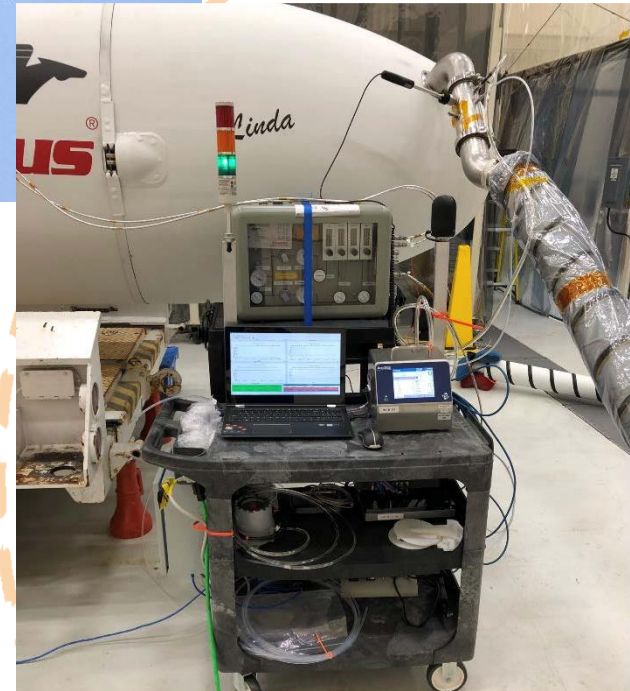
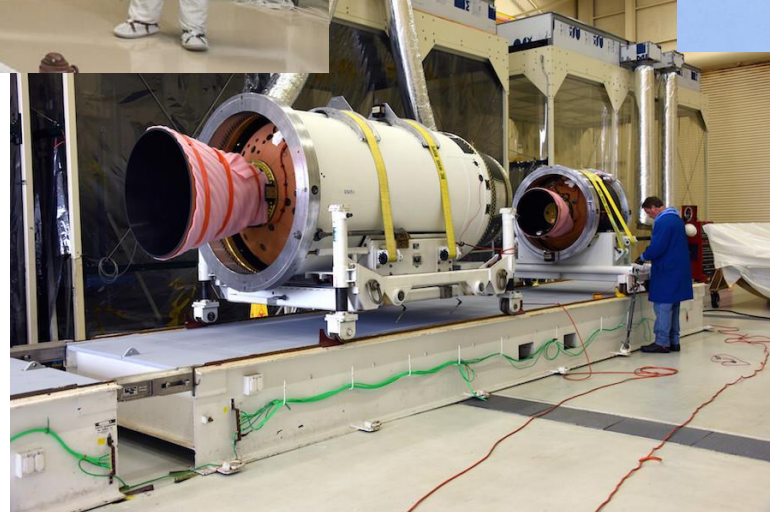
ICON
Ionospheric Connection Explorer

GOLD
Global-scale Observations of the Limb and Disk





ICON Current Status



Thanks!

ICON
Ionospheric Connection Explorer

GOLD
Global-scale Observations of the Limb and Disk

