

The Altius mission, a limb sounder for climate and for atmospheric monitoring

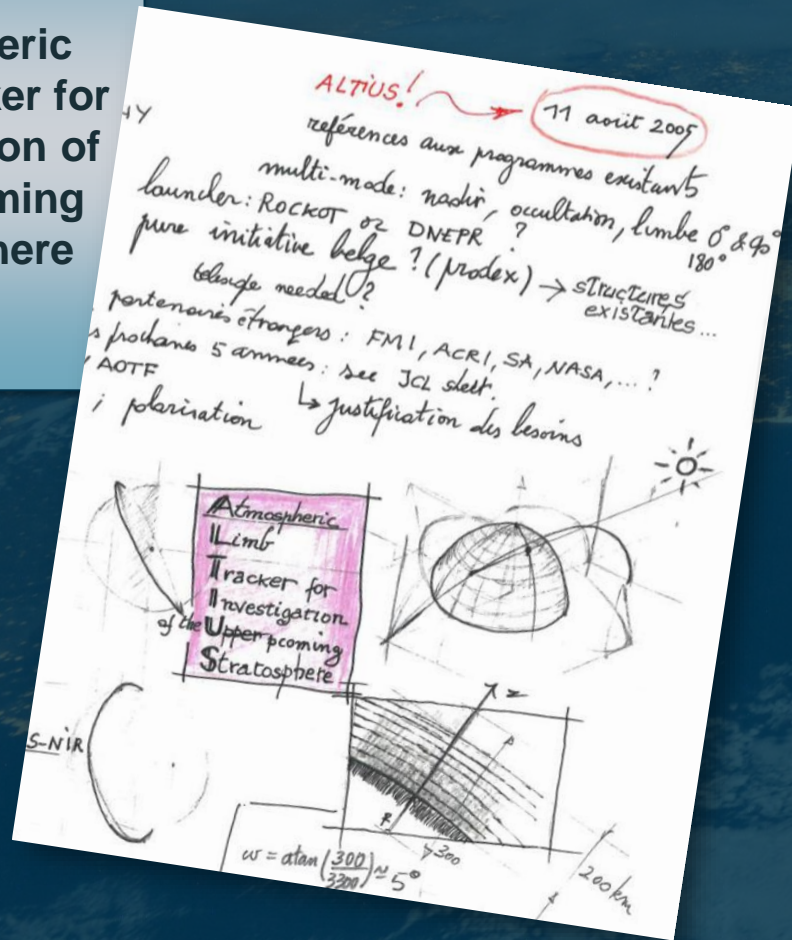
APPLICATIONS

altius

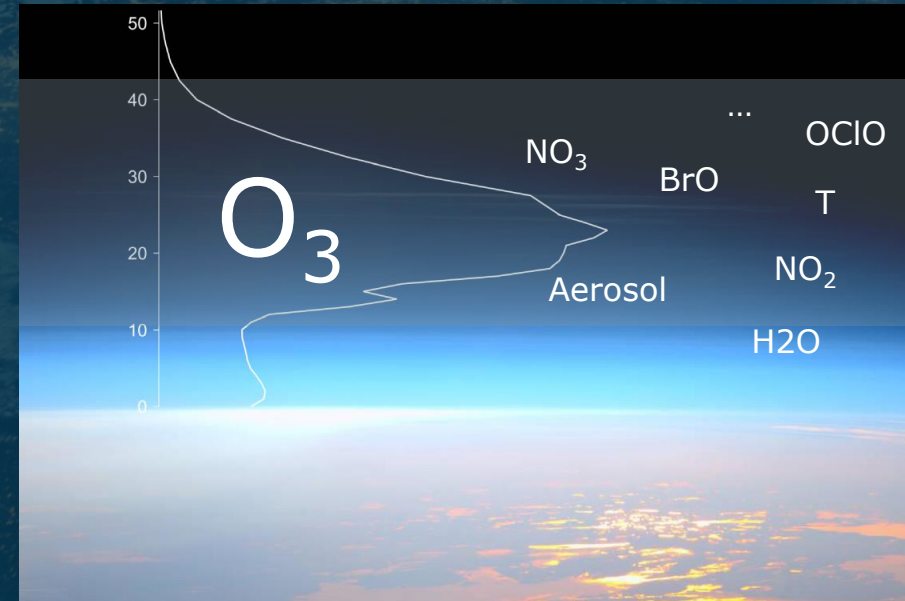
ESA's ozone mission

ALTIUS

Atmospheric
Limb Tracker for
Investigation of
the Upcoming
Stratosphere



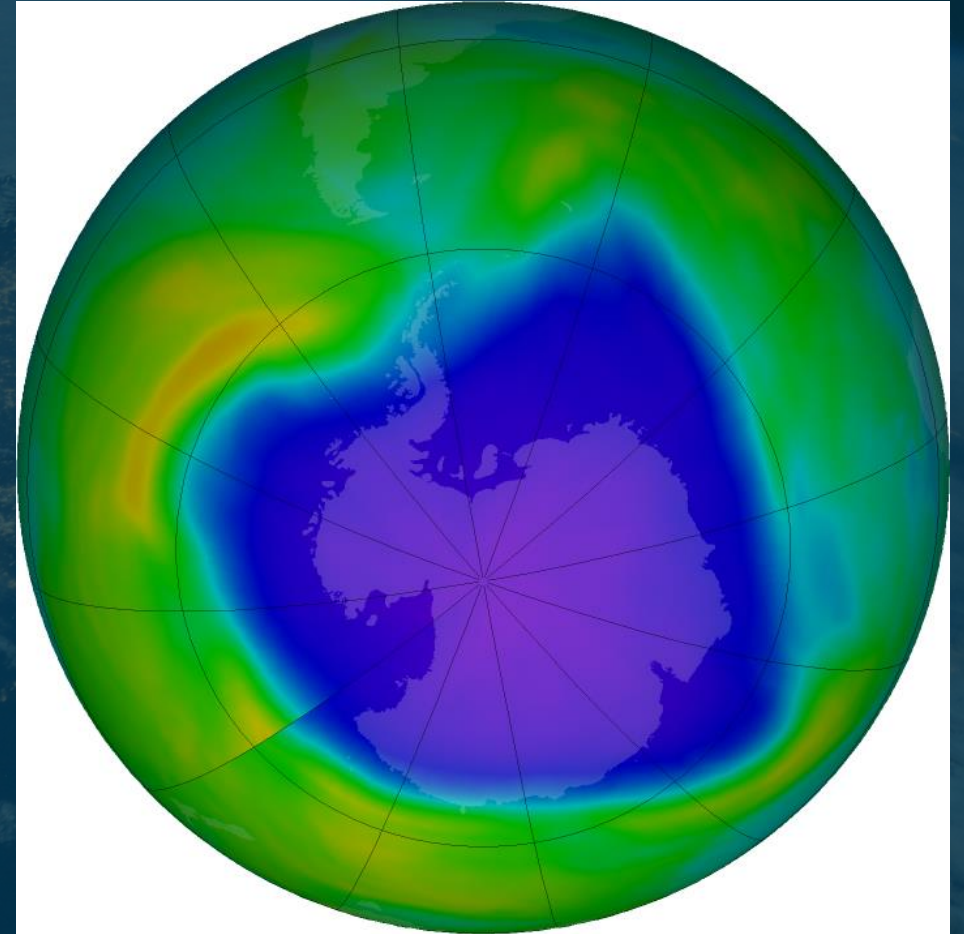
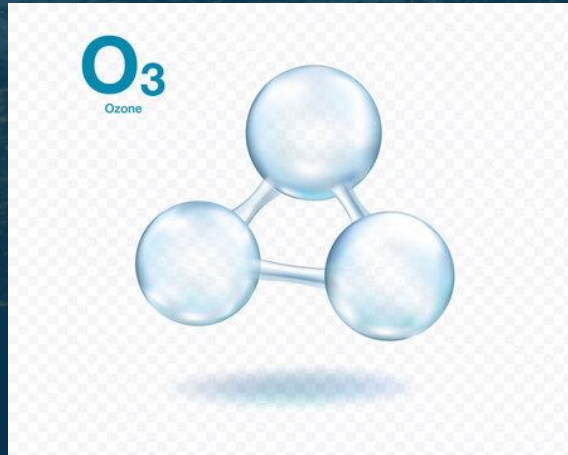
Distribution of stratospheric ozone and related gases at high vertical resolution



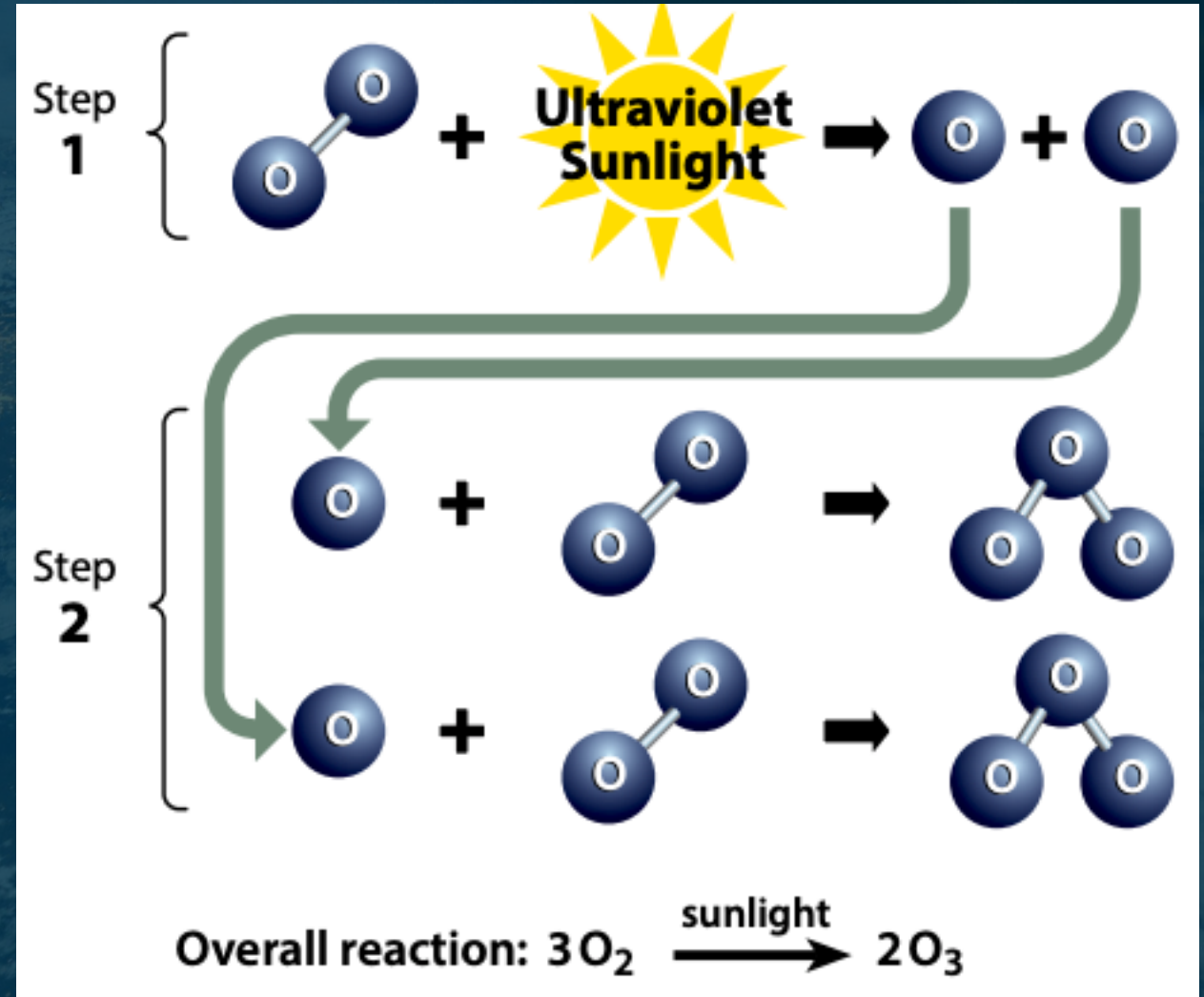
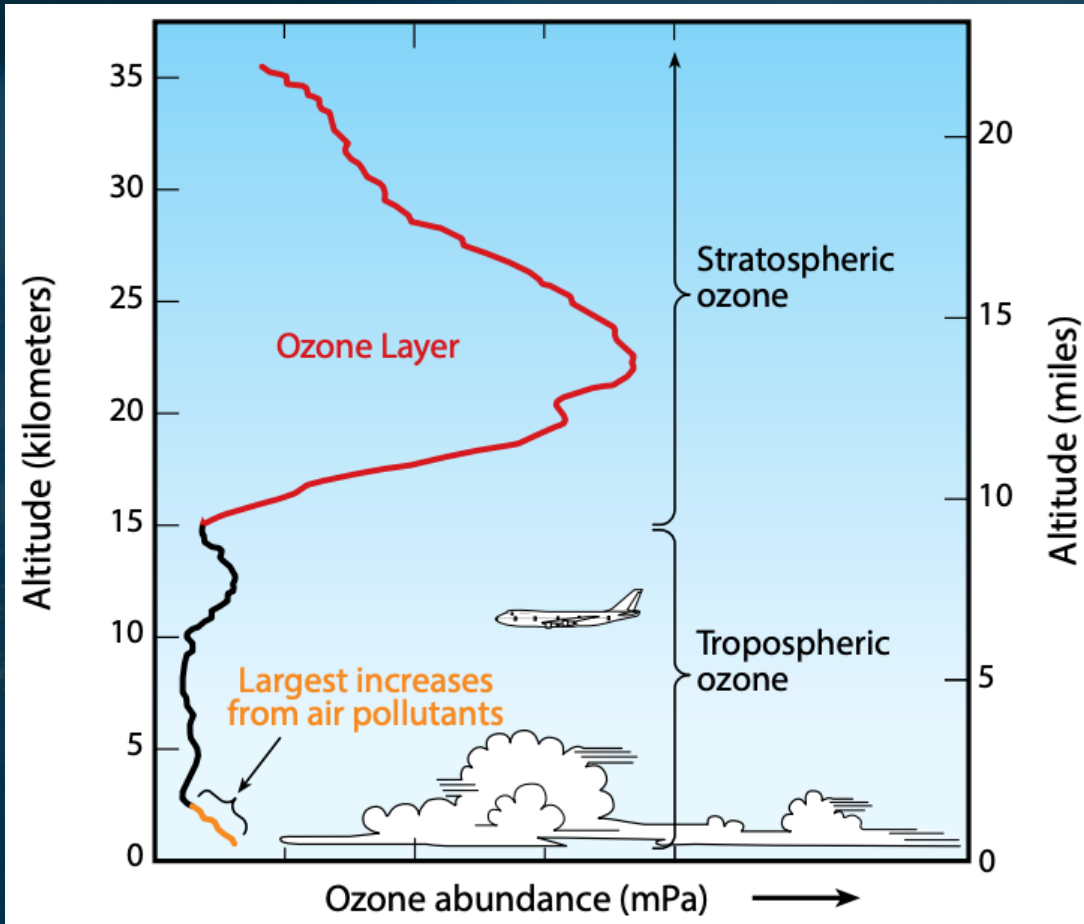
Why do we care about stratospheric ozone?



?

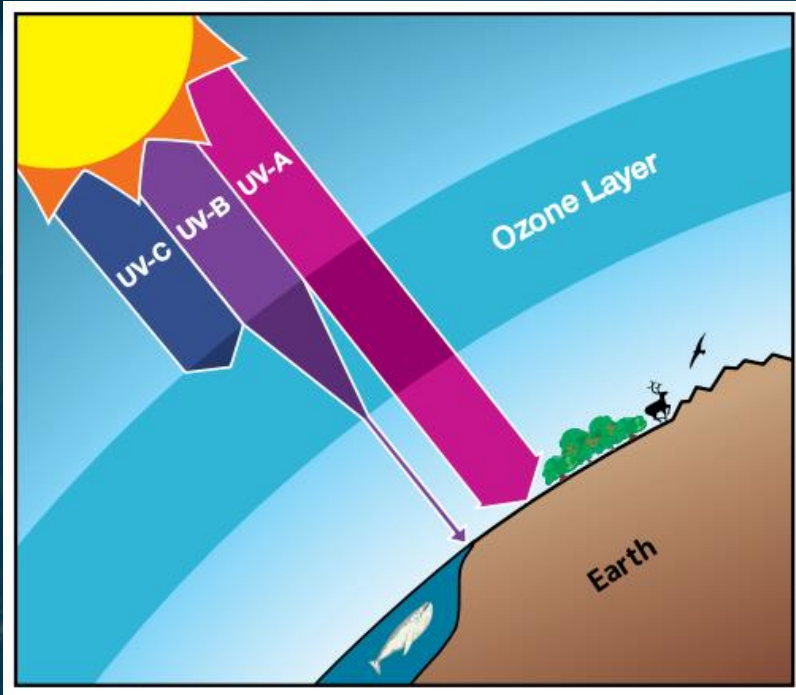


Ozone in stratosphere

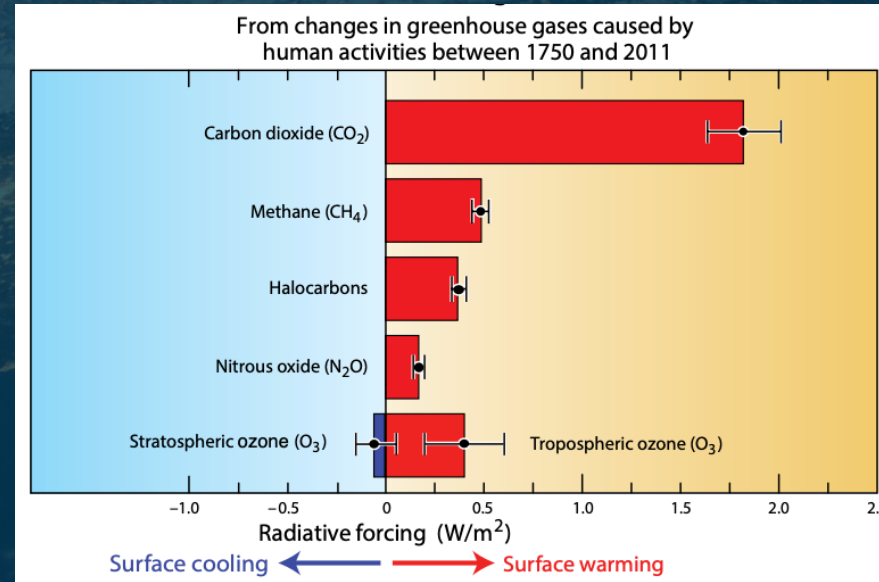


Why do we care about stratospheric ozone?

O3 absorbs a large part of the Sun's biologically harmful ultraviolet radiation

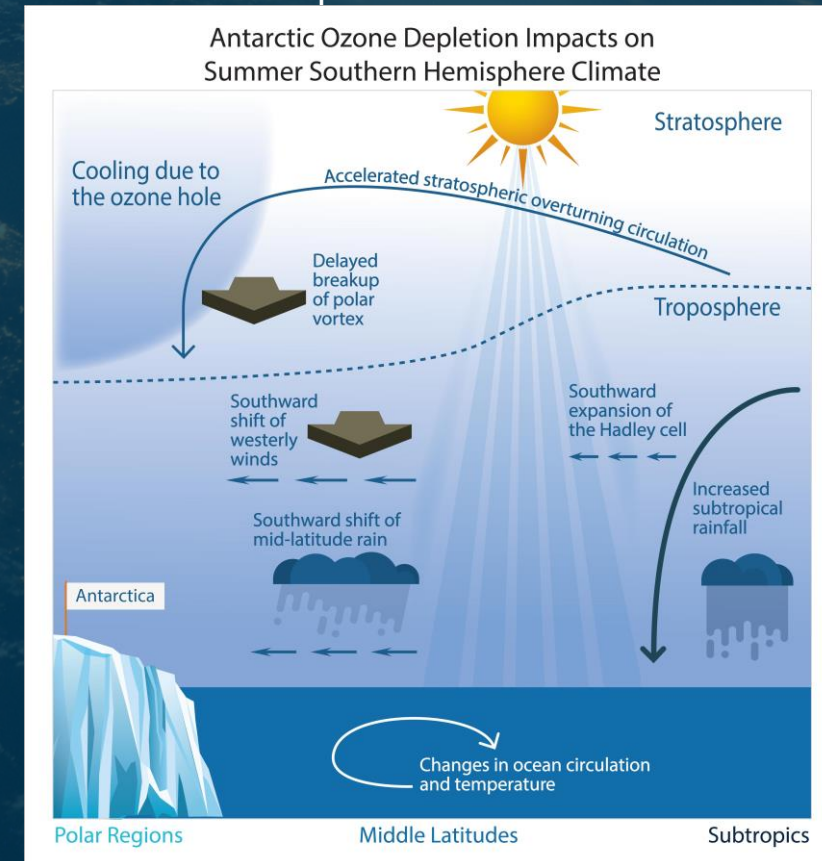


Ozone is strongly linked to climate due to its influence on Earth's radiative budget



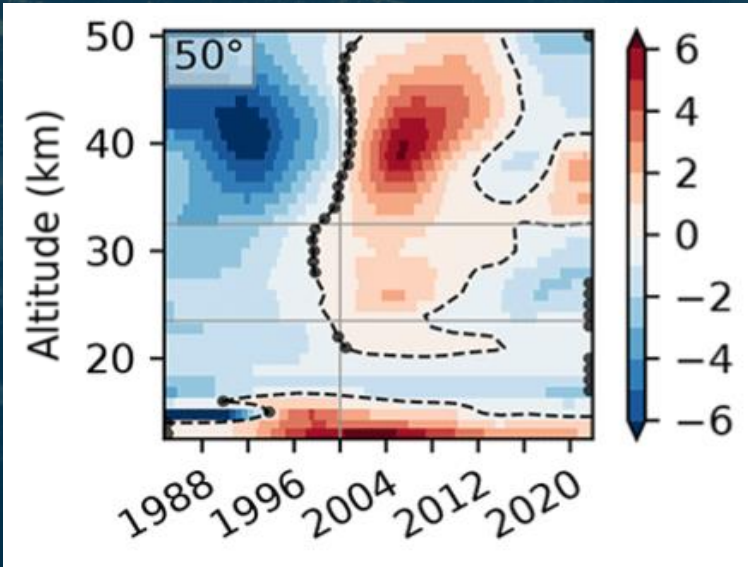
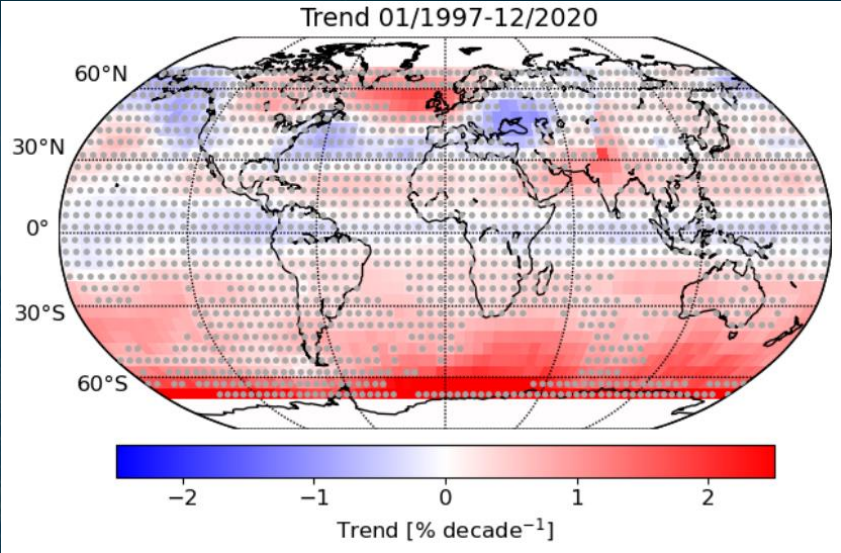
Credit: UN Ozone secretariat

Antarctic ozone hole has contributed to changes in Southern Hemisphere surface climate through effects on the atmospheric circulation



Credit: NOAA

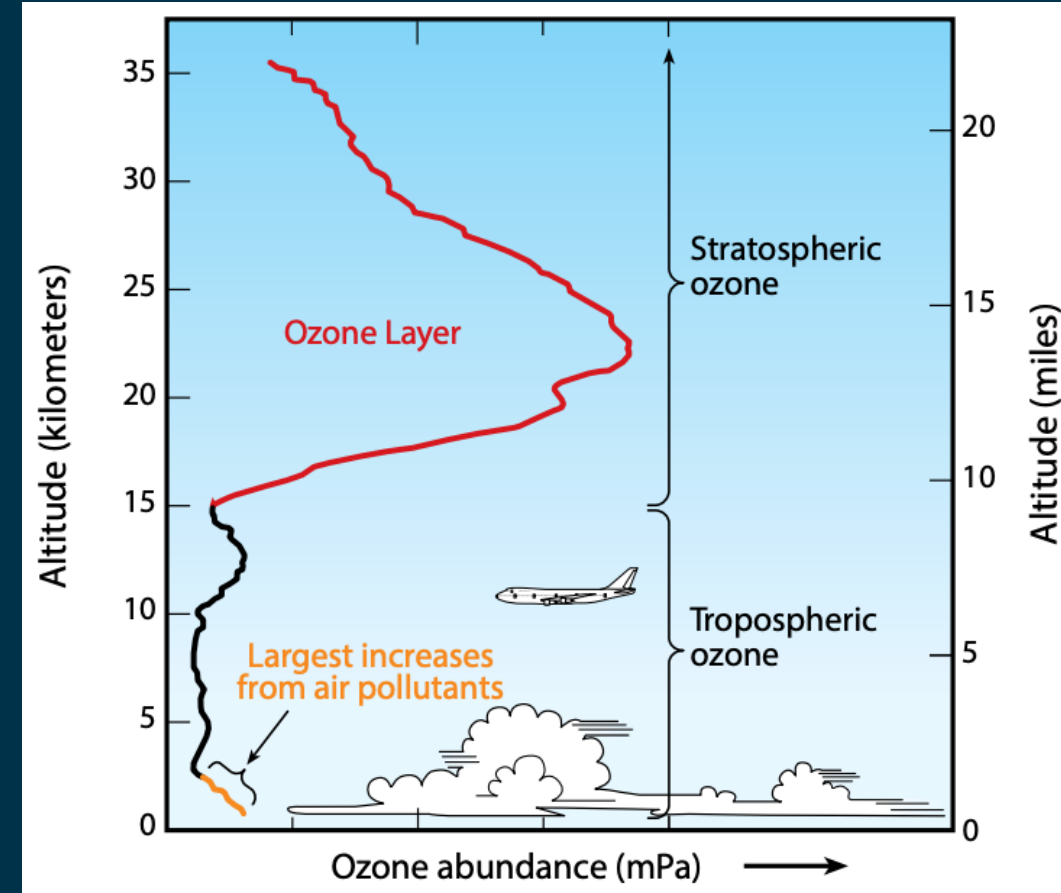
Montreal Protocol



Altius objectives

Measurement of distribution of stratospheric ozone and related gases at high vertical resolution

- To improve global atmospheric composition, regional air quality and UV index forecasts
- To improve numerical weather prediction (NWP) forecasts by improving the feedback on atmospheric temperatures and winds
- To the milestones of a clear Ozone recovery process on a global scale following the Montreal protocol

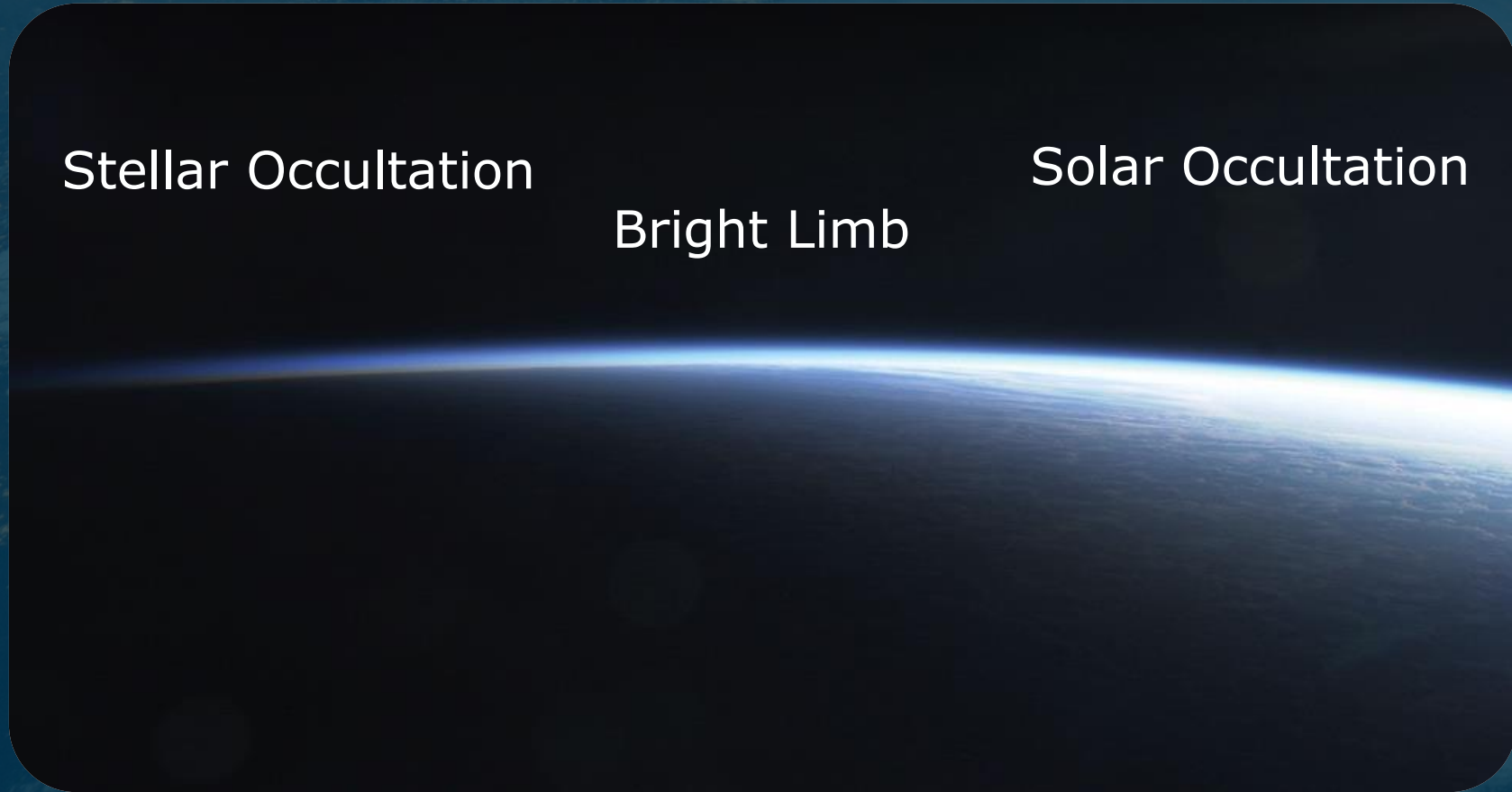


Repetitive 2-D imaging of Atmospheric Limb in different observation modes in a number of wavelengths in UV, VIS, NIR

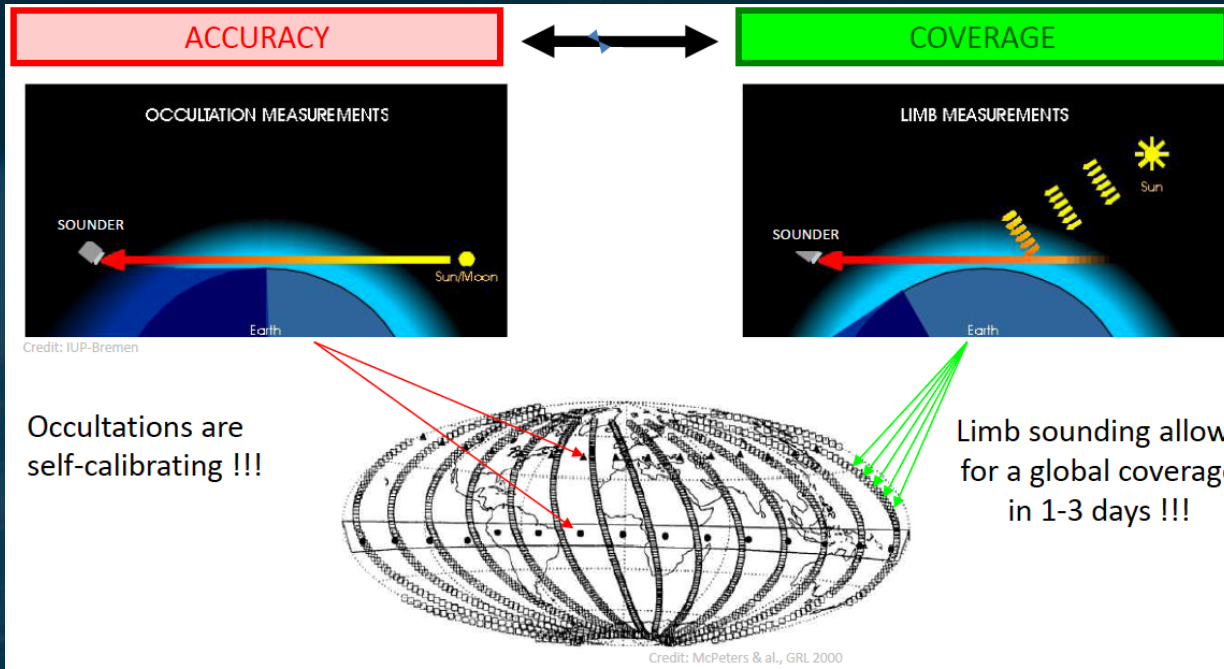
Stellar Occultation

Solar Occultation

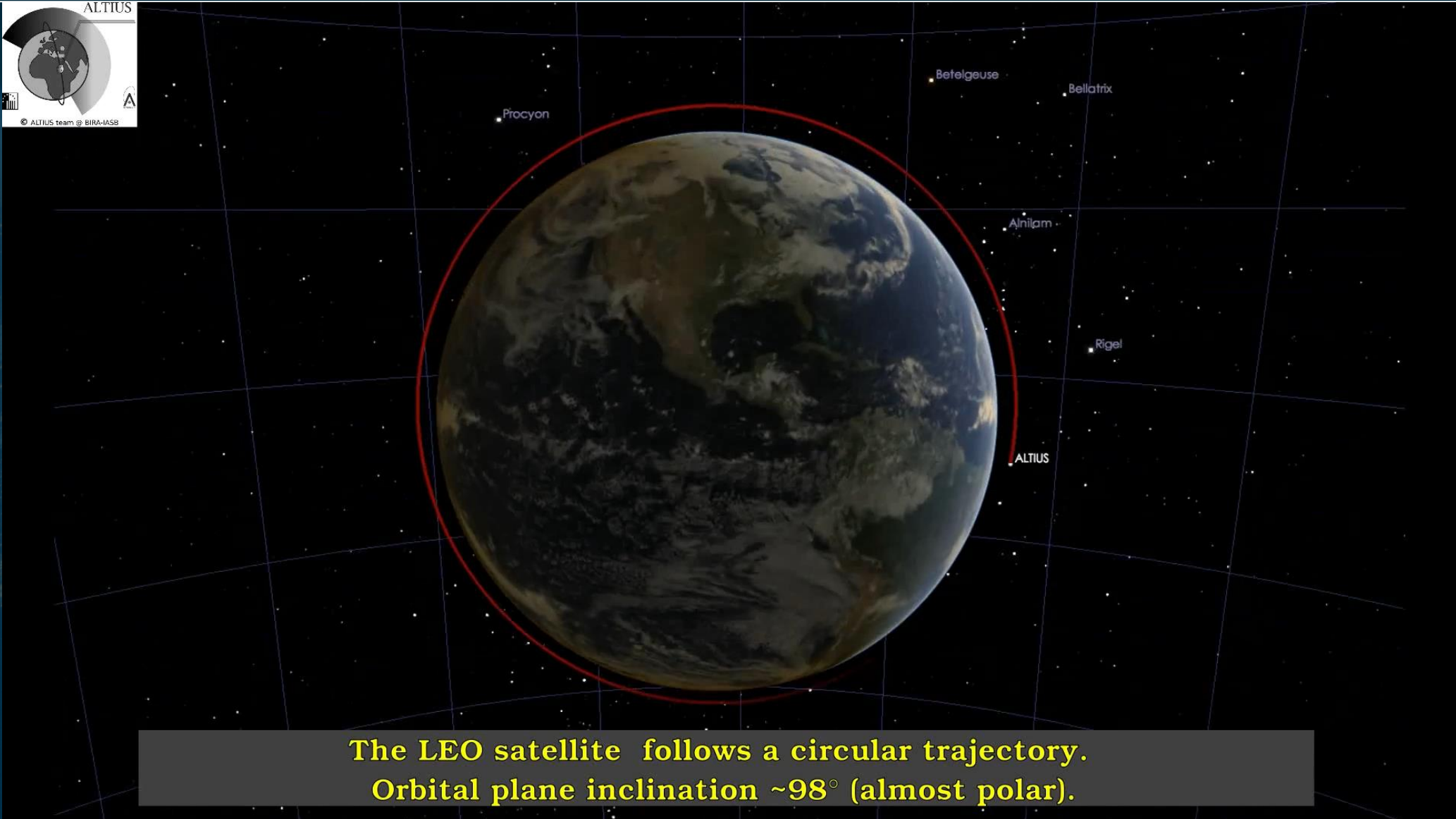
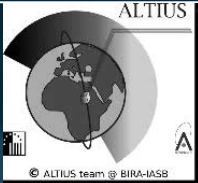
Bright Limb



Altius Observations Concept

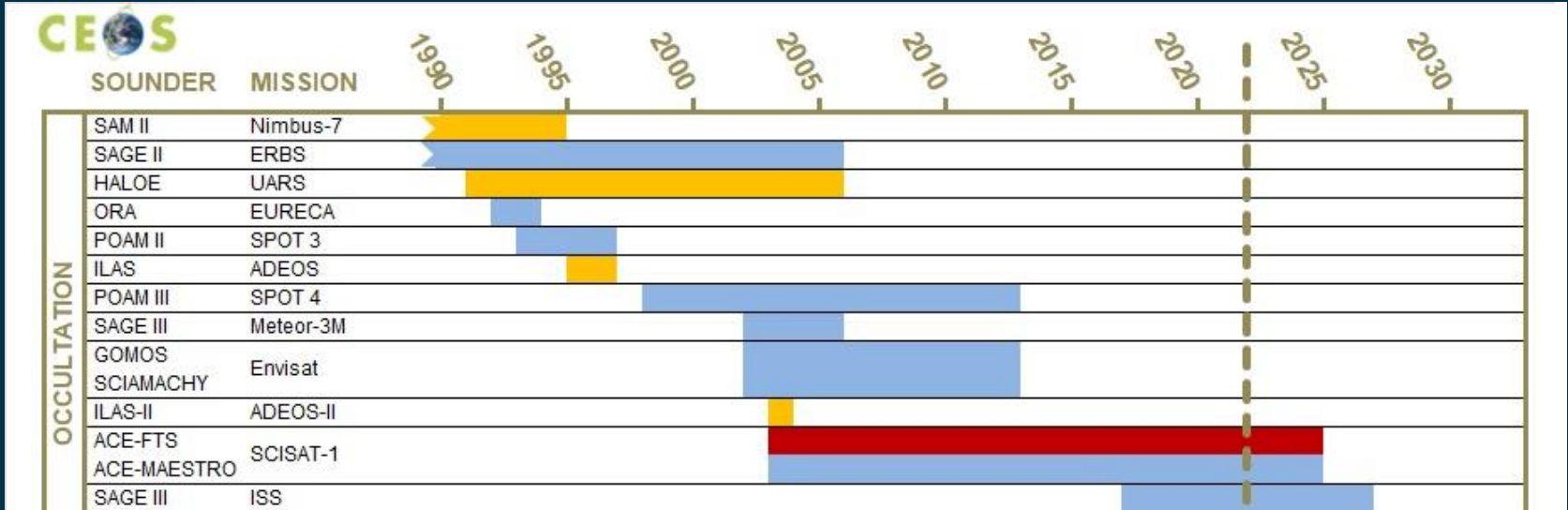


Altius Observations Concept



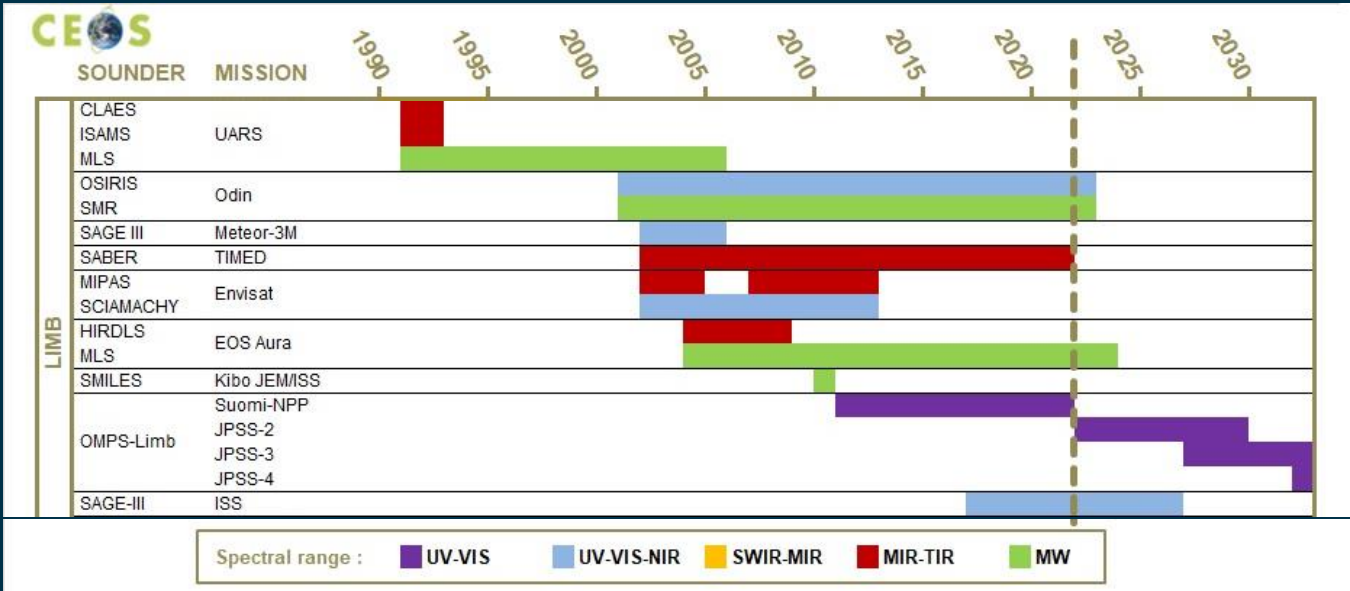
The LEO satellite follows a circular trajectory.
Orbital plane inclination $\sim 98^\circ$ (almost polar).

Gap filler



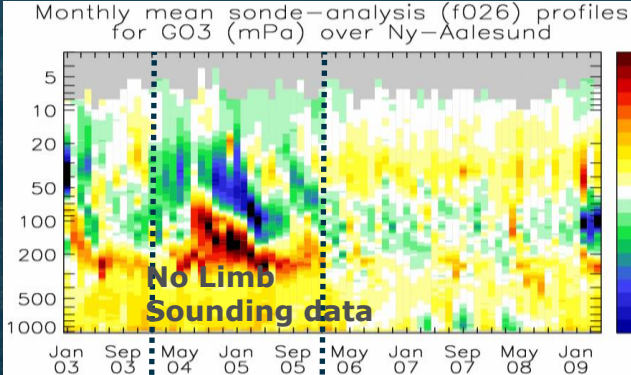
Credit: BISA-BIRA

Beside Altius and the American JPSS-2/OMPS-LP successive missions, there is no other limb mission planned to fill the gap with the existing aging limb missions



Credit: BISA-BIRA

- Stratospheric ozone profiles, complementary to total ozone column measurements (GOME-2, Sentinel-5P) used for operational data assimilation for numerical weather prediction or atmospheric composition forecast (e.g ECMWF, CAMS)



- ALTIUS data will extend the provision of ozone profile as Essential Climate Variable. Connection with e.g.



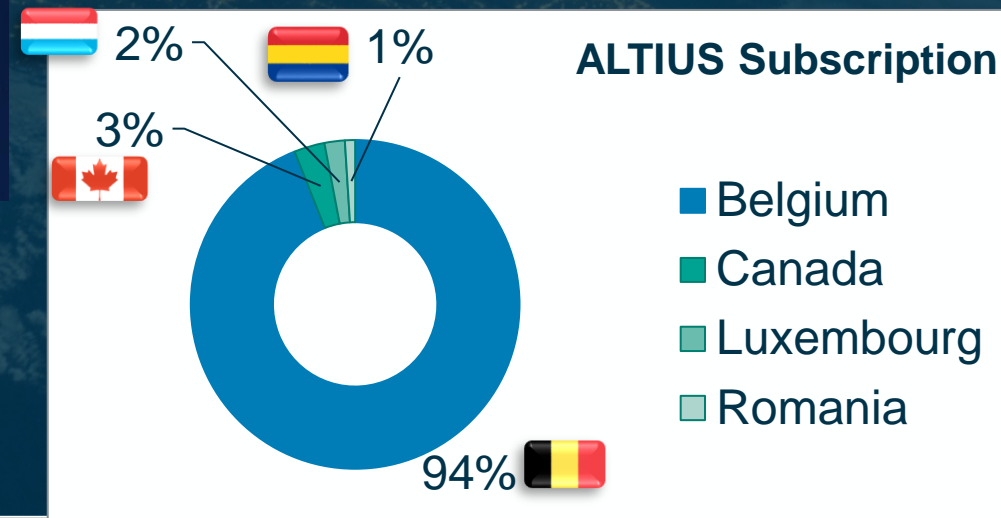
- Altius dataset is of high importance for atmospheric modelling analysis.

Scientific use cases:

- Transient phenomena (e.g. solar proton events, sudden stratospheric warming, sprites)
- Wildfire intrusions in the stratosphere
 - radiative effect (climate effect)
 - chemical effect (change of stratospheric composition)
 - ozone depletion (climate and UV effects)
- H₂O trends continuation
- Volcanic eruptions
 - aerosol injection in the stratosphere (climate effect)



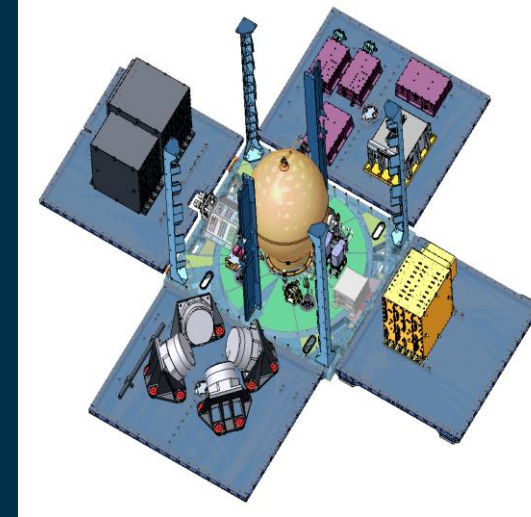
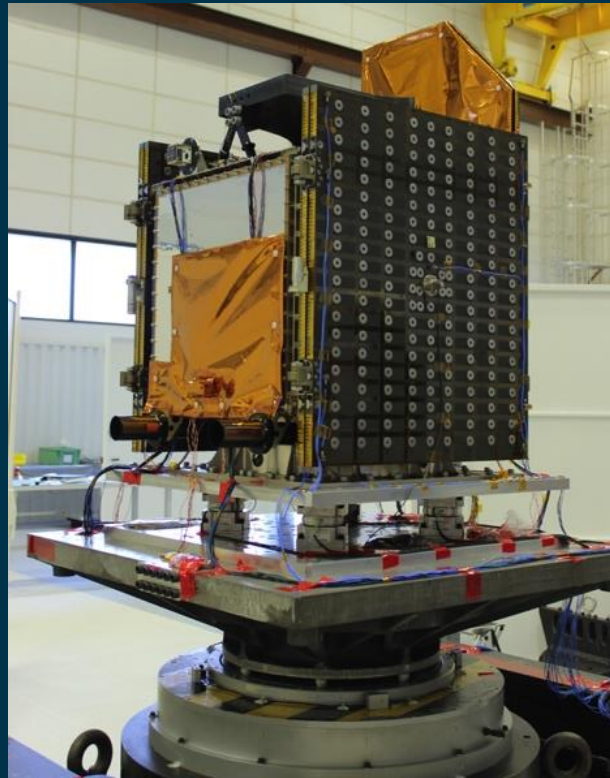
Where is Altius in ESA

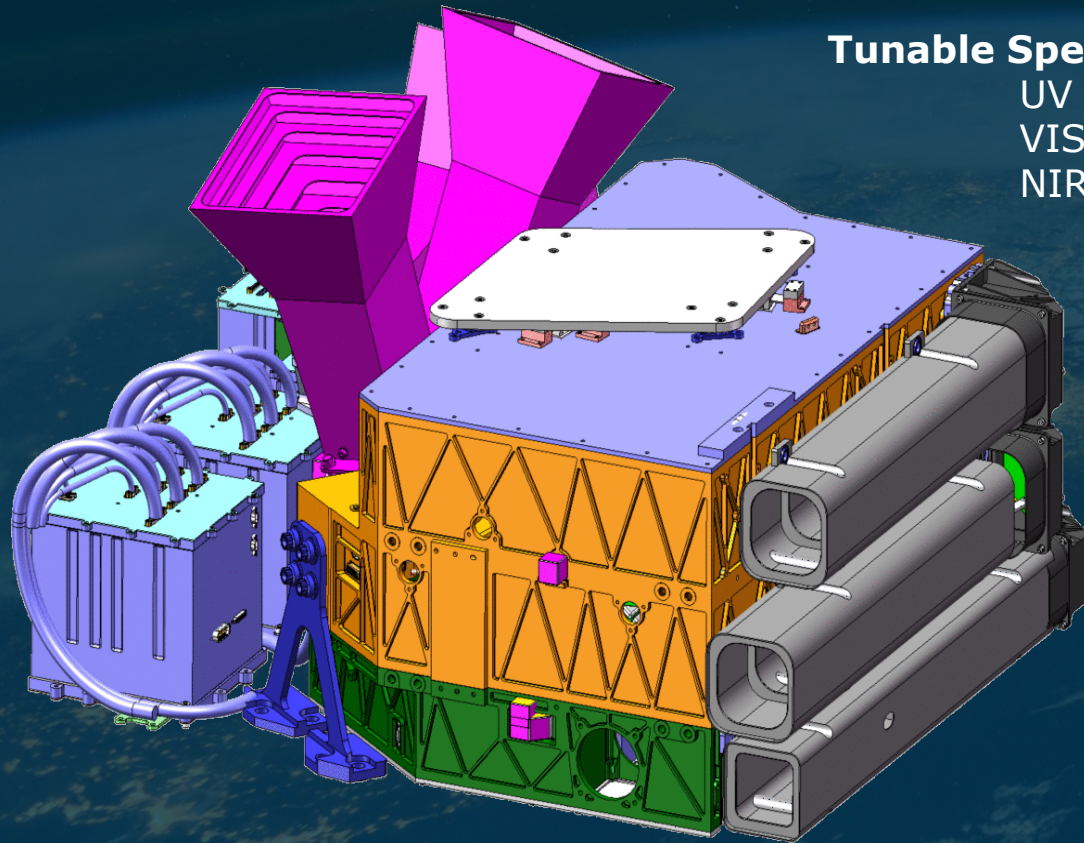


Altius Satellite



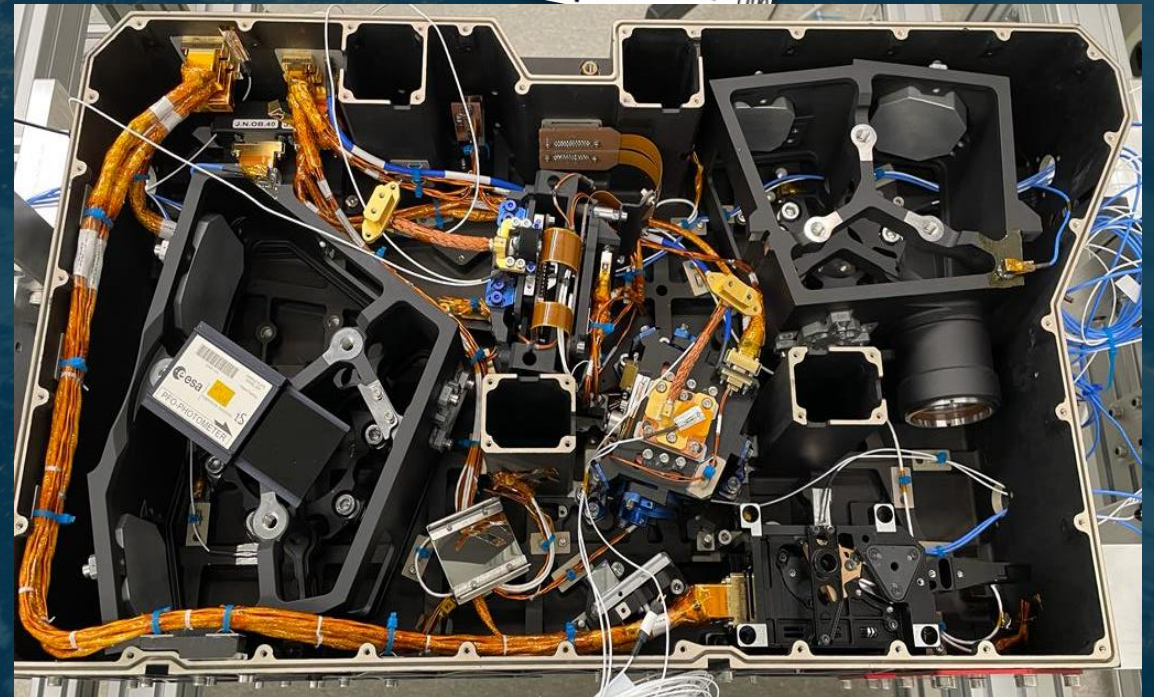
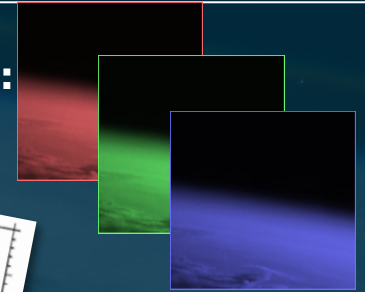
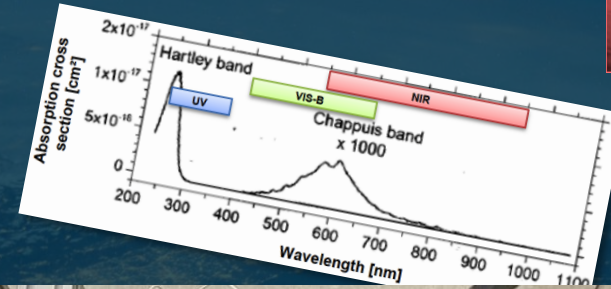
- New developed platform with new avionics (LEON3 dual-core)
- Mass 275 kg
- Volume (H: 1,3m, L: 0,9m - expended 3,8m)
- Very agile AOCS
- Power: max 230W





Tunable Spectral imager with 3 independent channels:

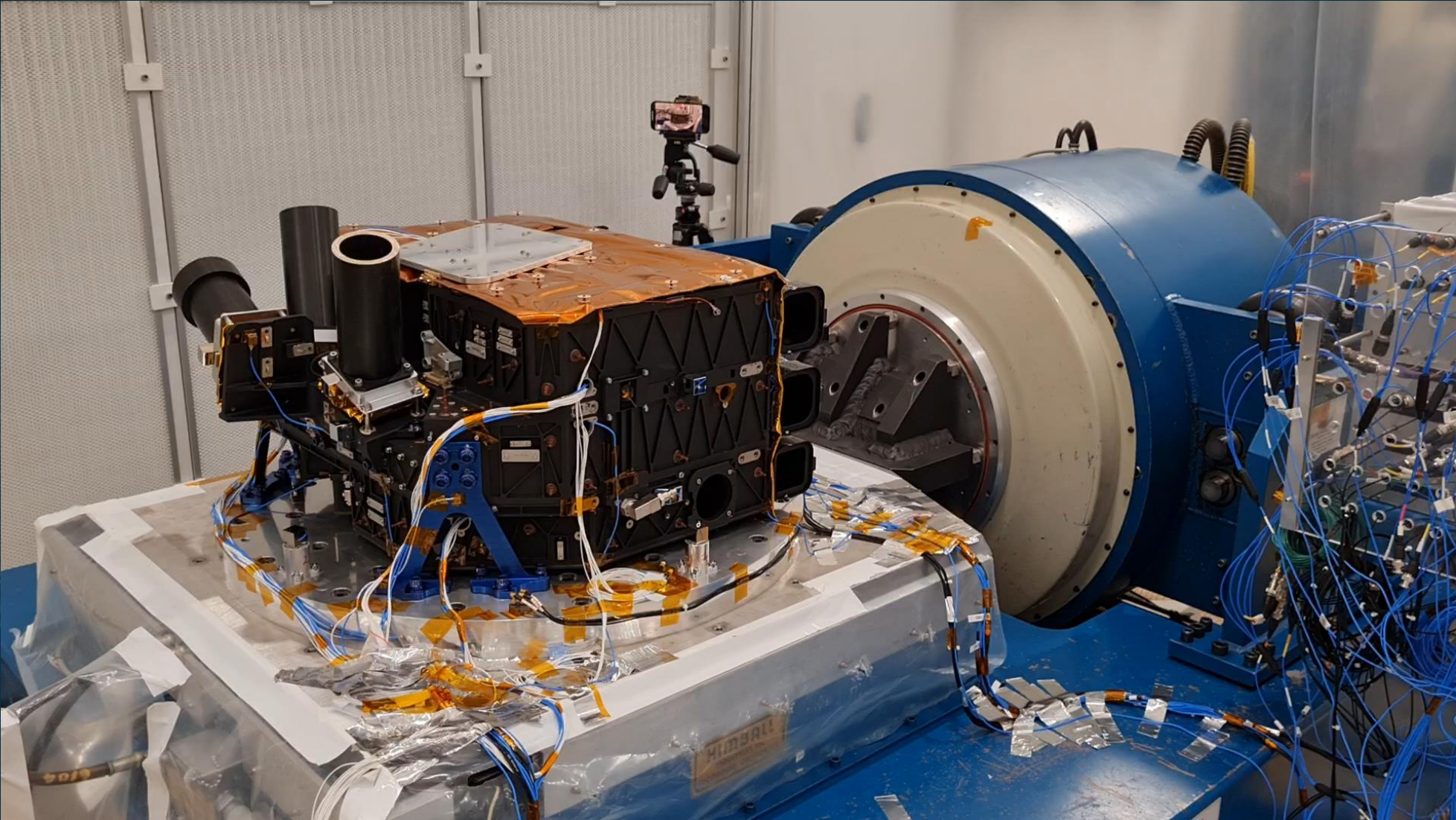
- UV (250 – 355nm)
- VIS-B (440-675nm)
- NIR (600 – 1020nm)



Spectral filters:

Acousto-Optic Tunable Filter for VIS-B/NIR

Fabry Perot Interferometer for UV



Altius Ground Segment

Flight Operation Center will be located in ESA-Redu (ESEC)

Payload Data Ground Segment will be located at the High Performance Computing Facility at Uccle Plateau (BE)

Complemented with ground stations in the north pole



- Be at the forefront of the O3 layer and related gases monitoring
- Support validation of other limb sounders (mission synergies, including nadir missions)
- Climate change studies (H2O trends, O3 trends, temperature trends, wildfire aerosols)
- Improve forecasts of numerical weather models, and atmospheric composition monitoring

Technical advances:

- Novel AOTF-based or FPI-based hyperspectral imaging
- Agile and versatile advanced platform
- multi-observation modes mission (highest agility of any atmospheric mission so far)

Thank you for your attention!



Looking forward to the launch early 2026

