Karlsruhe Institute of Technology

First flight of the mid-infrared limb-imaging interferometer GLORIA on a stratospheric balloon

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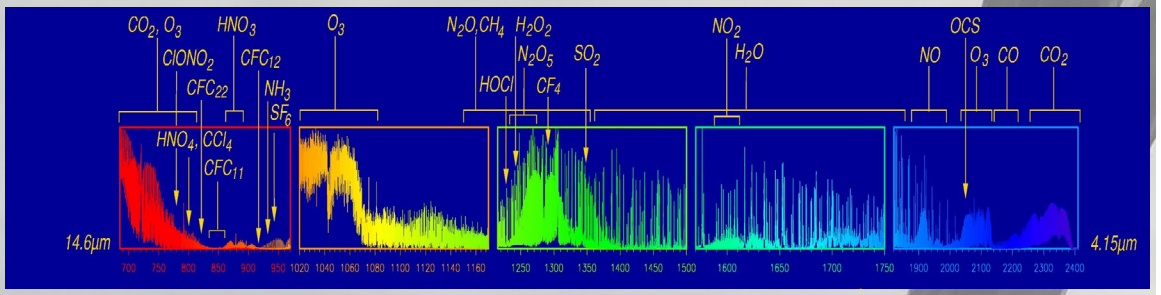
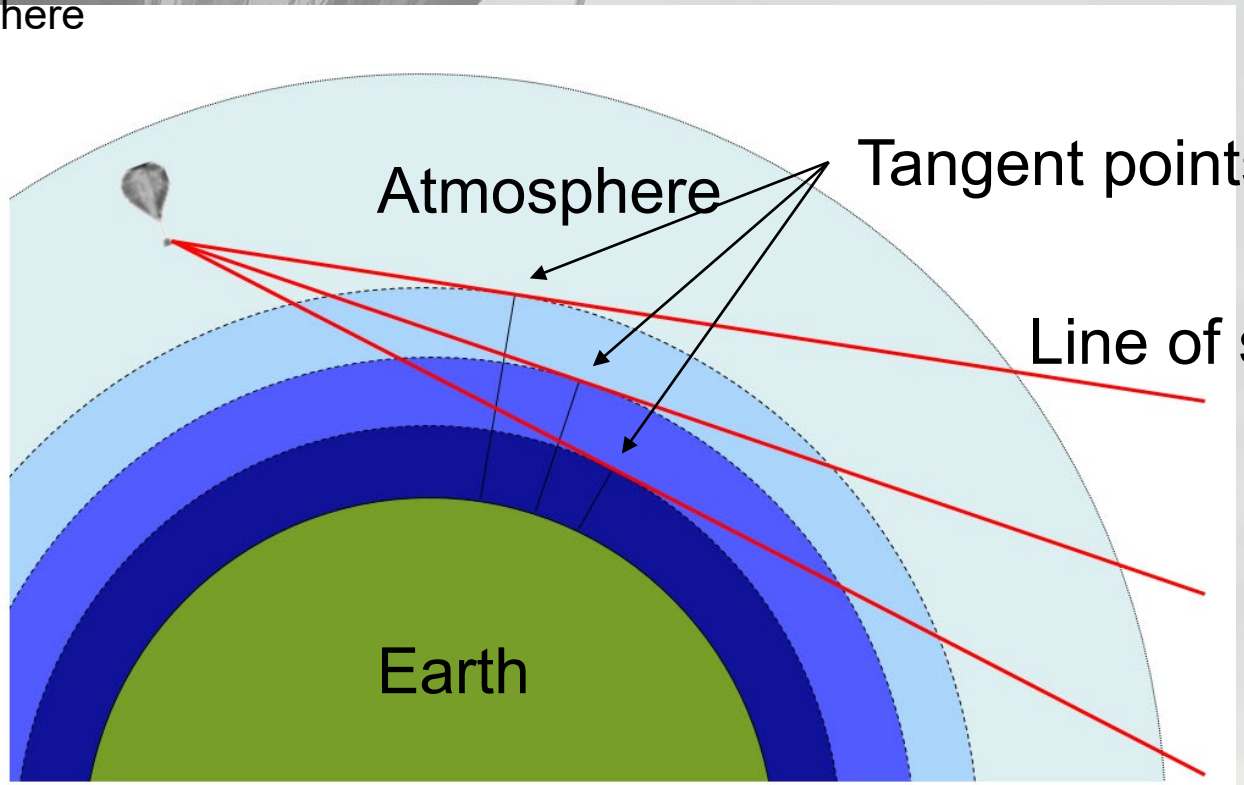
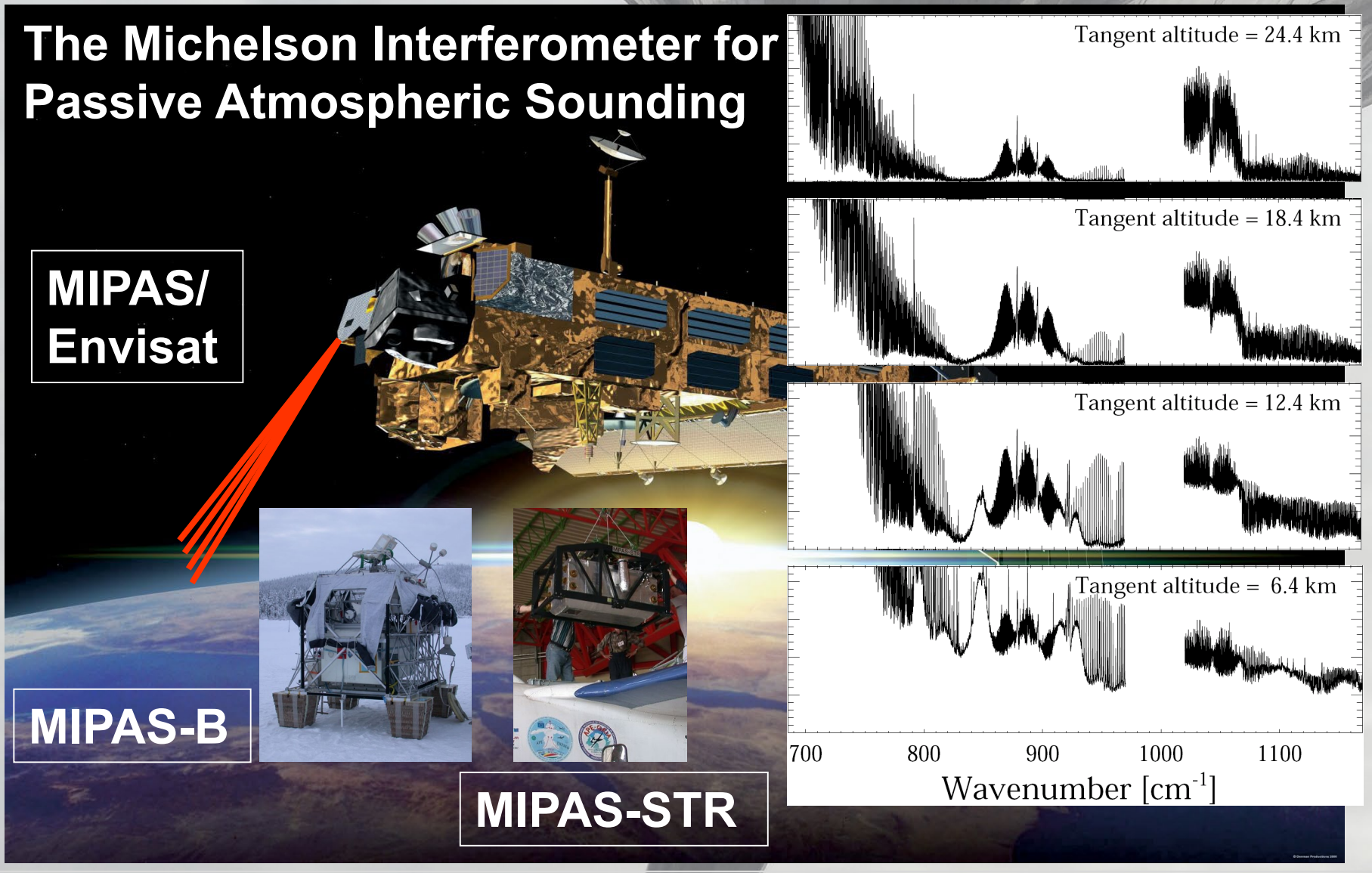
Mid-IR limb emission spectroscopy

- View through the atmosphere against cold space
  - ➔ Measurement of thermal atmospheric emission
  - ➔ Independent of a source like sun or moon
  - ➔ High sensitivity due to long path through the atmosphere
- Different tangent altitudes
  - ➔ High vertical resolution
- FTIR spectroscopy
  - ➔ Separate rotational-vibrational spectral signatures of many trace gases

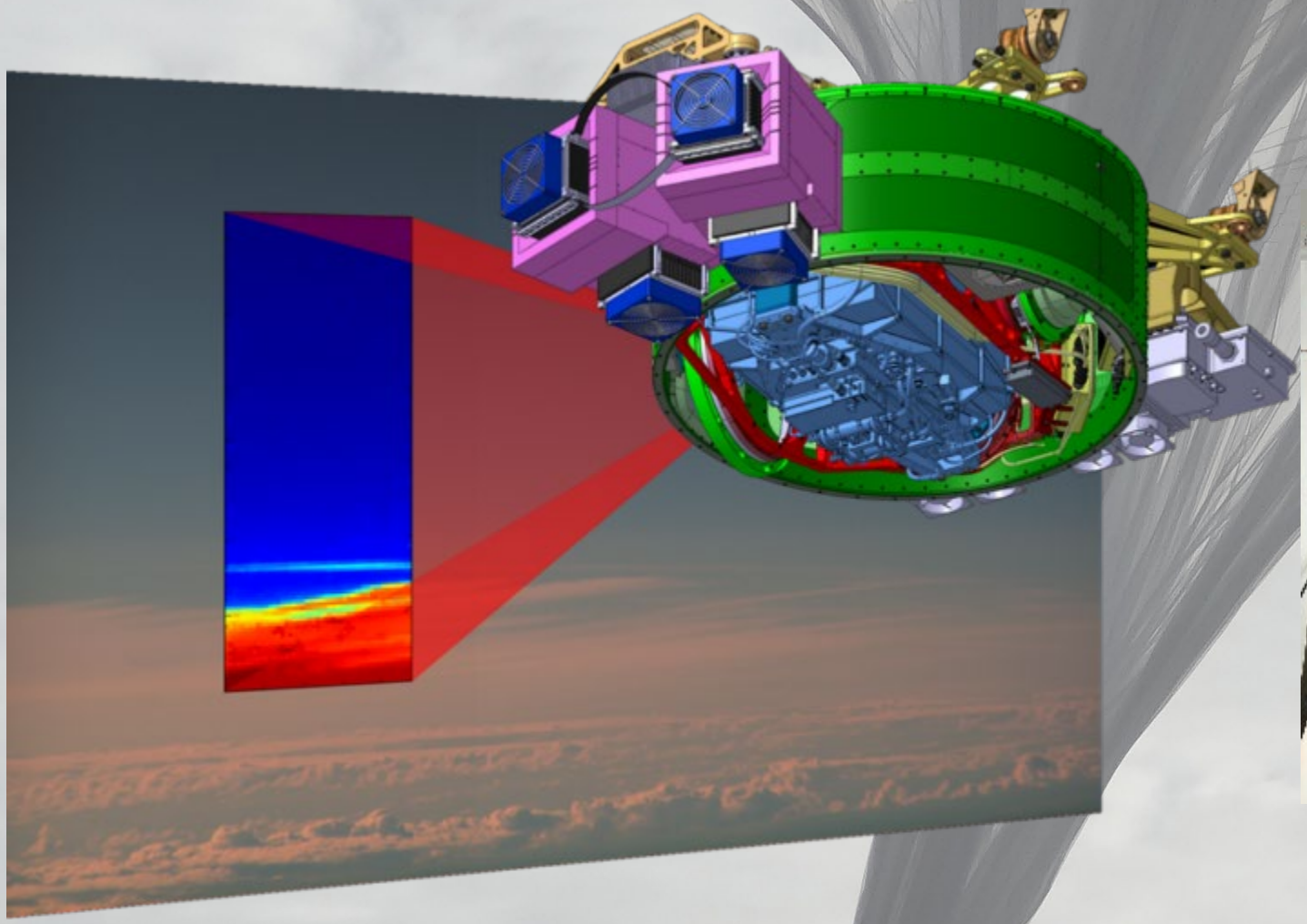




From limb-scanning MIPAS instruments ….

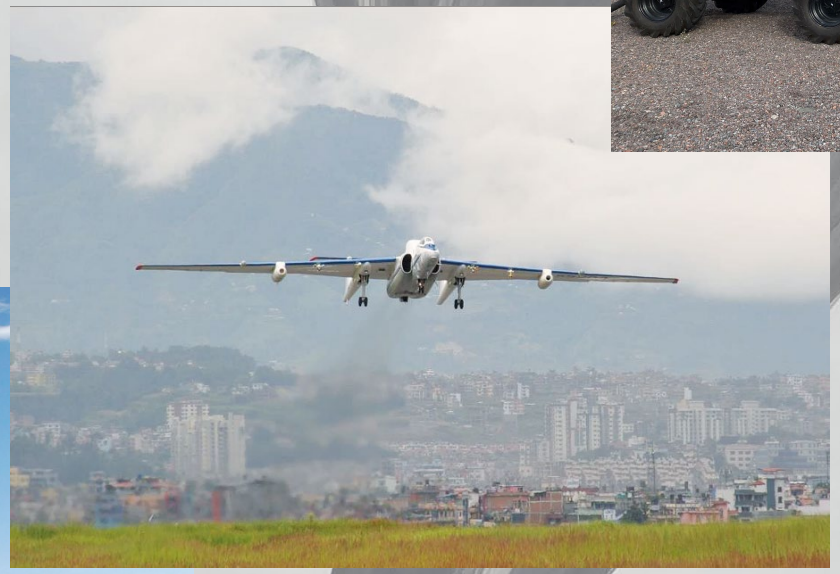


… to limb-imaging GLORIA instruments



GLORIA@StratoBalloon ~36 km

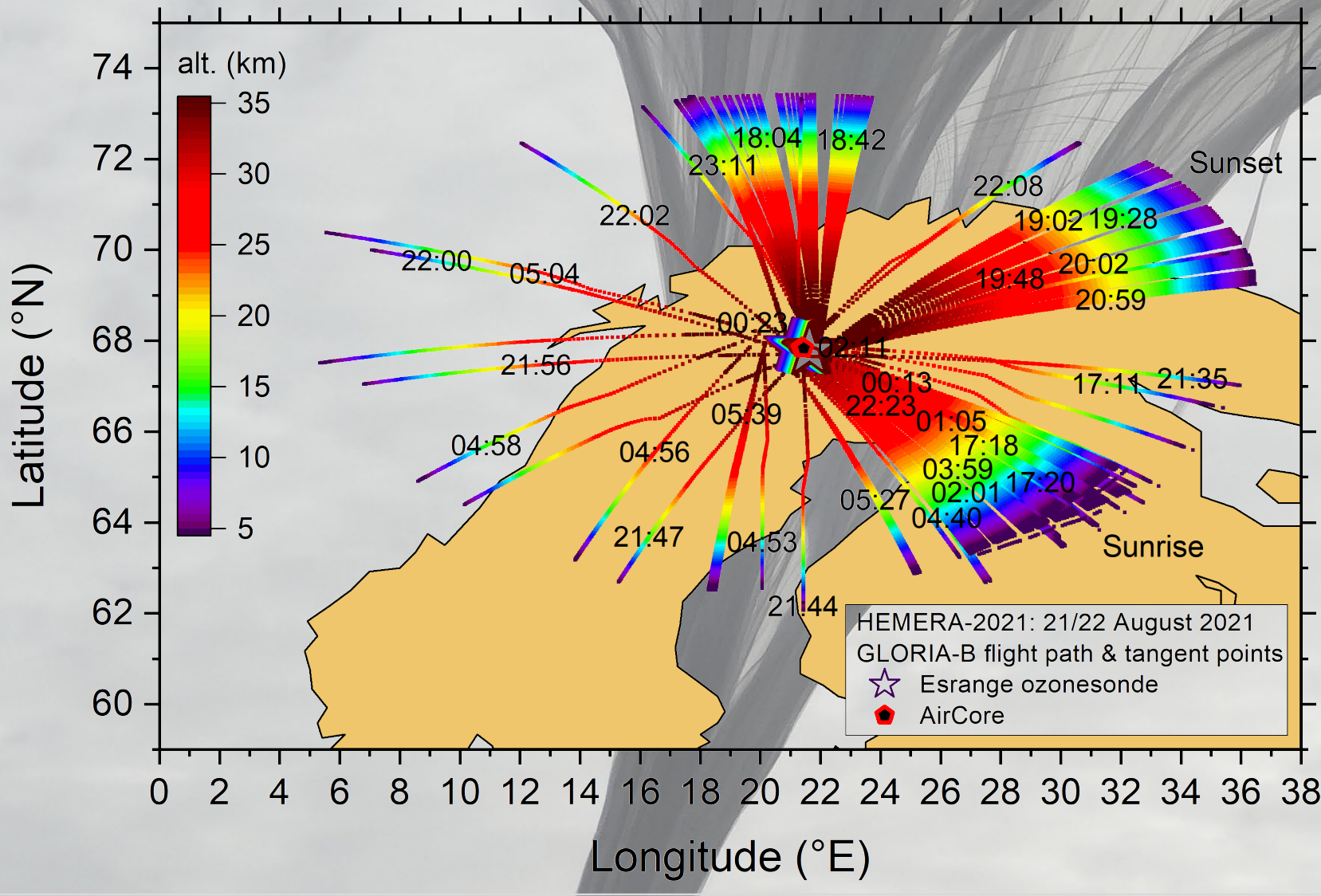
Maiden flight during EU-project HEMERA
from Esrange/N-Sweden on 21 Aug 2021



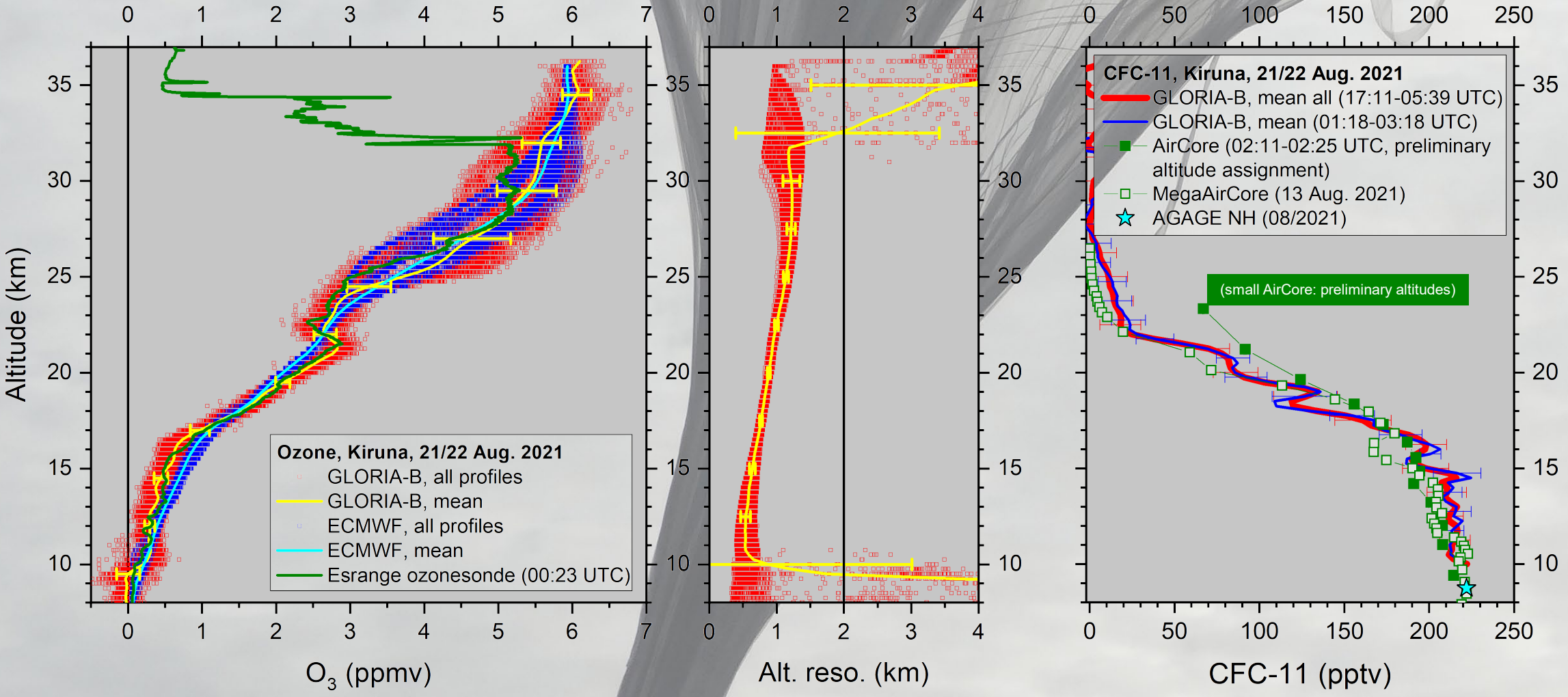
GLORIA@Geophysica ~20 km

GLORIA@HALO ~14 km

GLORIA-B tangent point position

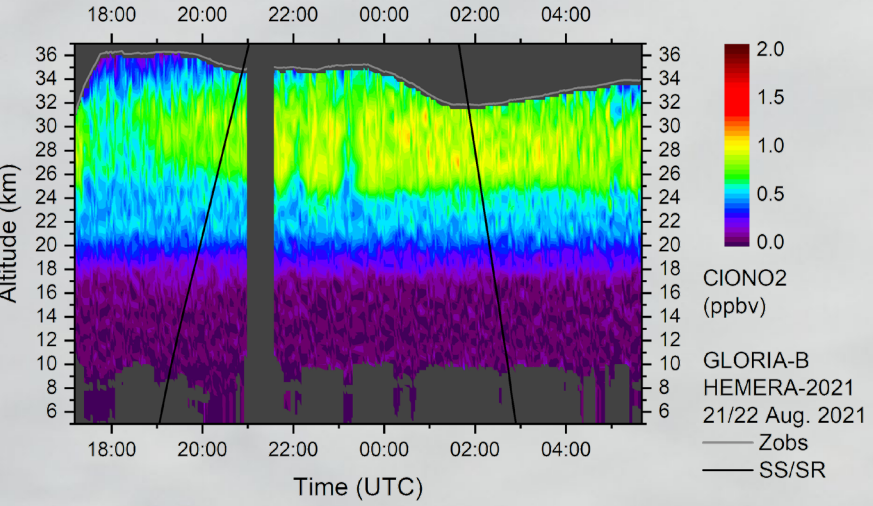


GLORIA-B measurements in comparison to ozonesonde and AirCore in-situ observations

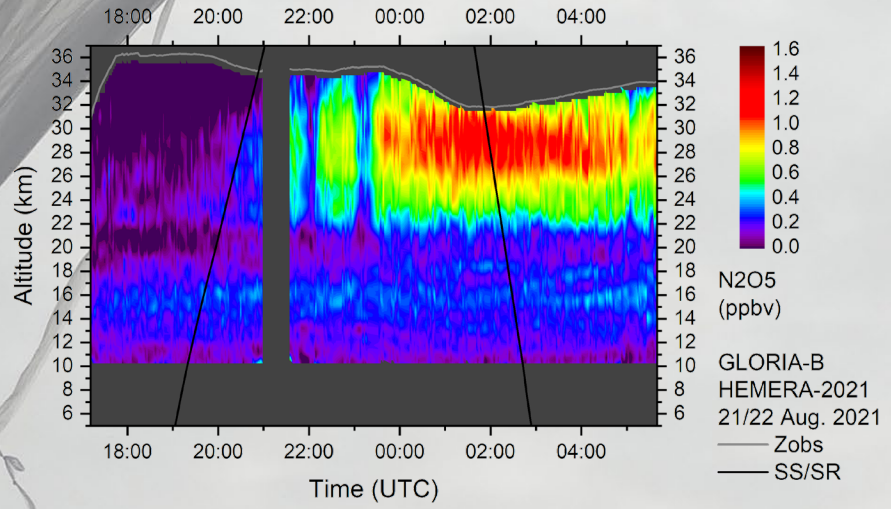


Investigation of diurnal cycle of many trace gases involved in ozone chemistry

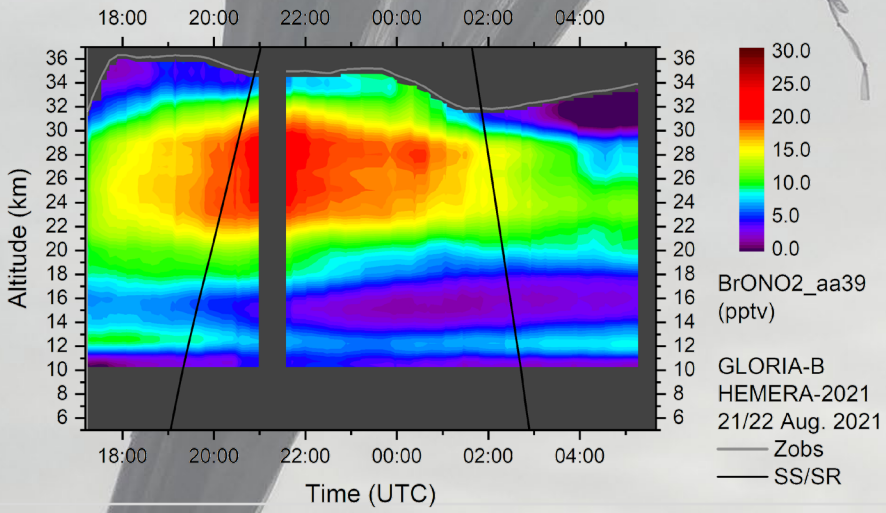
Chlorine species (e.g. $ClONO_2$)



Nitrogen species (e.g. N_2O_5)

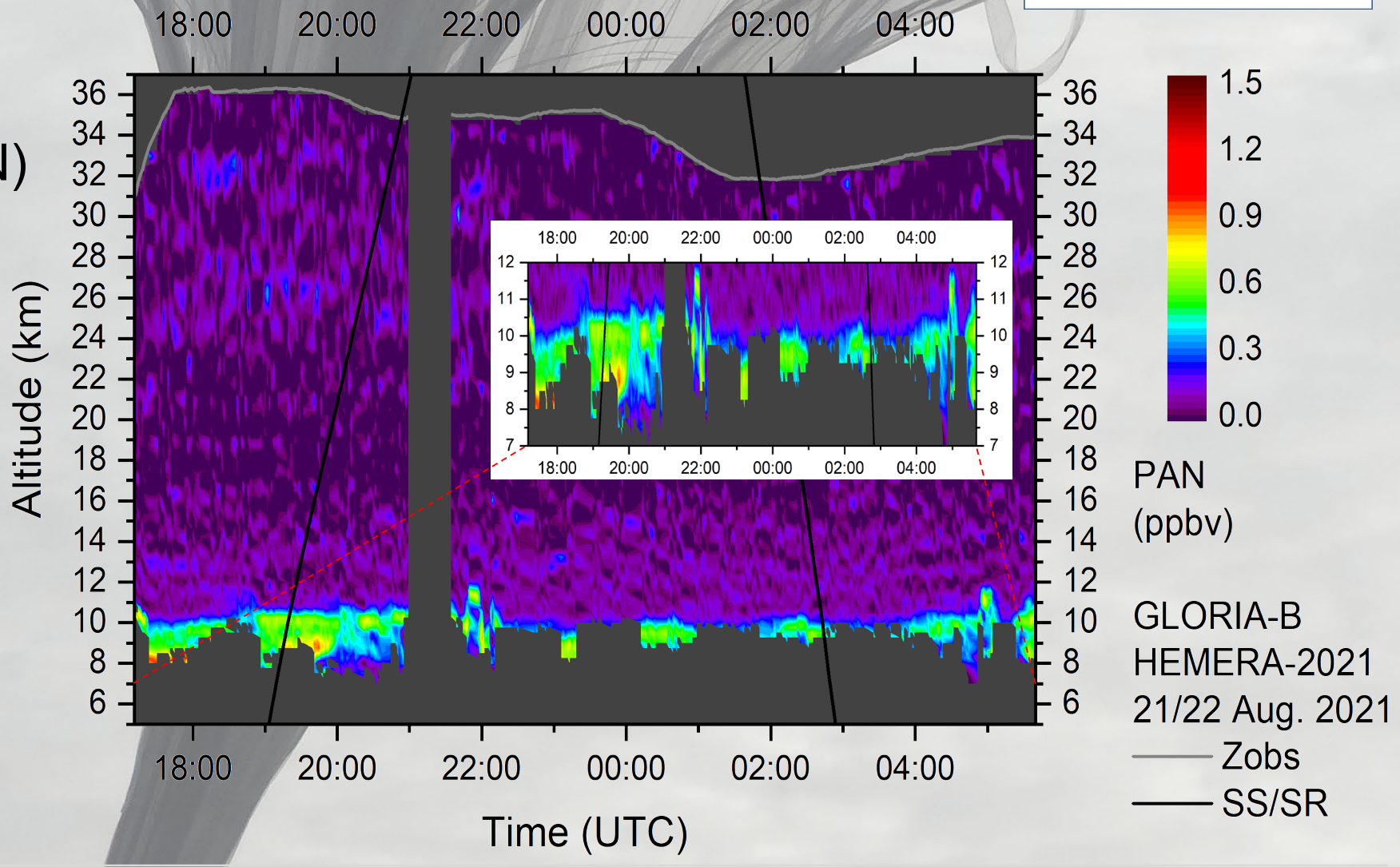


Bromine species ($BrONO_2$, preliminary)



Investigation of pollution in the upper troposphere and stratosphere

Pollutant species (e.g. PAN) from forest fires or export from the Asian monsoon



Summary

- Maiden flight of limb-emission FTIR imager GLORIA on a stratospheric balloon: HEMERA-2 flight during the KLIMAT campaign, Esrange/N-Sweden on 21/22 Aug 2021
- Very successful measurements
- Validation:
  - First comparisons with in-situ data of ozone sounding and AirCore
  - Further: HEMERA1&SuperCLIMAT flights (CH_4, SF_6, CFC's,...), Satellite MLS/Aura (O_3, N_2O, H_2O, …)
- Science:
  - Covering sun-set and sun-rise: photochemistry
  - Pollution in the UTLS
  - Dynamics, Age of Air
- Upcoming: Strato Science 2022 campaign, Timmins/Canada, Aug 2022
- ➢ Demonstrator for ESA's 11th Earth Explorer mission candidate CAIRT

Acknowledgements

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