MULTIPLY:
Development of a European HSRL airborne facility

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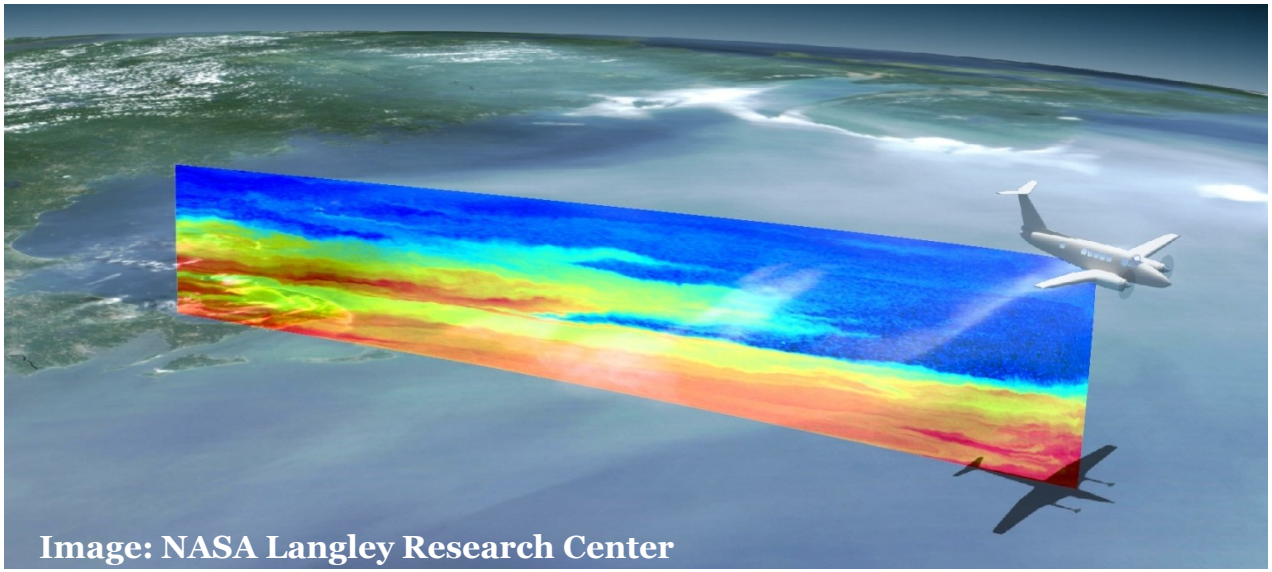
The MULTIPLY project in a nutshell

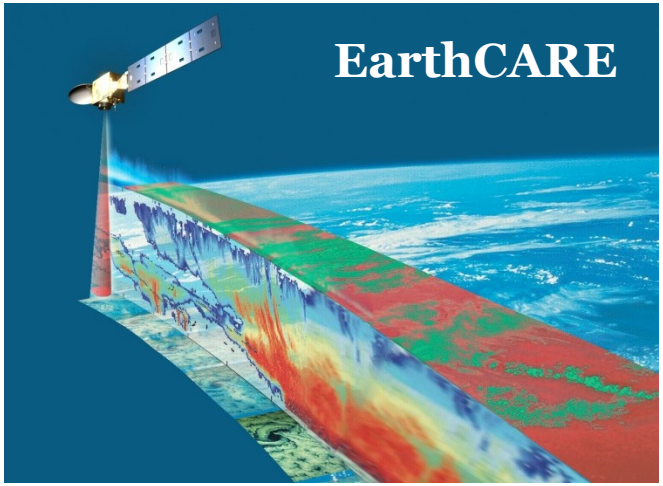
- An airborne High Spectral Resolution Lidar (HSRL).
- It will measure aerosol optical properties at 3 wavelengths (355, 532, 1064nm).
- Main product will be aerosol extinction, backscatter, and depolarization profiles.
- Developed by a consortium of institutes in:
  Romania, Germany, Poland, Greece, and Netherlands.



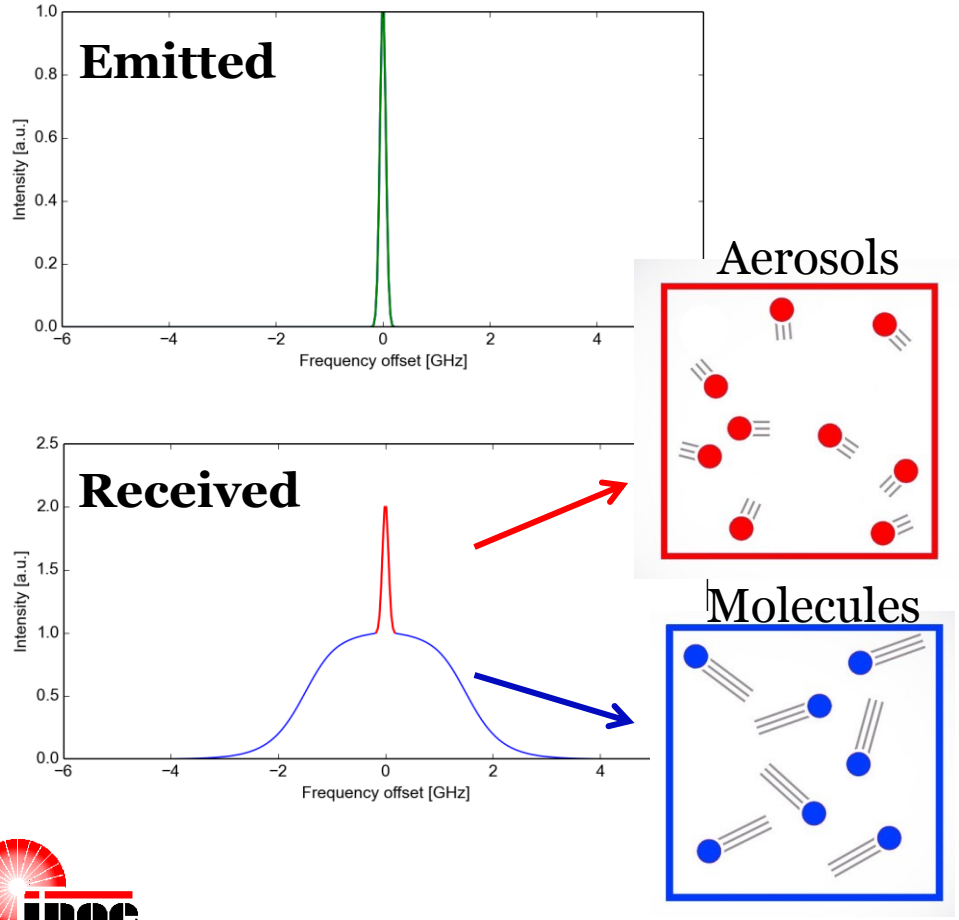
ESA aerosol missions

- ESA is planning a number for aerosol monitoring missions.
- ESA's active remote sensing missions: EarthCARE, ADM-Aeolus.
- Several Sentinels will also provide aerosols products.

There is a need for detailed validation of aerosol products, and evaluation of their uncertainties .



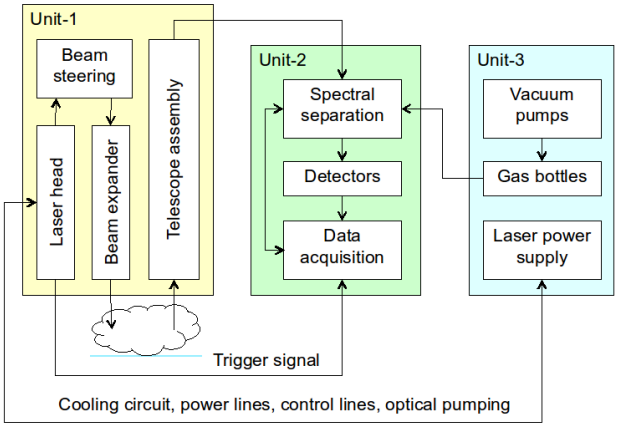
Why High Spectral Resolution?



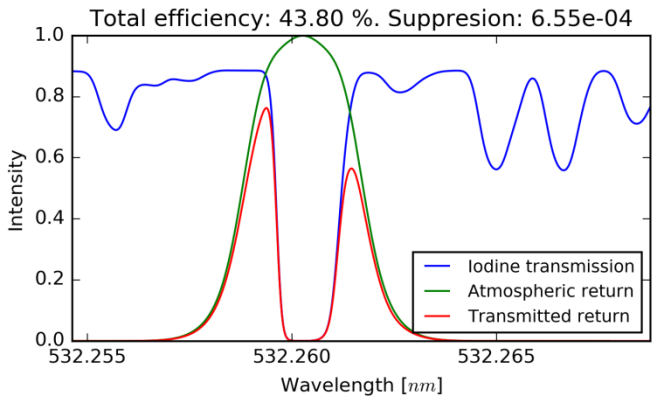
- Laser light is monochromatic.
- Light scattered in the atmosphere is broadened by the movement of aerosols and molecules.
- Aerosol move slower than molecules -> different spectrum.
- The difference is very small (~1pm) so we need high spectral resolution to detect this.
- If we do, we can separate aerosol and molecular scattering, and gain detailed information on aerosol properties.

How it works

System schematics



Iodine filter simulation

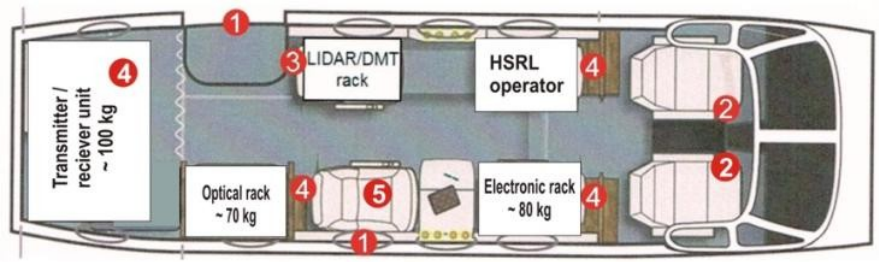


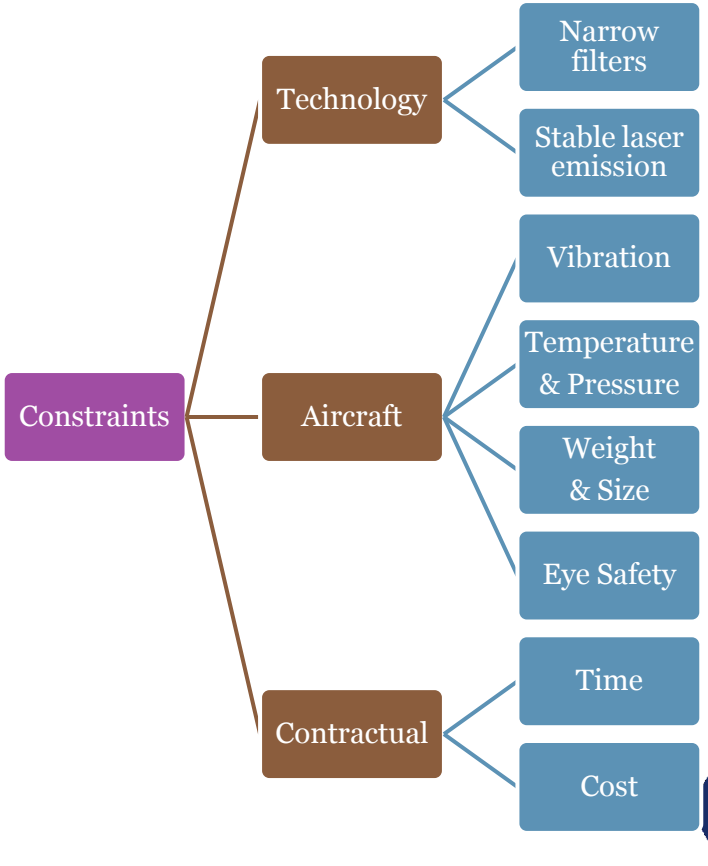
Simulation based on Forkey et al., Applied Optics, 1997, doi: 10.1364/AO.36.006729

- A laser beam is emitted in the atmosphere.
- Light is scattered on molecules and aerosols.
- A telescopes observes the light that is backscattered towards the system.
- 3 laser wavelengths are emitted and detected in the same time.
- High spectral separation is done with either Fabry-Perot interferometers (355, 1064nm) or Iodine filters (532nm).

Tight project constraints

- Multiply is a challenging project with many constraints.
- For its success, we need to push the state of the art in system design.





Project partners & Responsibilities

MULTIPLY project covers the complete design and development of the system, including hardware design, software development, and testing.

INOE, Romania
Coordination, Algorithm & Software, Procurements

Max Planck Institute for Meteorology, Germany
Hardware design and development

National Observatory of Athens, Greece
Instrument Simulations

University of Warsaw, Poland
Testing/Quality assurance

National Institute of Aerospace Research (INCAS), Romania
Aircraft requirements, validation

National Aerospace Laboratory, Netherlands
Aircraft requirements