EC-KLIM – Coordination of German EarthCARE Validation

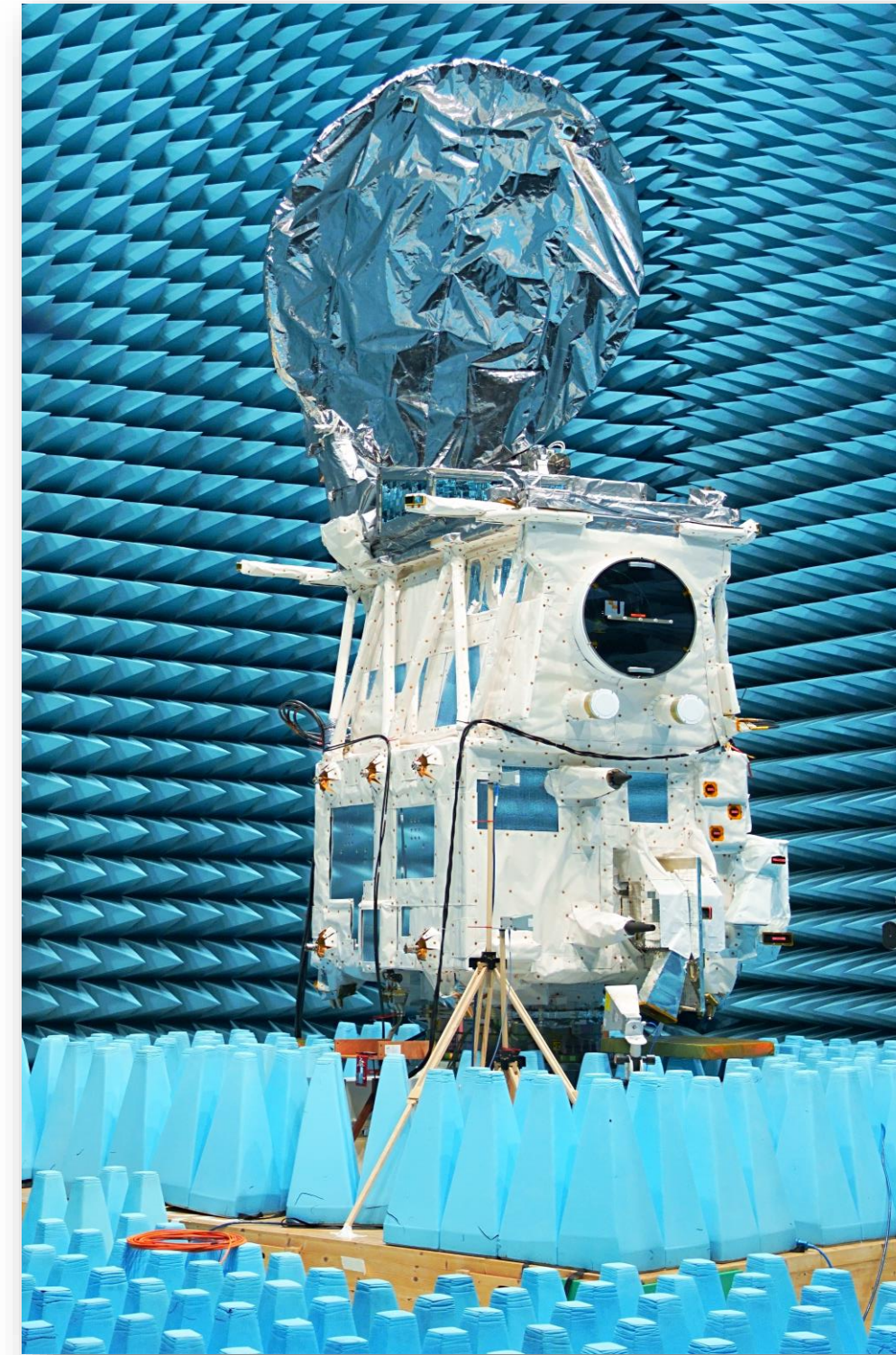**Sabrina Zechlau[1,2], Silke Groß[2], Ulla Wandinger[3], Holger Baars[3]**

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The German EC-KLIM Project

- The EarthCARE project office is part of the EC-KLIM project at LMU and is funded by German Aerospace Agency
- Aims:
  - Supporting German user community for using EarthCARE data products
  - Coordination and contact for scientific preparation
  - The work is closely connected to the ESA/JAXA EarthCARE Mission and international climate science programs
  - Work in collaboration with DLR German Space Agency
- Tasks:
  - Gap-Analysis (Identifying potential gaps in user requirements (incl. synergistic data products and mission products)
  - User concept (written for users to provide guidance for optimal use EarthCARE data)
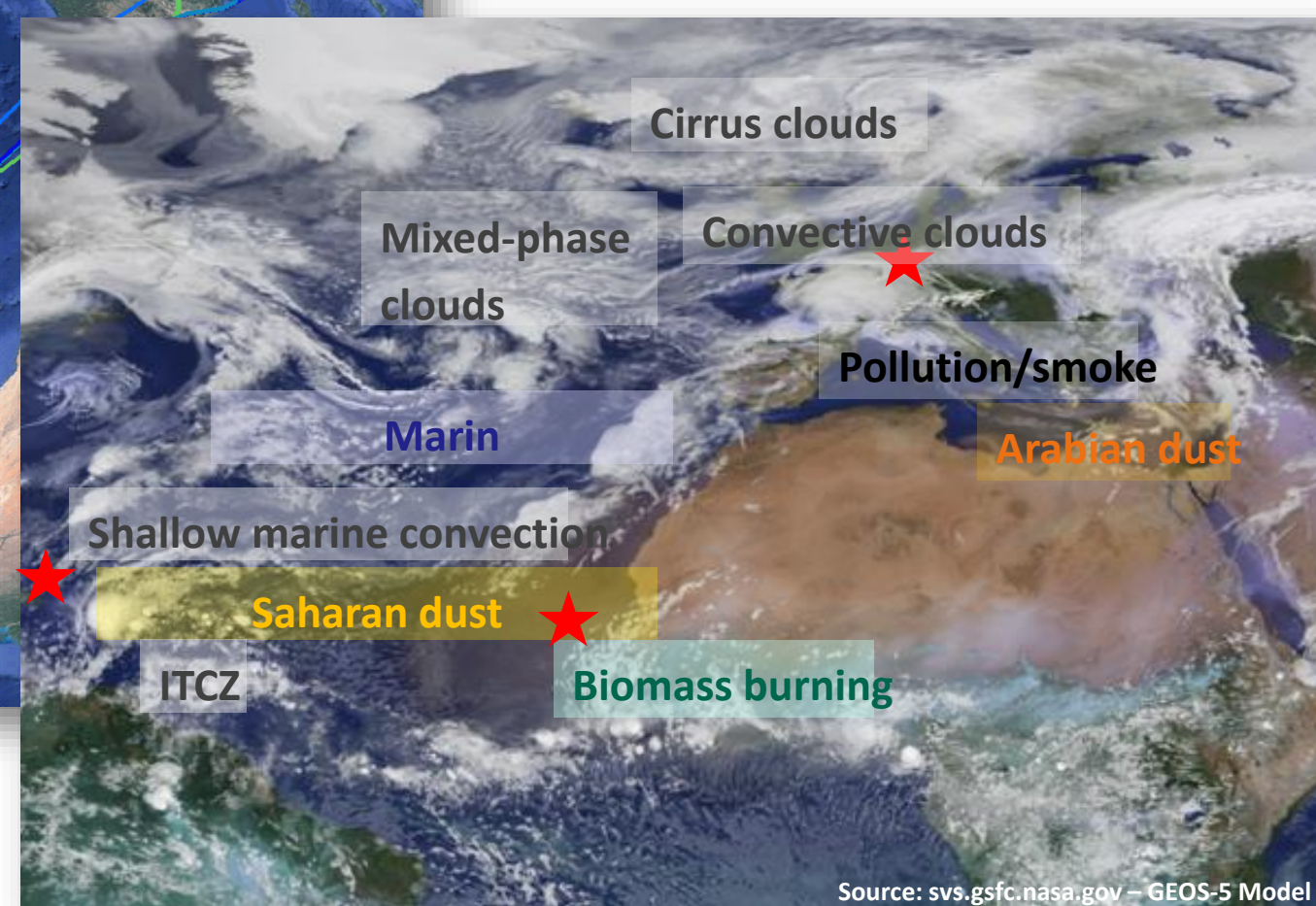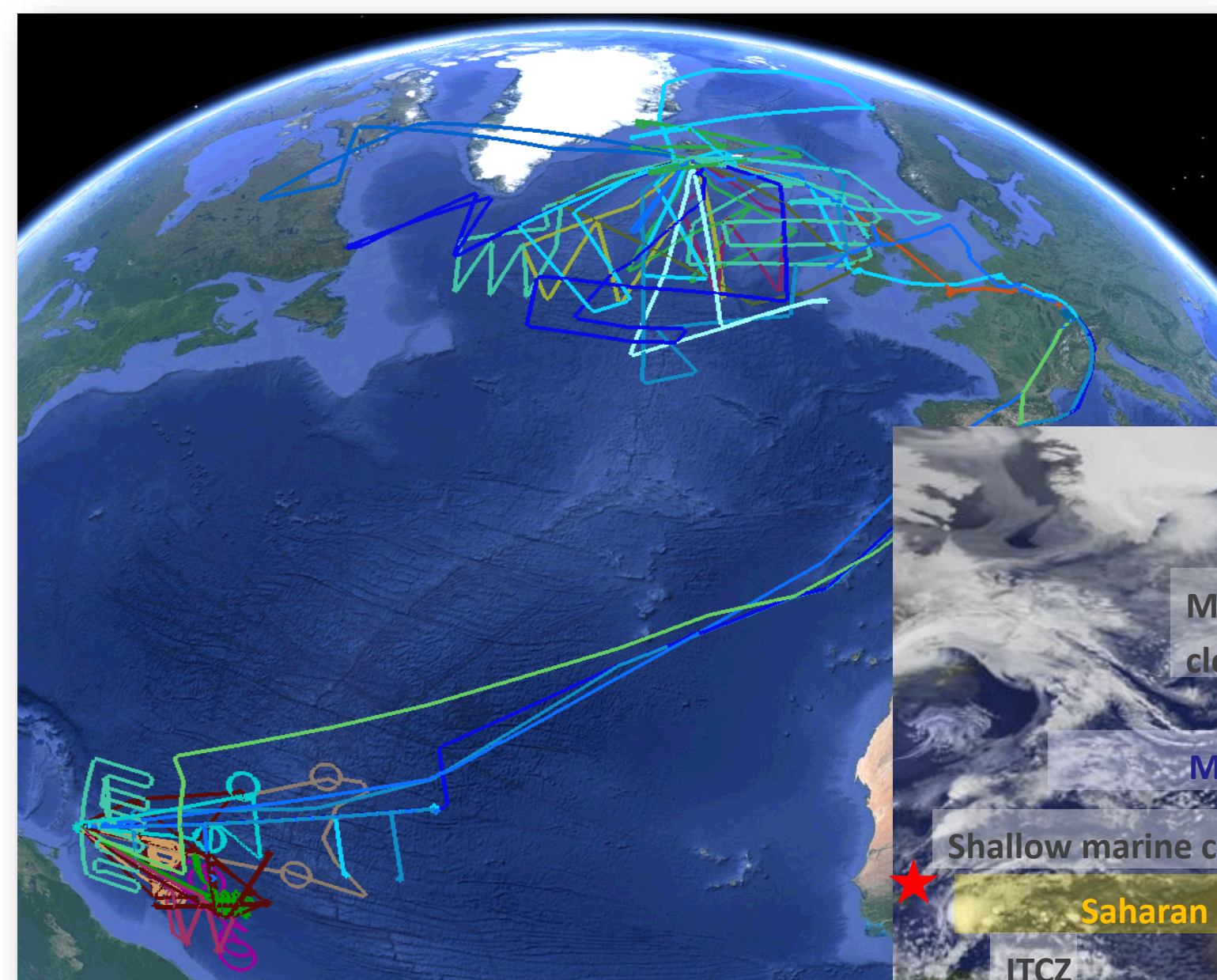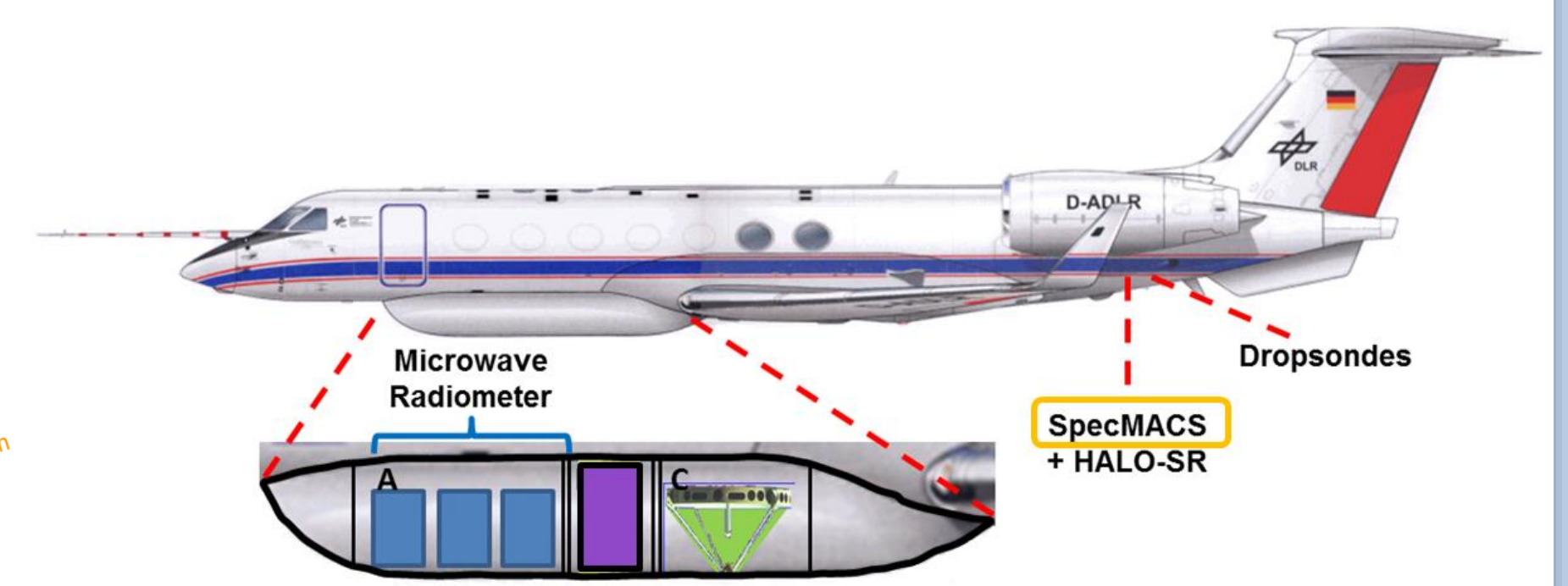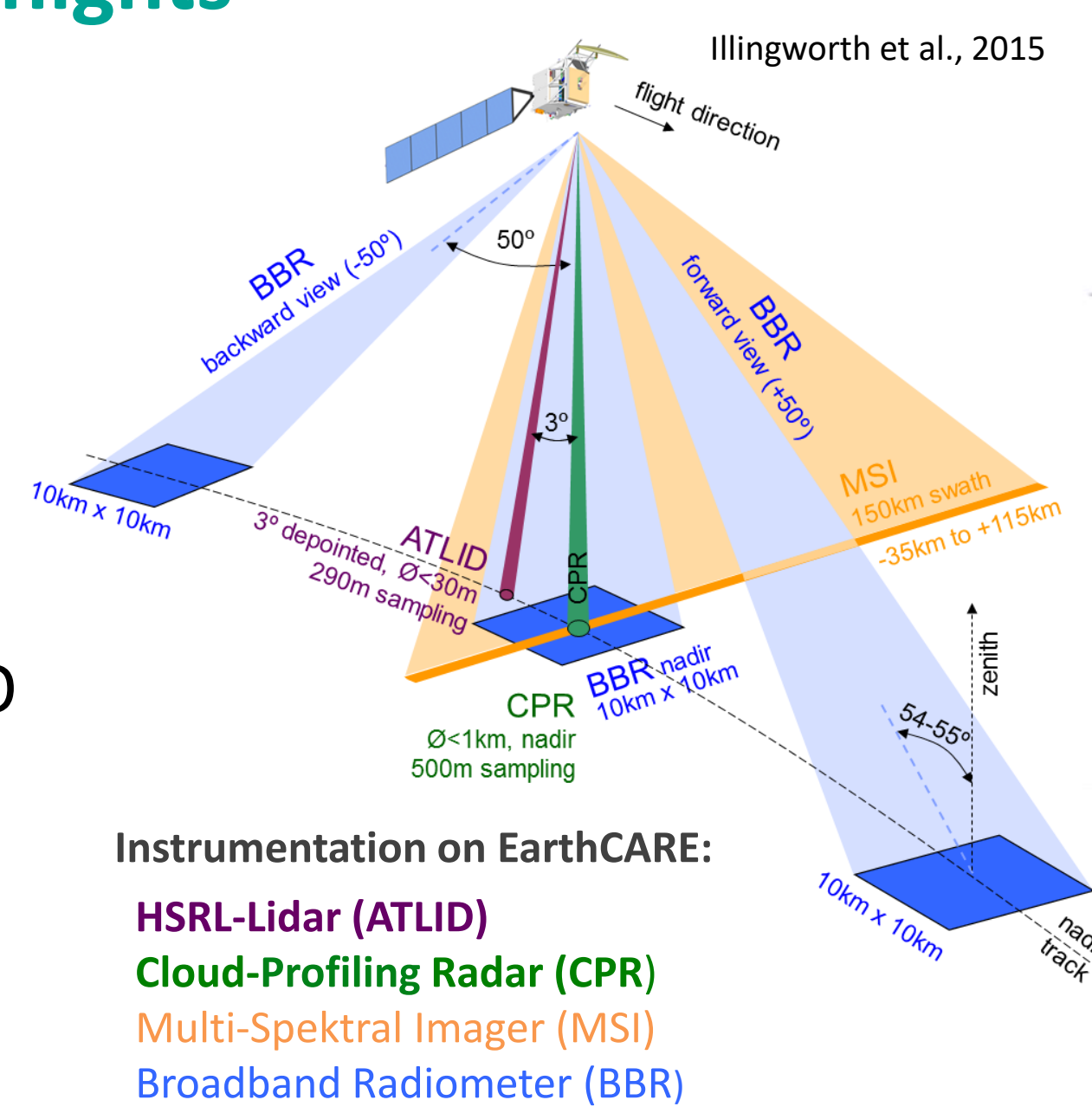 - Presentation of EarthCARE related topics and validation activities

https://earthcare-mission.de/
Visit our website or scan the QR-code.

Airborne Validation – 10-year experience of A-Train underflights

- **The challenge:** a seamless transition of Cal/Val between A-Train and EarthCARE
  - Influence of different resolution?
  - Influence of different wavelength?
  - Is the radiative closure working?

- Deploying an EarthCARE-like payload on German research aircraft HALO
- Validation with independent airborne observations

Illingworth et al., 2015

Instrumentation on EarthCARE:
HSRL-Lidar (ATLID)
Cloud-Profiling Radar (CPR)
Multi-Spektral Imager (MSI)
Broadband Radiometer (BBR)

Instrumentation on HALO:
HSRL-Lidar + DIAL (WALES)
Cloud-Profiling Radar (MIRA35)
Hyper-Spectral Imager (specMACS)
Microwave Radiometer (HAMP)

The airborne platform: HALO (High Altitude and LOng range) aircraft
- remote sensing payload, a unique asset
- G550, max. alt 16 km / max. range: 8000 km
- since 2012 in operation by DLR

Airborne campaigns with HALO (figure left):
- Tropical North Atlantic:
  - NARVAL-I: 10 – 20 Dec 2013 (dry season)
  - NARVAL-II: 8 – 29 Aug 2016 (wet season)
- Extra-tropical North Atlantic:
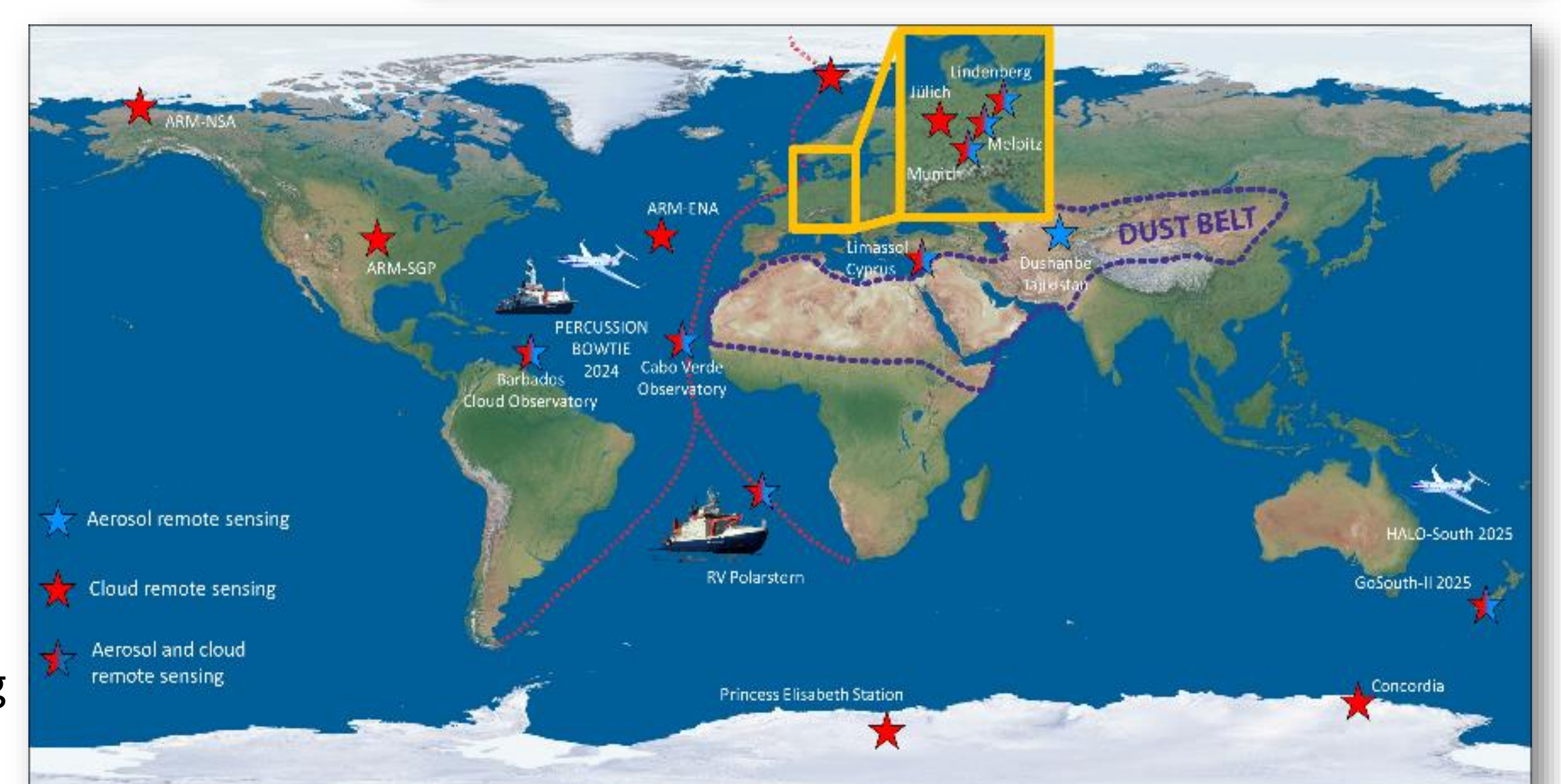 - NARVAL-I: 7 – 22 Jan 2014
  - NAWDEX: 15 Sep – 18 Oct 2016

After Launch EarthCARE Cal/Val Campaigns:
- PERCUSION (trop. North Atlantic; east/west): 12 Aug – 28 Sept 2024
- PERCUSION-EU (EarthCARE underpasses over Europe): Nov 2024
- HALO-South + GoSouth-II (Southern Ocean)

Cirrus clouds
Mixed-phase clouds
Convective clouds
Marin
Pollution/smoke
Shallow marine convection
Arabian dust
ITCZ
Saharan dust
Biomass burning
Source: svs.gsfc.nasa.gov – GEOS-5 Model

GIVE – German Initiative for the Validation of EarthCARE

- EarthCARE will provide over 40 data products
- Consortium of 10 German research institutes
- Holistic validation approach
- Start of project 01/2024 – support over mission lifetime
- Validation of L1 and L2 EarthCARE data
- Iincluding synergistic data products

Investigating aerosol-cloud-dynamics interaction with LACROS

atmospheric water content
aerosols
clouds
dynamics
radiation
precipitation

Disdrometer
Microwave Radiometer
Cloud Radar
Doppler lidar
+ solar radiation station
Polly[XT] Raman lidar
LACROS Leipzig Aerosol and Cloud Remote Observations System

ATLID

TROPOS - L1/L2 and synergistic ATLID-MSI; maintaining ground-based stations (LACROS, PollyNET)
DLR - HALO validation campaign with WALES
FZ Juelich - Inverse Modelling with 4D var data assimilation
MPI-M – partner of HALO validation campaign and contribution of ground-based data (BCO)

BBR

TROPOS - 3D field campaigns in 2026 with DWD-Lindenberg
University Leipzig - measuring radiation with Barcadi, SMART and VELOX on HALO

CPR

LMU – providing data from ACTRIS station, derived cloud + precipitation products
University of Cologne – forward simulations from ground data and providing ACTRIS station data
DWD - Lindenberg – providing CPR and Lidar data
University Hamburg – modelling IWC with neuronal networks
DLR - HALO validation campaign with MIRA35

MSI

TROPOS - validation of synergistic aerosol products
FU Berlin - aerosol validation and cross checks with forward modeling
DLR - HALO validation campaign with specMACS

Aerosol remote sensing
Cloud remote sensing
Aerosol and cloud remote sensing

ARM-NSA
ARM ENA
ARM-SGP
Cabo Verde Observatory
Barbados Cloud Observatory
PERCUSION BOWTIE 2024
RV Polarstern
Princess Elisabeth Station
Lindenberg
Mindelo
DUST BELT
Limassol
HALO-South 2025
GoSouth-II 2025
Concordia