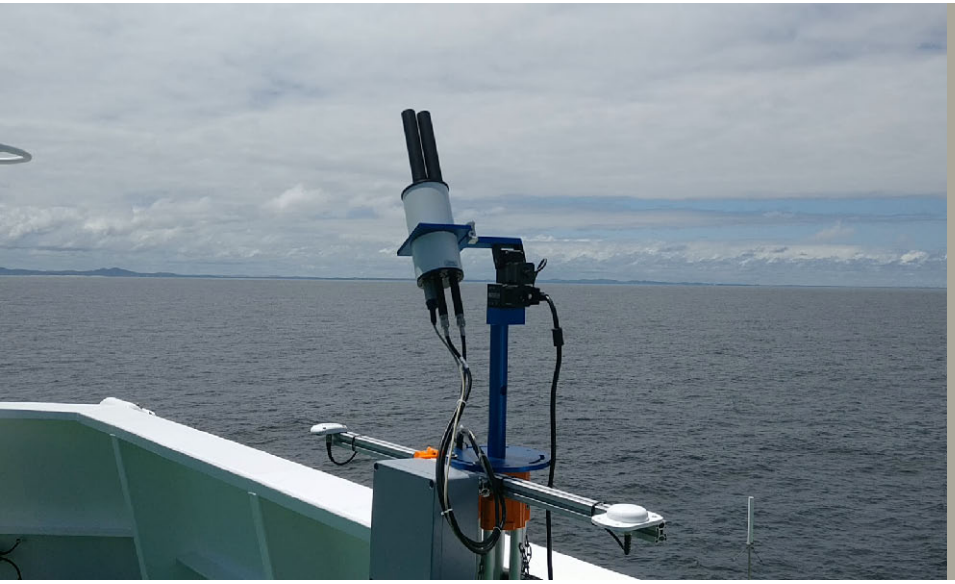


Contributions to Pandonia by six Pandora-2s at globally distributed sites

Jürgen Fischer

IDEAS + Cal/Val Workshop 2017

Lille, 6. – 7. April 2017

esa
European Space Agency

Pantonia Sites

Barbados (MPI Meteorologie, June 2016**)**	**Stefan Kinne**
Palau (AWI-Potsdam, August 2016**)**	**Markus Rex**
Summit/Greenland (UoW, January 2017**)**	**Ralf Bennartz**
Namibia (KIT, April 2017?)	Folke Oelsen
Lindenberg (DWD, March 2017**)**	**Lionel Doppler**
Campaigns (FUB, October 2016**)**	**Thomas Ruhtz**

Pantonia Sites

Pantonia Sites - challenges

Barbados (MPI):	harsh environmental conditions, sea spray, wind, rain
Palau (AWI-Potsdam):	Tropical conditions, very humid, rain
Summit/Greenland (UoW):	harsh environmental conditions, freezing temperatures, snow/ice, strong winds
Namibia (KIT):	dust, salt, dew
Lindenberg (DWD):	unproblematic operation due to constant maintenance
Campaigns (FUB):	harsh environmental conditions, moving plattform

Campaigns (FUB) Thomas Ruhtz, Ulrich Küster

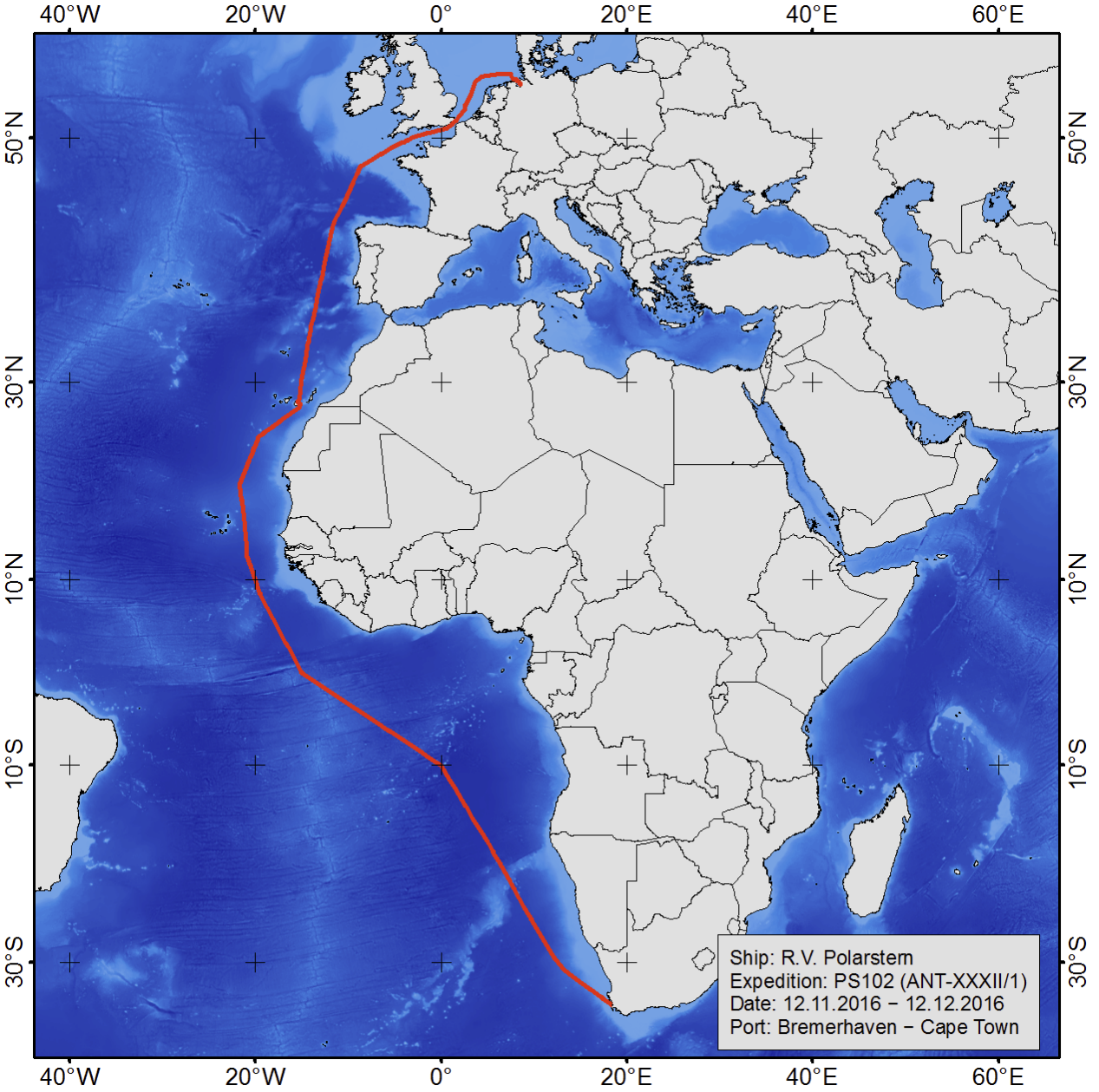
Polarstern (12. November to 12. December 2016)

Maria Merian (04.02. to 16.02.2017)

Polarstern (20. May to 20. July 2017)

Challenges: moving ships, integration of inertial system

Campaigns (FUB): Polarstern (12.11. to 12.12.2016)



Campaigns (FUB): Polarstern (12.11. to 12.12.2016)

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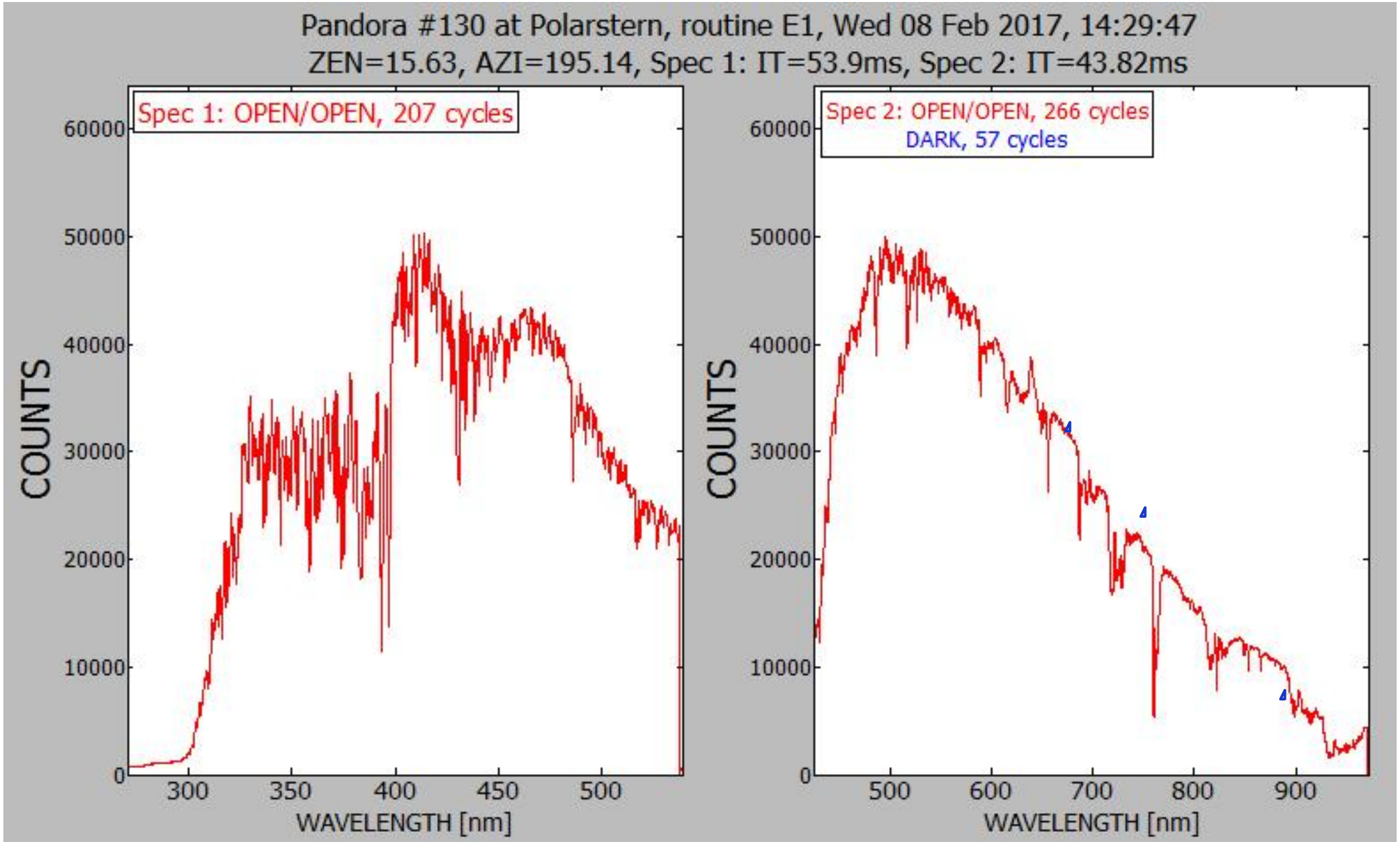
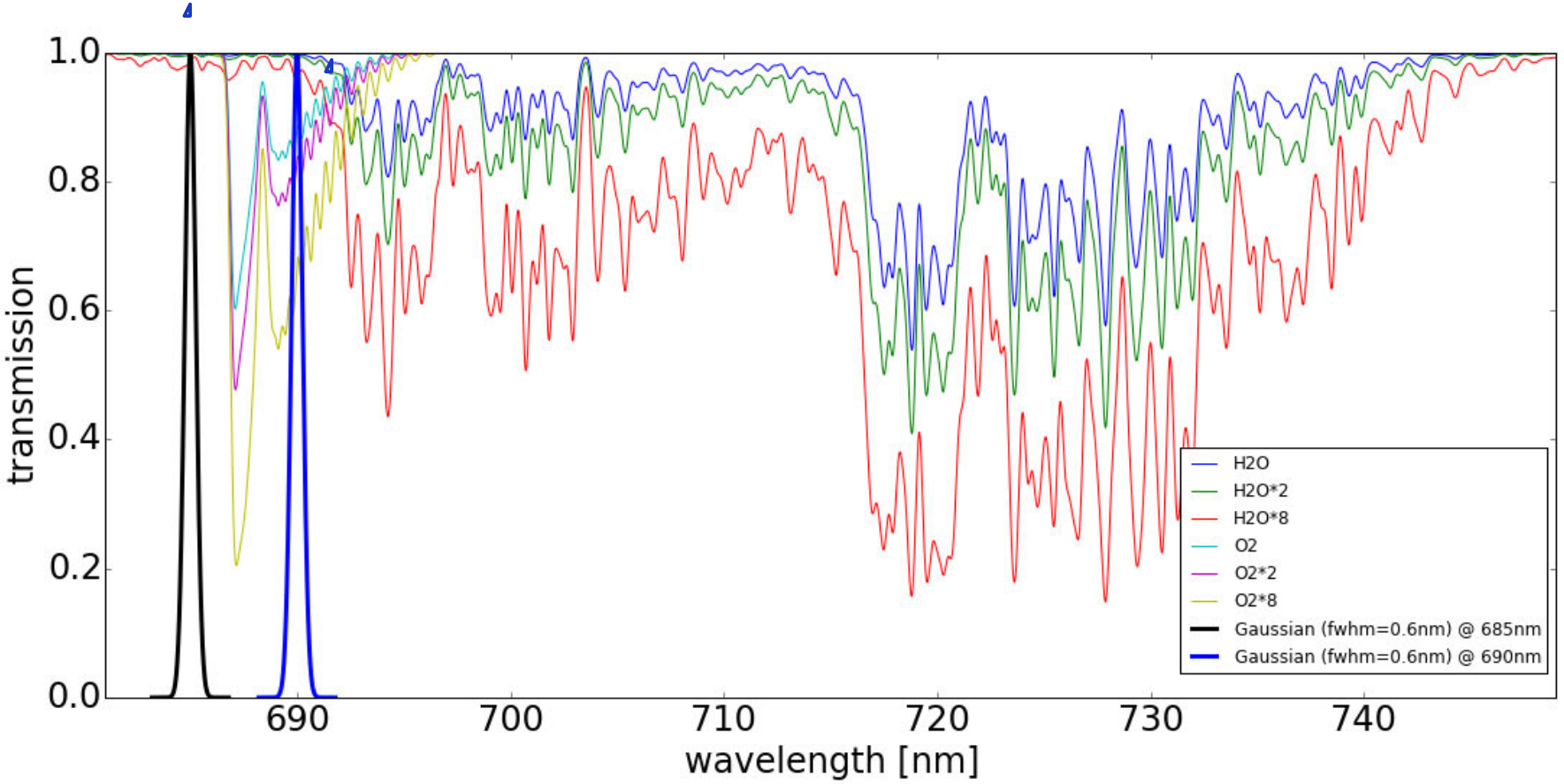
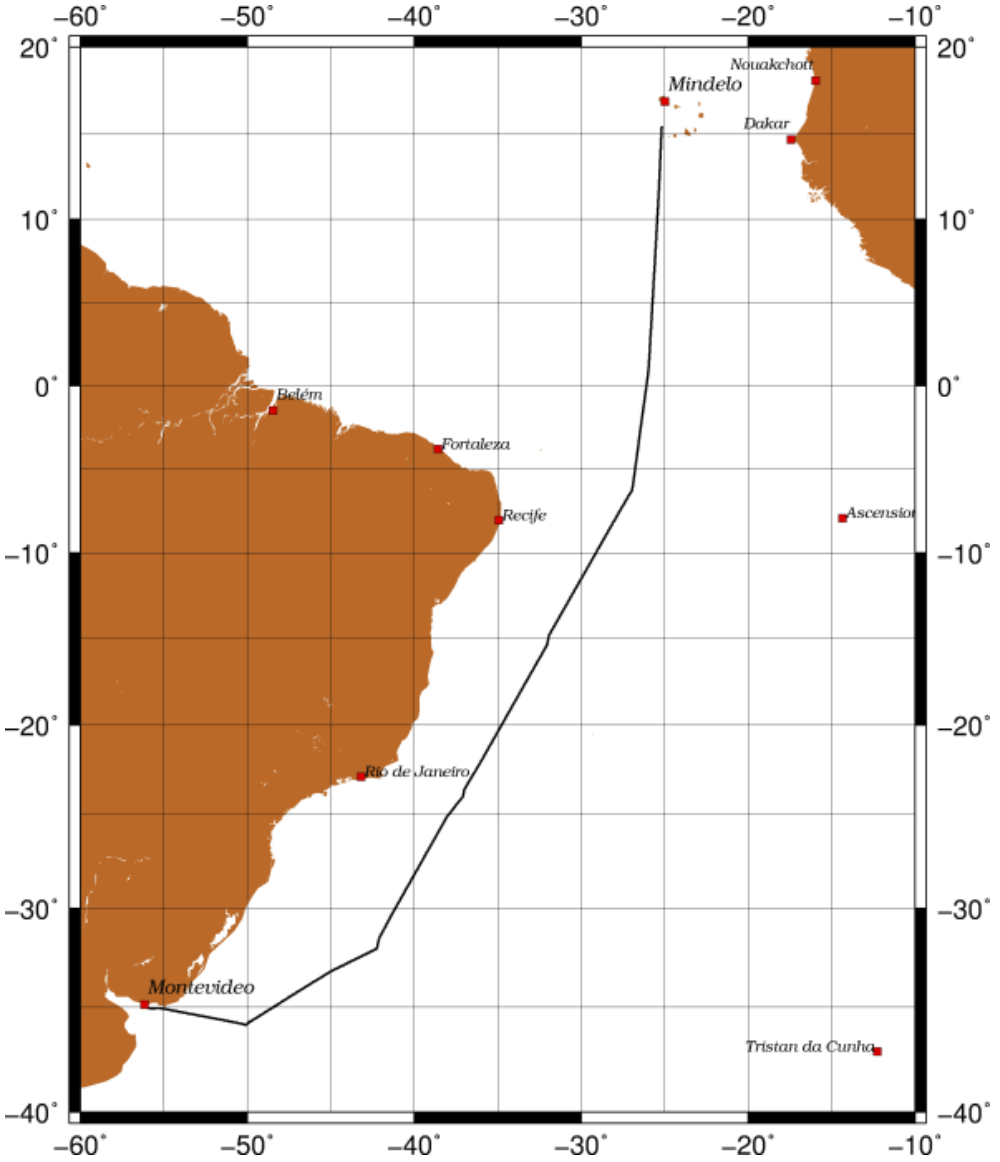


Water vapour retrieval (FUB) atmospheric transmission

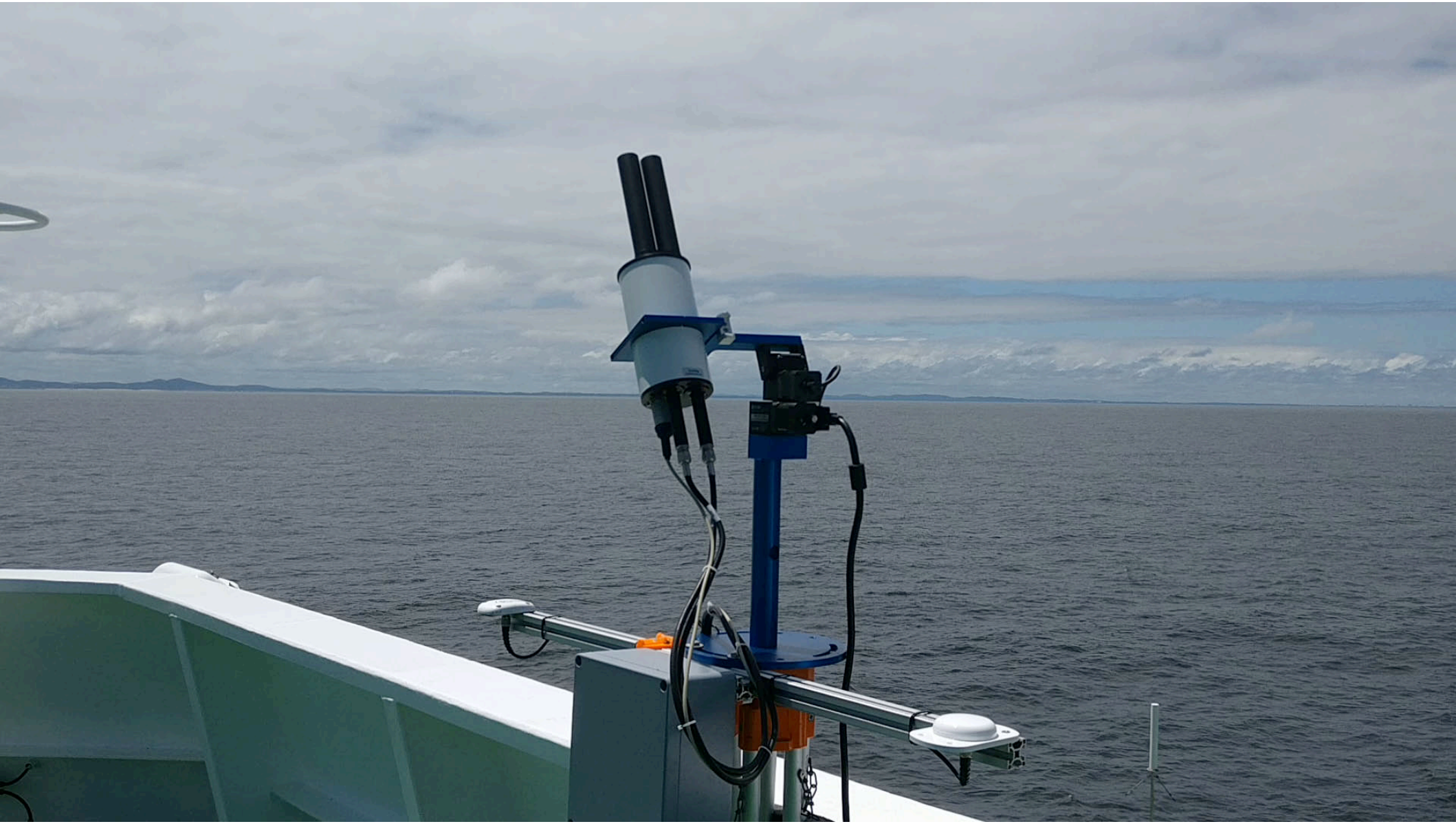


Campaigns (FUB): Maria S. Merian (04.02. to 16.02.2016)

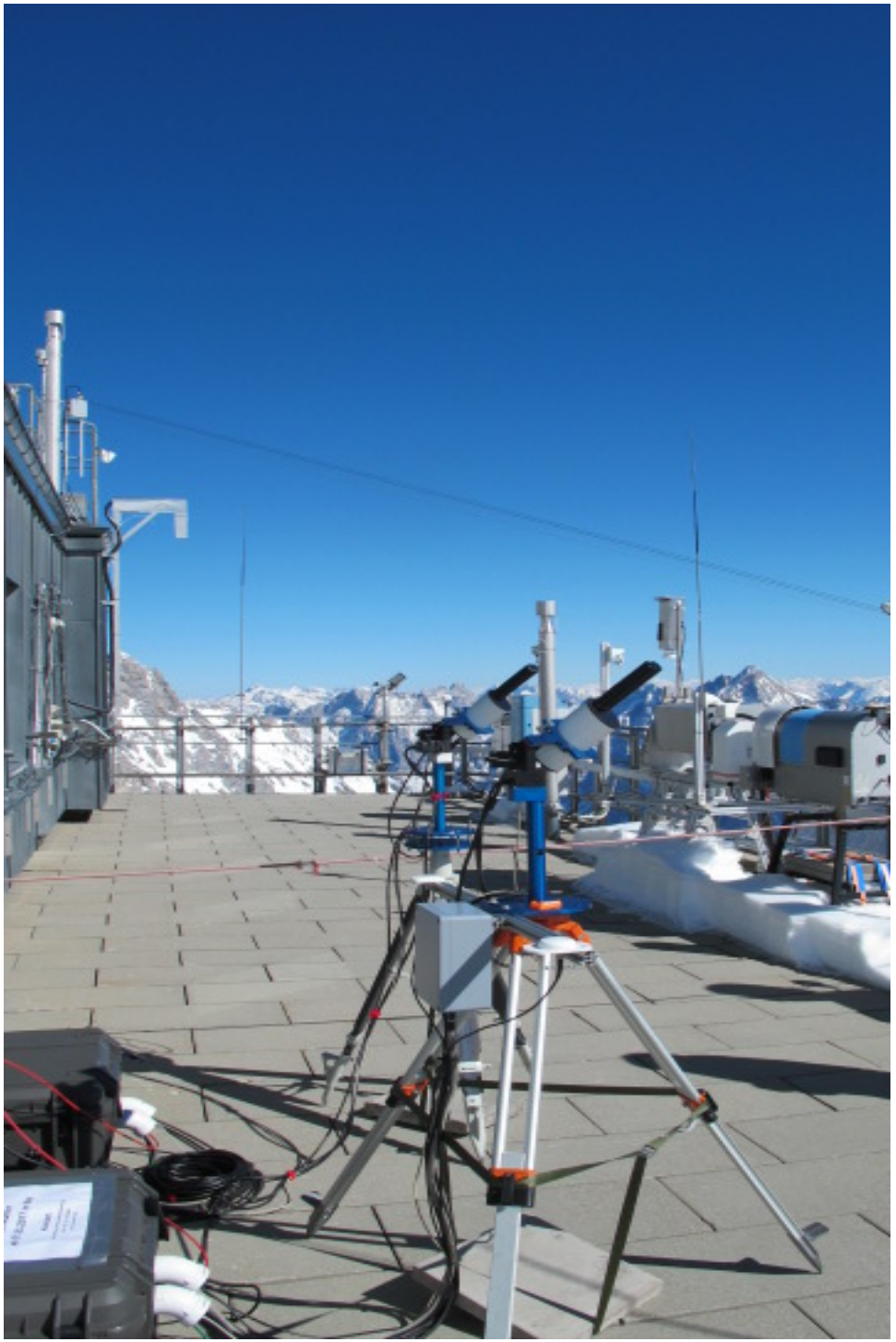


Track of RV Maria S. Merian, cruise MSM60-2

Pandora Head-sensor motor steering



Campaigns (FUB)



Research station Schneeferner-Haus (Zugspitze), 27. March 2017.

Barbados (MPI) PI: Stefan Kinne, Bjorn Stevens

Barbados (MPI)

Barbados (MPI)

The instruments currently installed at our cloud observatory, include:

1 - Weather sensor
2 - Raman LIDAR
3 - DIAL (decommissioned)

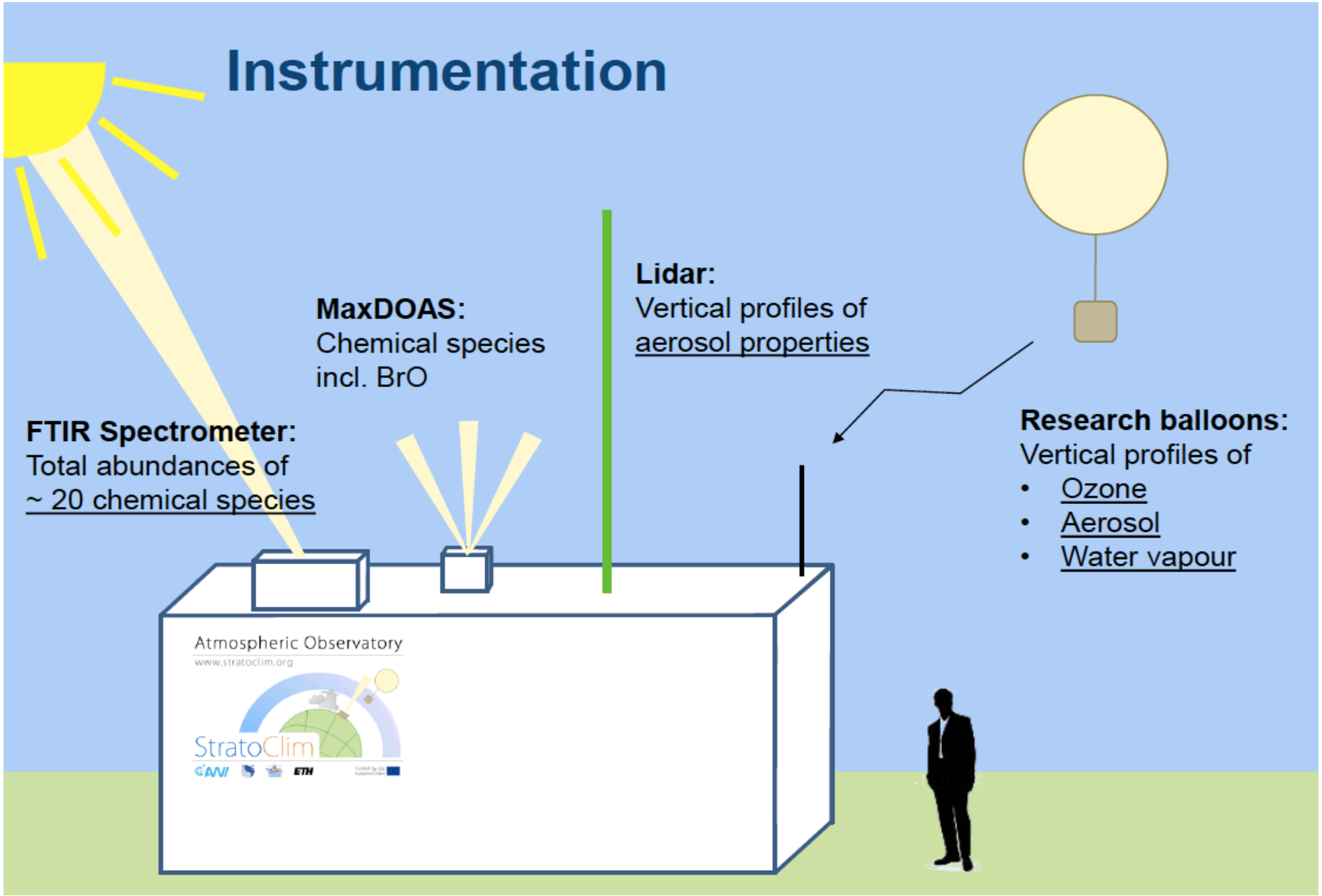
4 - K-Band cloud radarCloud radar
5 - Micro Rain Radar
6 - Ceilometer
7 - All-sky imager

Palau (AWI) PI: Pr. Markus Rex, Katrin Müller

Key messages:

- Ozone below the detection limit of ECC ozonesondes suggests a pronounced minimum of OH throughout the troposphere over the tropical West Pacific.
- Such a “hole” in the tropospheric OH shield causes lifetimes of key tropospheric species to be substantially longer over the tropical West Pacific than in other parts of the tropics.
- This region of the globe may therefore provide a more efficient pathway for shorter lived biogenic species and for SO2 to reach the stratosphere than currently thought.
- More detailed and longer-term measurements of atmospheric composition are needed in this region.

Palau (AWI)


Instrumentation
MaxDOAS:
Chemical species
incl. BrO
Lidar:
Vertical profiles of
aerosol properties
FTIR Spectrometer:
Total abundances of
~ 20 chemical species
Research balloons:
Vertical profiles of
• Ozone
• Aerosol
• Water vapour
Atmospheric Observatory
www.stratoclim.org
StratoClim
AWI
ETH

Palau (AWI) climate research base

- Location is ideal to study the role of stratospheric composition changes in climate change

- 2-3 years of initial operation during 2014 – 2018, long term operation planned

- Suite of world-leading instruments to observe climate / chemistry interactions:
  - Fourier Transform Infrared Spectrometer for e.g.:
    - O_3, CO, C_2H_2, C_2H_6, CH_2O, HCN, COS, NO, NO_2
    - profiles (~3-5 independent layers), tropospheric & total columns
  - Ozonesondes (ECC)
  - New UV-diode ozone spectrometer sondes for better detection limit
  - Water vapour sondes (CFH)
  - Backscatter sondes (COBALD)
  - Multi-wavelength aerosol & cloud lidar (ComCAL)
  - Continuous cloud lidar
  - GPS receiver for highly accurate vertical temperature profiling

Greenland/Summit (UoW) Ralf Bennartz, John Rausch

Greenland/Summit (UoW) Suite of Instruments

- MMCR- 35-GHz millimeter-wave cloud radar
- PAERI- Polar Atmospheric Emitted Radiance Interferometer
- 2 water vapor line and 60-GHz oxygen absorption line and 90, 150 GHz
- Radiosondes – 2 per day, 1 GPS
- Ceilometer and Micropulse Lidar- identify cloud base
- POSS - Precipitation Occurrence Sensor System
- SODAR – boundary layer depth
- Hotplate
- Multi-Angle Snowflake Camera

Namibia (KIT) Gobabeb site PI: Jan Cermak,

Atmospheric Science & Meteorology ASM

Long term and operational meteorology

- First order weather station since **1962** - more than 50 years climate record
- Automatic synoptic station operated by NMS
- **Over 50 years** of meteorological / fog observations of varying extent

ASM

1. air sampling for CO2 data, **1997**, NOAA (USA)
2. Validation stations for operational satellite data **2007**, KIT (GER)
3. Micrometeorology and energy balance since **2009**, Univ. of Basel (CH)
4. CO2 related trace gas measurements since **2011**, Max Planck Inst Jena (GER)
5. Broadband radiance data, BSRN network, **2012**, Univ. of Basel & KIT
6. Deep Sand Sea met. Station, **2012**, Royal Geog. Soc. (GB)
7. 8 met. stations incl. fog catcher (FogNet), **2014**, Gobabeb (NAM), BMBF.
8. H2O Isotope analysis based on FogNet, Univ. Indianapolis (USA)
9. Upgrade of Gobabeb MET station **2014**.
10. VIS & NIR spectral data, RadCalNet, **2015**, NPL (GB), ESA/CNES
11. AERONET-Station.
12. Trace gases with VIS-NIR (EM27) spectrometer in occultation, IMK-ASF
13. International radiometer comparison within EarthTemp - project

Lindenberg (DWD) PI: Lionel Doppler

DWD/MOL-RAO Research Groups

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

➔ **4 research groups: "Sachgebiete"**

MOL1
Remote Sensing

→ **Active remote sensing (aerosol, clouds, wind, precipitation, WV):** Cloud radars, Lidars, Ceilometers, Doppler Lidars, Raman Lidar RAMSES…
Passive remote sensing (T, WV Prof): Microwave Rad

MOL2
Boundary Layer

→ **Study of Boundary-Layer processes (Temperature, humidity, pressure, dynamic):** Messfeld Falkenberg, 100 m and 50 m tower, Scintillometers, Doppler Lidar, flux and turbulence sensors

MOL3
In-Situ Sounding

→ **Observation of the atmosphere, radiosounding, aerology (Temperature, humidity, pressure, ozone, aerosol):** 4 balloons/day, 1 ozone/week, Research sound / 2 weeks. GRUAN Lead Center, Wetterwarte

MOL4
Radiation processes

→ **Large Band Radiation:** Pyr-ano/helio/geo-meters
Spectroscopy in UV/VIS/near IR
Optic passive Remote sensing: Day&Night photometry
All-Sky Observation and clouds' caracterisation

Problems

- For the mobile Pandora a new Sun alignment has to be performed after each re-start of the instrument, since the connection of corrected Tracker and INS leads to wrong offset angles

- Temperature in the Pandora box becomes very high under solar irradiance (e.g. PC cooling element could not be toughed during measurement at Maria S. Merian)

- Moisture in the Pandora box

Problems

- Incomplete software installation
  - Incorrect configuration files
  - Missing instrument calibration files
  - Blick-P binary missing
  - SciGlob has been very helpful in resolving these issues, although, response time has been often slow.

Recommendations - FUB

- Backup of „Blick folder“ (data, configs, logs), per ftp
- Main log-file which automatically opens and where the operator register all changes (e.g. Pandora at Palau, …)
- External hard-disk within the Pandora box for an additional backup of the entire system
- Access to L0 and L1 data of all instruments
- Information on L0 -> L1 processor (including calibration files)
- Use of scripts instead of Windows software
- New tracker motor, with a resting position pointing to the ground (to avoid rain and dust in the lens tube)
- Rain drainage within the lens tube
- Active sun-tracking, via solar-camera (available for Arctic PS106 cruise?)

Recommendations - UoW / Vanderbilt

- Simple routine to generate L0 & L1 data upon delivery to confirm operation and configuration
- Documentation of BlickP would be helpful
- Increase RAM to a minimum of 4GB
  - 2GB is sufficient for Blick alone
  - antivirus and OS overhead significantly depletes available physical memory occasionally while Blick is running
  - response time has been often slow.