IARA - GoAmazon 2014

Activities related to Aerosol, Cloud, Precipitation, and Radiation Interactions and Dynamics of Convective Cloud Systems (ACRIDICON)

and CHUVA Project

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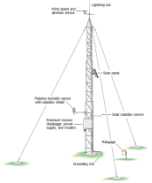
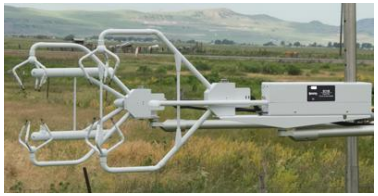
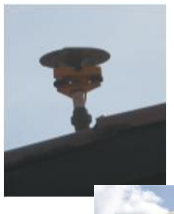
CHUVA Instrumentation in GoAmazon 2014.
Multi Instrument Container and Networks

SELEX METEOR 50DX
X-Band DUAL POLAION RADAR







CHUVA Instrumentation in GoAmazon

1) The radar X Band Dual POL probably SIPAM.

2) The MP3000, Joss Disdrometer and Raingauge at the Embrapa

3The MRR, Parsivel Disdrometer, Raingauge and Surface Flux Station in the T2 at Iranduba

4) The LMA network (It depends from Rachel Project)

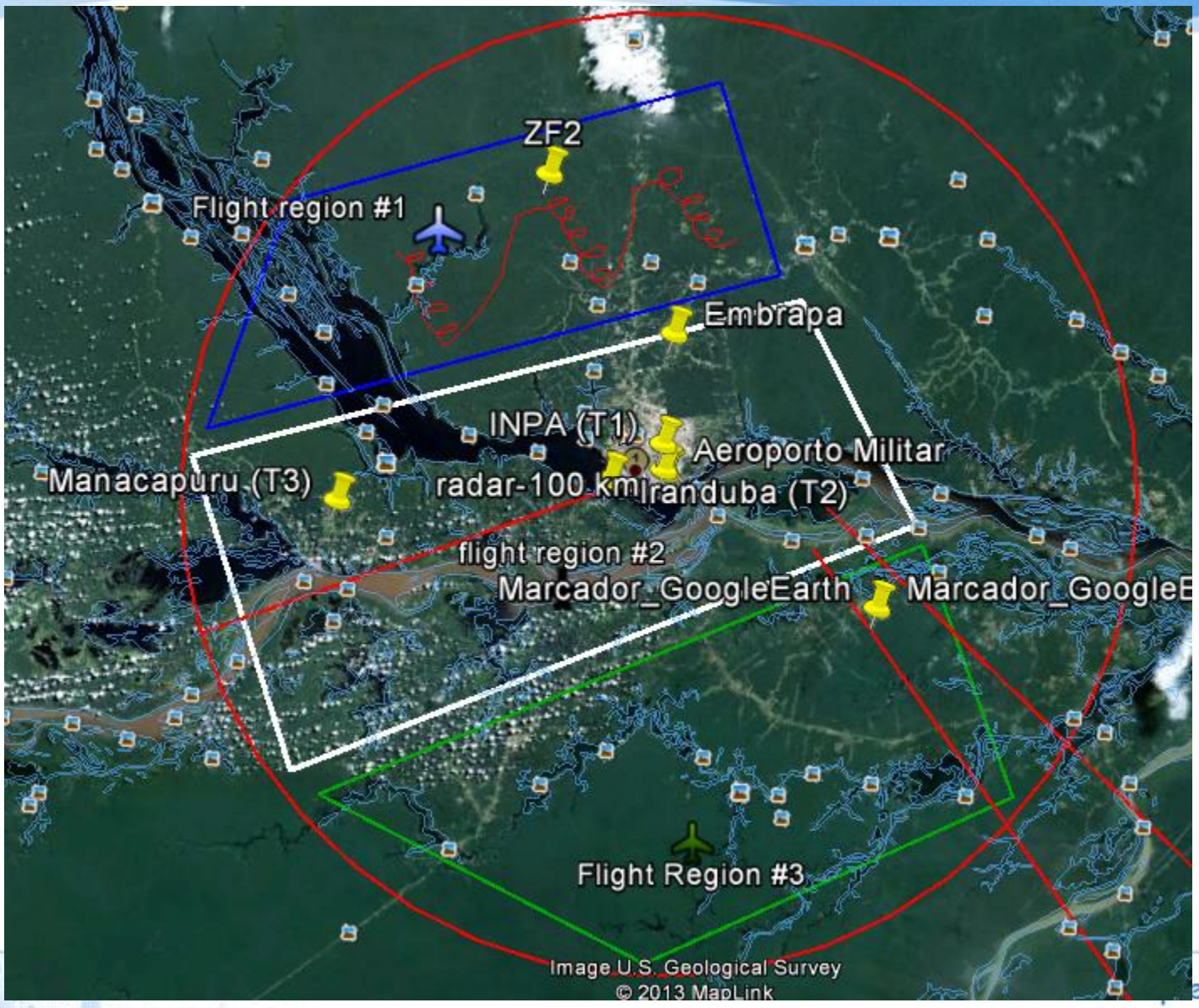
5) The GPS network additionally with David Adams effort.

6) Radiossonde at Air Force Base and ZF2

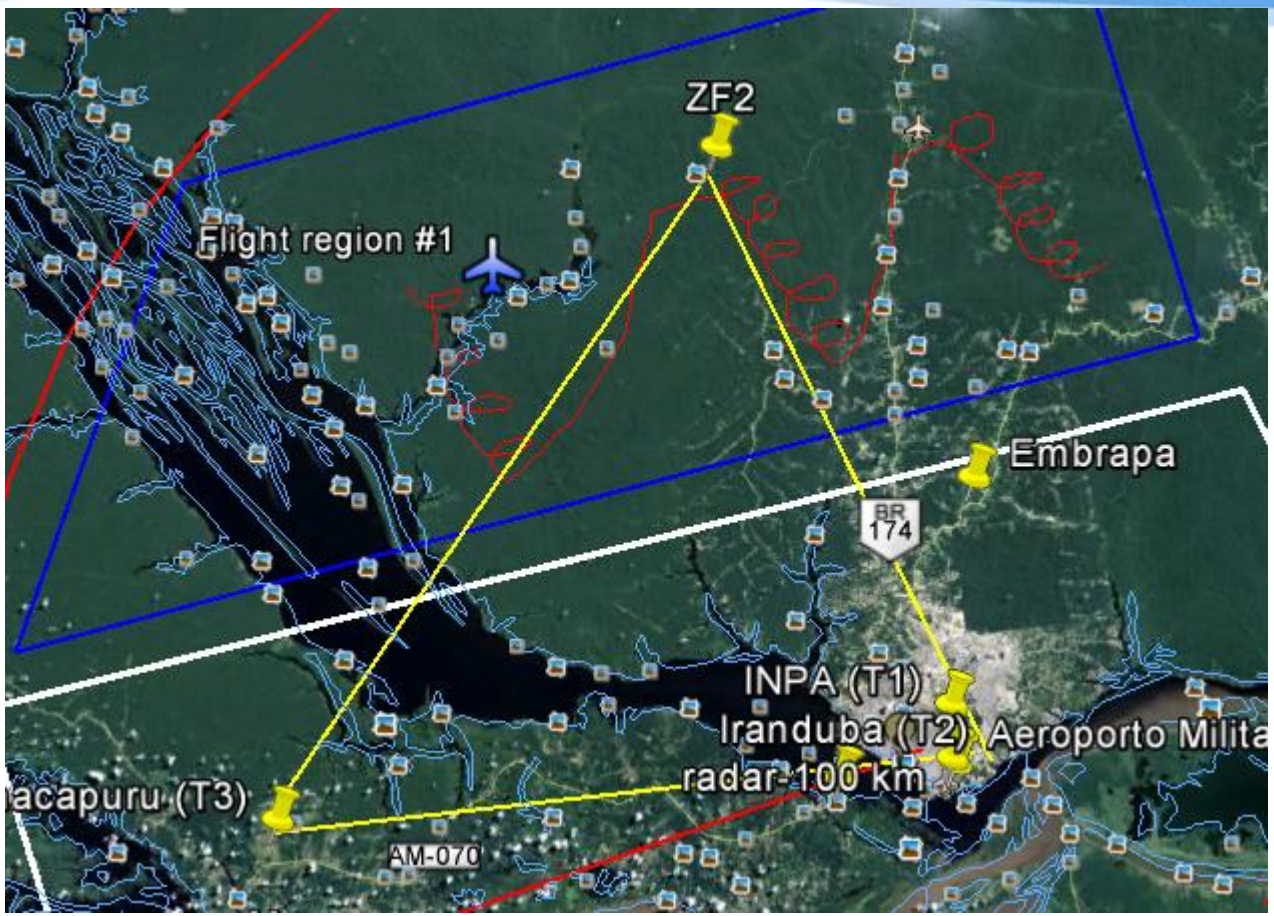
7) Parsivel disdrometer, Raingauge and MRR in UEA.

- Trainning Course
-SOS- GoAmazon - Manaus.
- Data Compiled (including Manaus SIPAM S- Band)
:

Proposal Locations

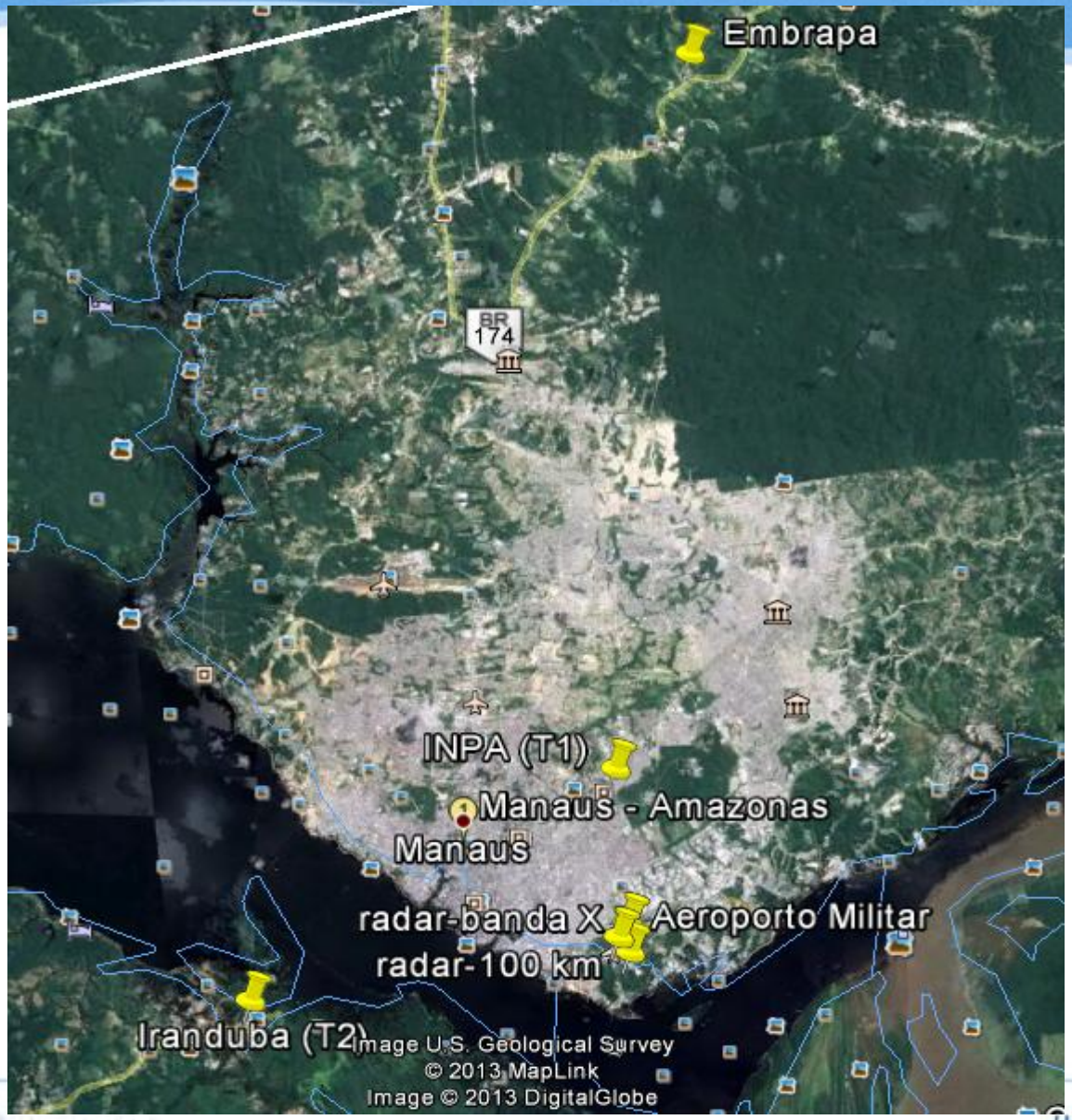


Radiossonde

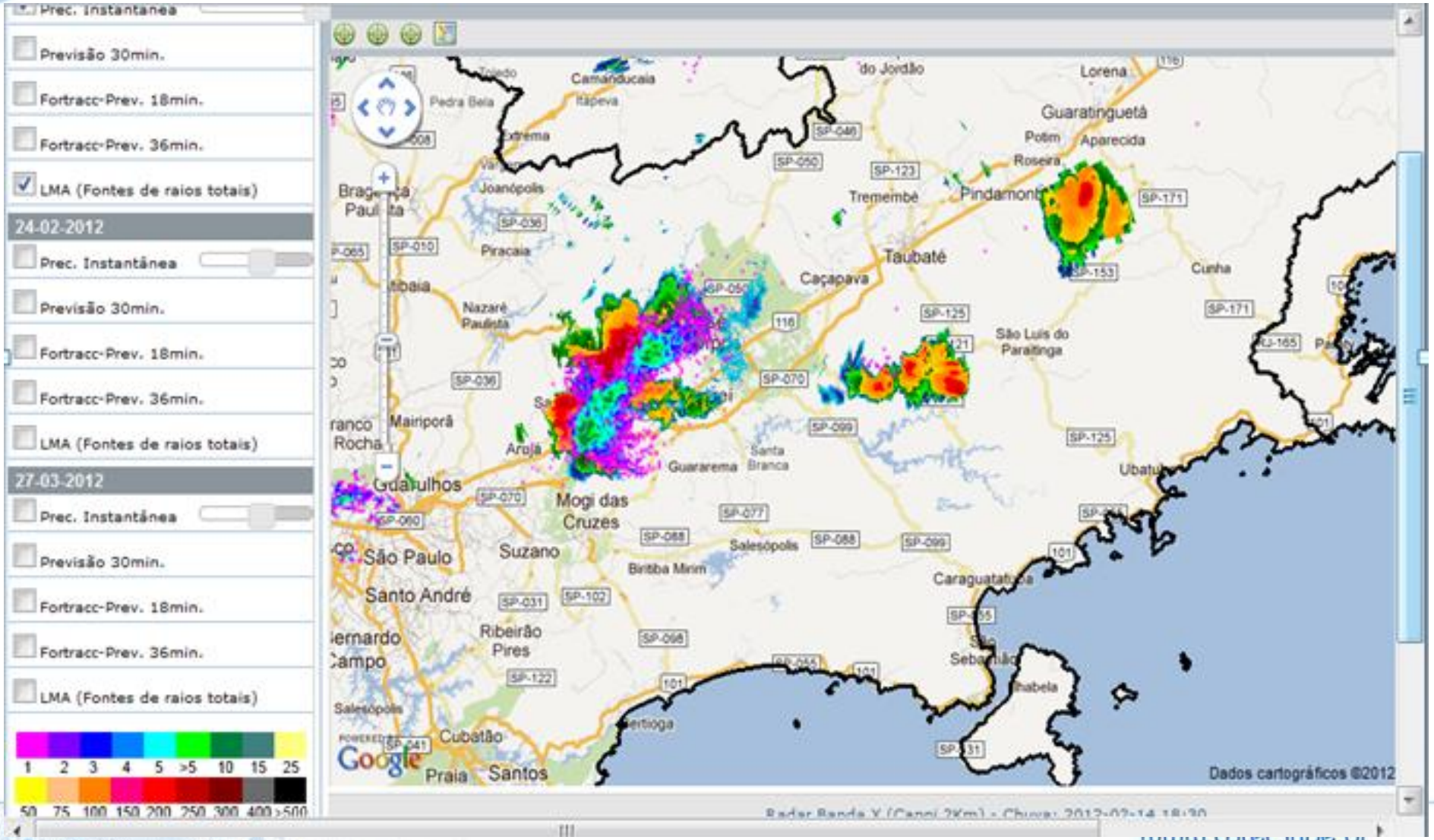


CHUVA 200 Radiosonde + 100 Interactions between urban and forest emissions in Manaus, Amazo
150 wet and 150 dry to wet IOP – 25 days 4 sondes/day

Others Instruments



The SOS – real time data for mission planning and operation

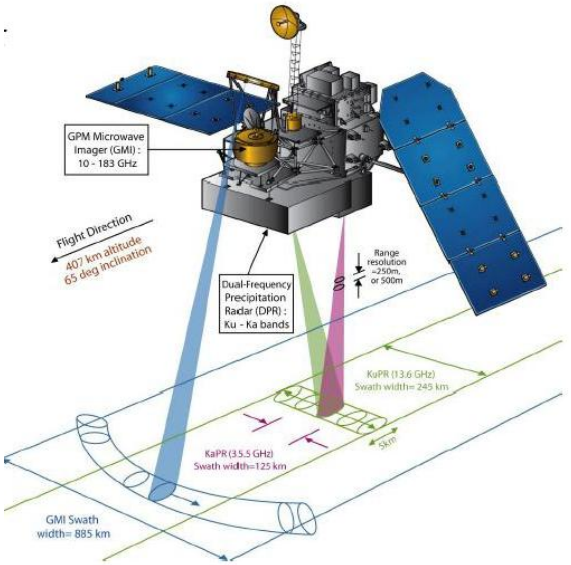


Satellites Validation and Ancillary Measurement

TRMM and GPM core satellite - Dual Freq. Radar

The core satellite and TRMM – is possible to have both.

Physical validation- Aerosol “regimes” impact the resultant physical characteristics of the precipitation. Precipitation estimation depends on cloud water vs. rain water threshold; impacts of aerosol loading/variability on rain water Droplet Size distribution and ice Particle size distribution – the first is critical for precipitation estimation by radar and the latter being critical to how the ice scattering is used to estimate precipitation by satellite



Boa Tarde!

O meu nome é Manfred Wendisch.

Muito obrigado … for organizing this meeting.

m.wendisch@uni-leipzig.de

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Faculty of Physics and Earth Sciences

Leipzig Institute for Meteorology - LIM

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Prof. Dr. Manfred Wendisch - Atmospheric Radiation (Director)
Prof. Dr. Christoph Jacobi - Upper Atmosphere Meteorology
Prof. Dr. Johannes Quaas - Theoretical Meteorology
Jun.-Prof. Dr. Bernhard Pospichal - Acoustics and Remote Sensing

Joint Appointments (TROPOS)

Prof. Dr. Andreas Macke - Physics of the Atmosphere
Prof. Dr. Hartmut Herrmann - Chemistry of the Atmosphere
Prof. Dr. Ina Tegen - Modeling of Atmospheric Processes

Honorarium Professors

Prof. Dr. Uwe Schlink - Urban and Bioclimate (UFZ)
Prof. Dr. Thomas Trautmann - Remote Sensing (DLR)
Prof. Dr. Alfred Wiedensohler - Atmospheric Aerosols (TROPOS)

Institute:
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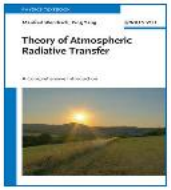
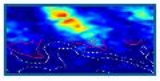
Atmospheric Radiation





Upper Atmosphere Meteorology

Acoustics and Remote Sensing

lobal Climate

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Aerosol, Cloud, Precipitation, and Radiation Interactions and Dynamics of Convective Cloud Systems (ACRIDICON)

M. Wendisch (Uni Leipzig), U. Pöschl (MPIC Mainz)
and the GERMAN Team

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Luiz Machado and the BRAZILIAN Team

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Aerosol, Cloud, Precipitation, and Radiation Interactions and Dynamics of Convective Cloud Systems (ACRIDICON)

- Funded by
  - the German Science Foundation (DFG)
    Max Planck Society (MPI), HGF, DLR, …

- Within the **Priority Program of DFG** for the High Altitude and Long Range Research Aircraft (HALO)
  ≈ 30 Projects

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Mission Types

(1) Cloud Vertical Evolution ***(Cloud Profiling)***

(2) Aerosol Processing ***(Inflow, Outflow)***

(3) Satellite Validation ***(Cloud Products)***

(4) Vertical Transport & Mixing ***(Artificial Tracer)***

(5) Clouds formed over Forest/deforested areas (forested and deforested)

→ *Contrast of pristine and highly polluted conditions (in comparable thermodynamic environments)*

→ *Contrasting thermodynamic conditions (cloud base temperatures, humidity fields, wind shear)*

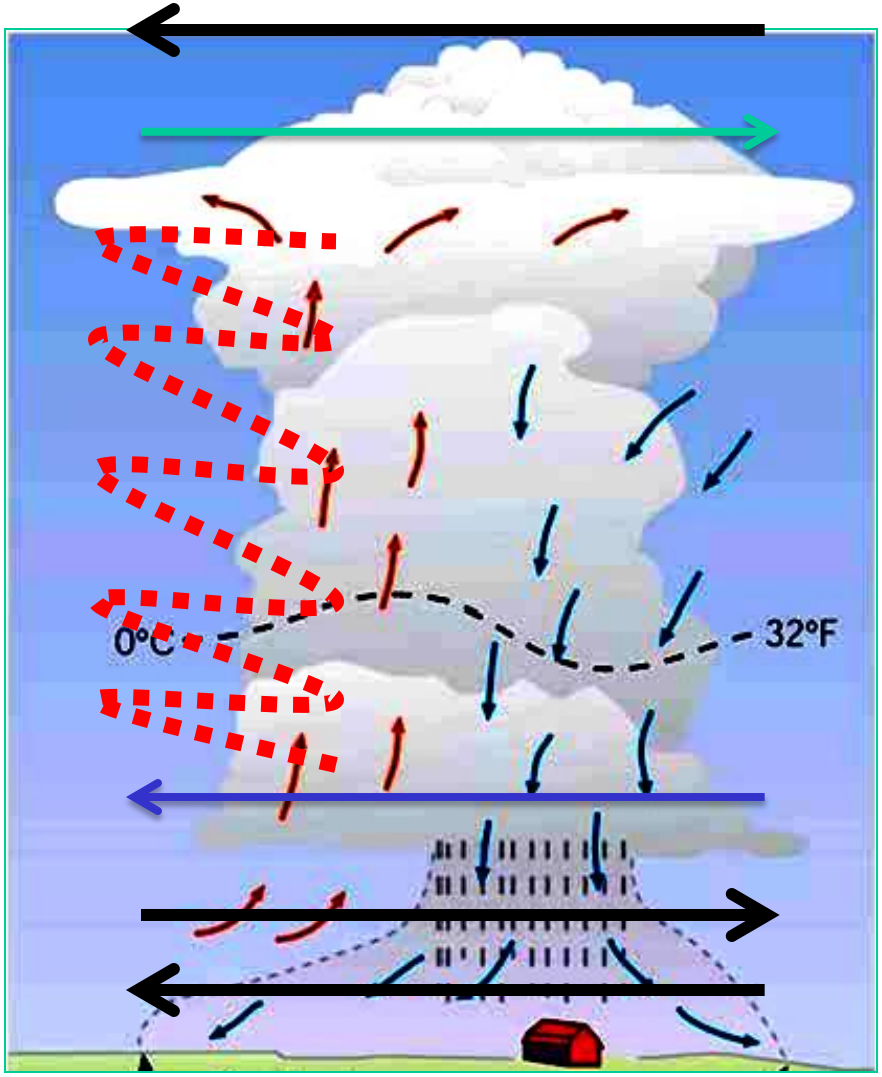
ACRIDICON Mission Type 1: Cloud Vertical Evolution

Objectives: Observe …

- Vertical evolution of cloud microphysical properties,
- Droplet/crystal growth and freezing mechanisms,
- Warm and cold precipitation formation.

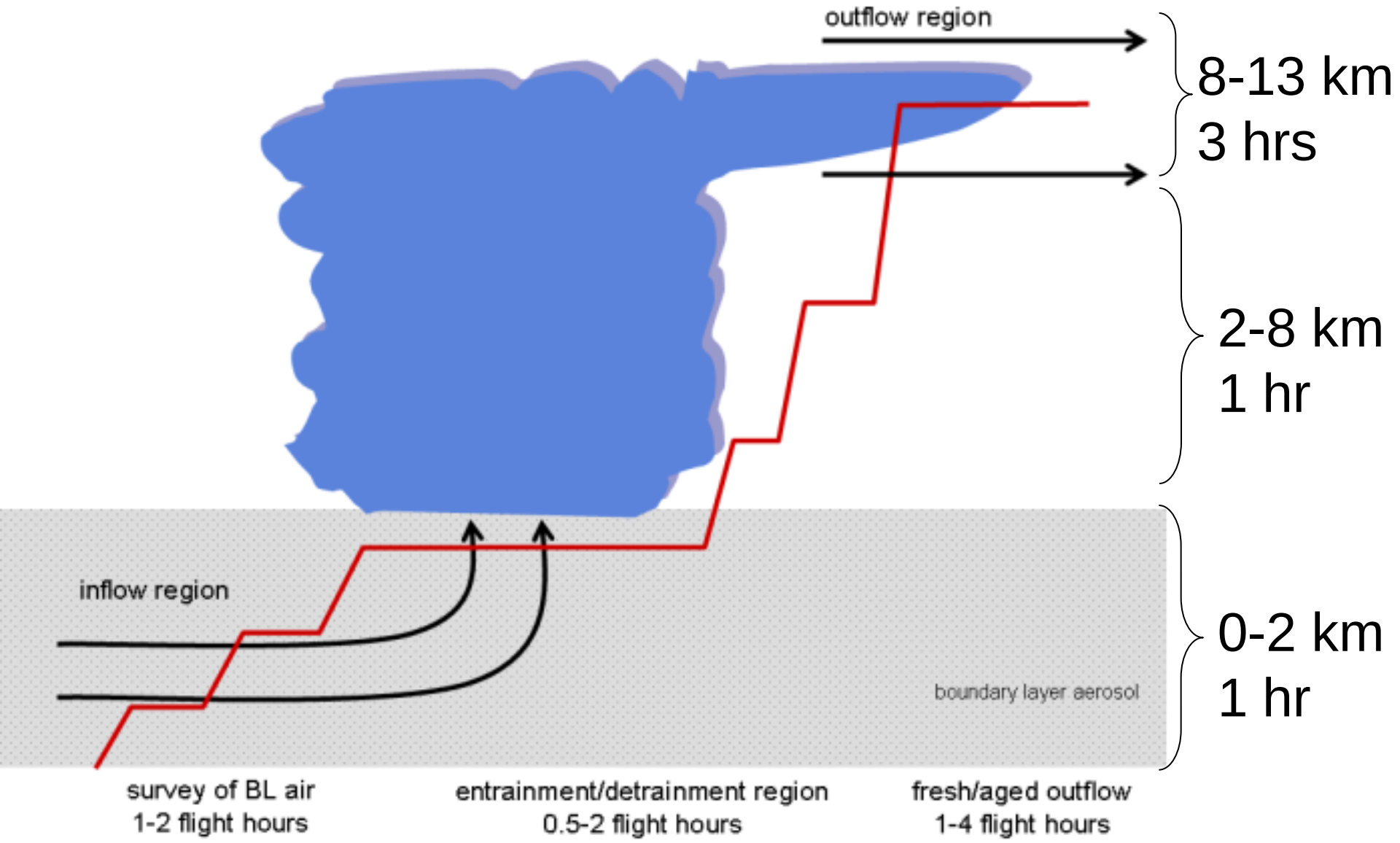
Strategy: Sample …

- Below cloud,
- At cloud base at an early stage,
- In growing upshear parts
- The anvil region, and
- Above cloud top.



Profile 3000-46000 ft: 1.5 hours

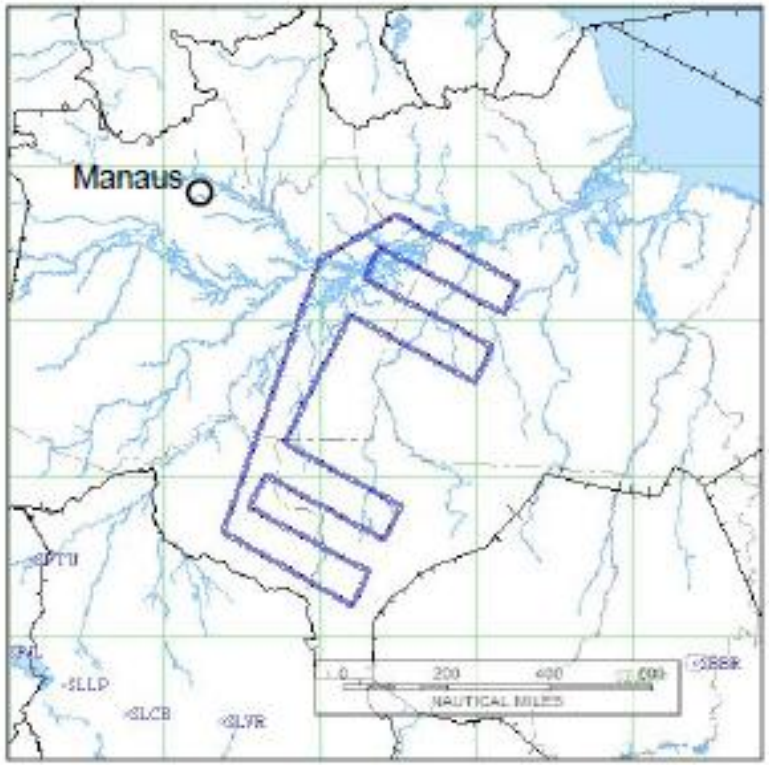
ACRIDICON Mission Type 2: Aerosol Processing



Mission Type 2 and 4 : Aerosol Processing

Long-Range Outflow

- Characterize aged particle outflow of several cloud systems.
- Compare with upper troposphere background.



from / to Manaus

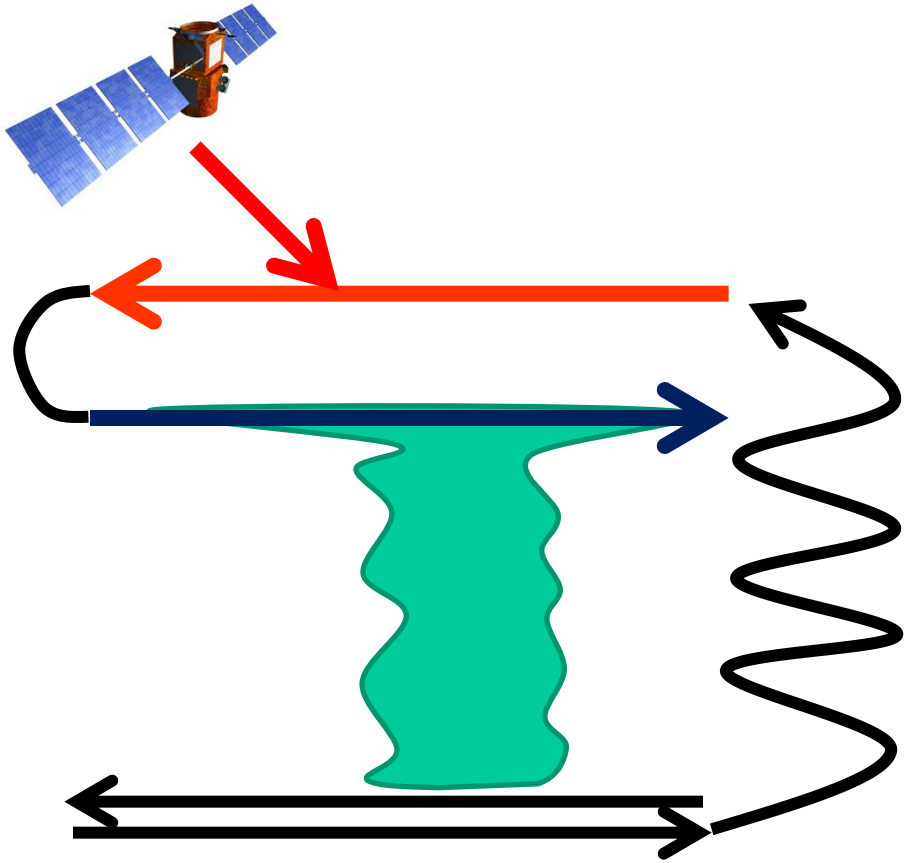
endurance: 08:00 hrs

range: 3400 nm

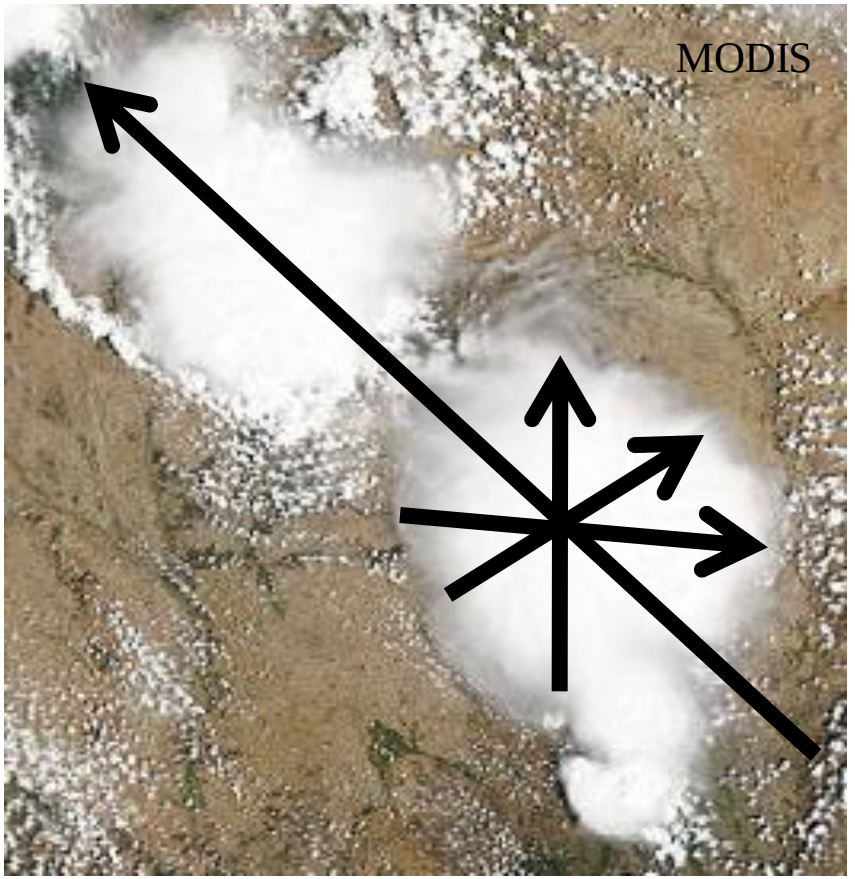
Mission Type 3: Satellite Validation

Fast cloud development requires adequate methods!

Stochastic approches → Random flight tracks



A-Train, 13-14 UTC, Spain

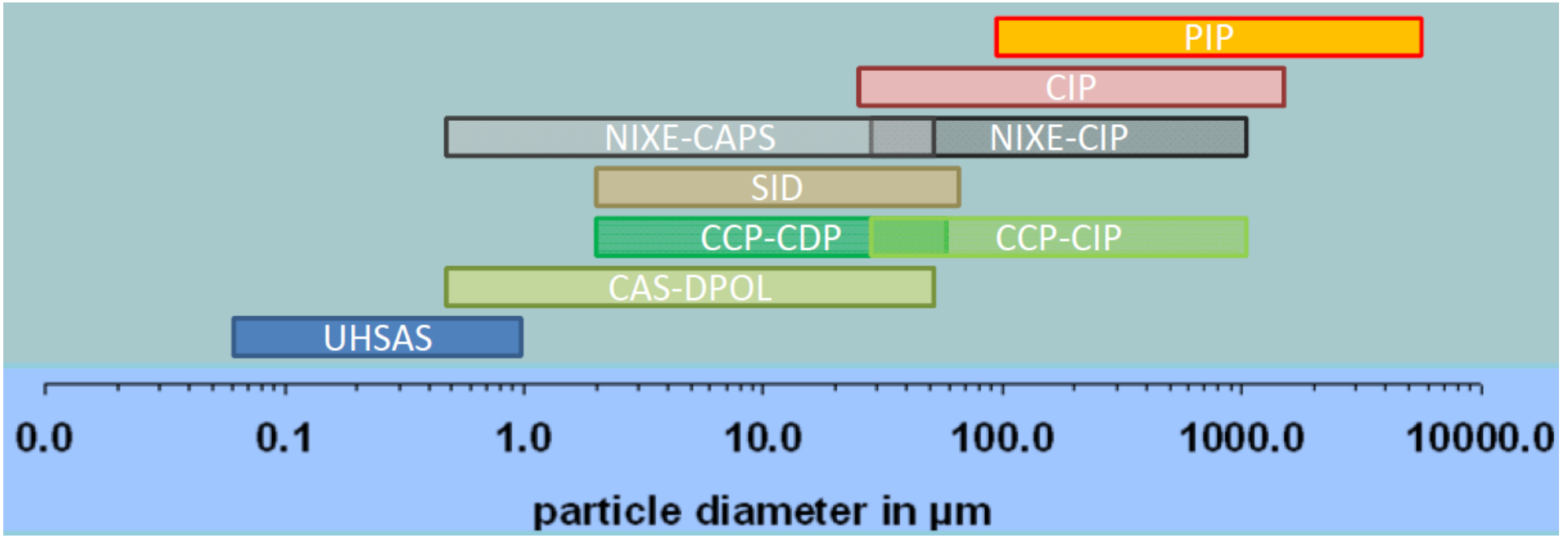


Total duration = 4-6 h

Measurement Parameters and Techniques

- **Microphysical probes**:
  - Aerosol particles (SD, BC, CCN, IN, Backscatter, Depol, Mixing State, Hygroscopicity)
  - Cloud droplets and ice crystals (SD, LWC, IWC)

- **Inlets**:
  - Droplets (CVI)
  - Aerosol particles
    MAI (submicrometer)
    HASI (micrometer)



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- **Microphysical probes**:
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  - Cloud droplets and ice crystals (SD, LWC, IWC)

- **Inlets**:
  - Droplets (CVI)
  - Aerosol particles
    - MAI (submicrometer)
    - HASI (micrometer)

- **Radiation**:
  - Spectral Radiometers (solar)
    - Radiance
    - Irradiance
  - DOAS, LIDAR

- **Trace gases**: CO, O_3, SO_2, NO_x, NO_y, PFC, CH_2O NO_2, HONO, BrO, IO, OIO, O_2 und O_4, H_2O (Gas)

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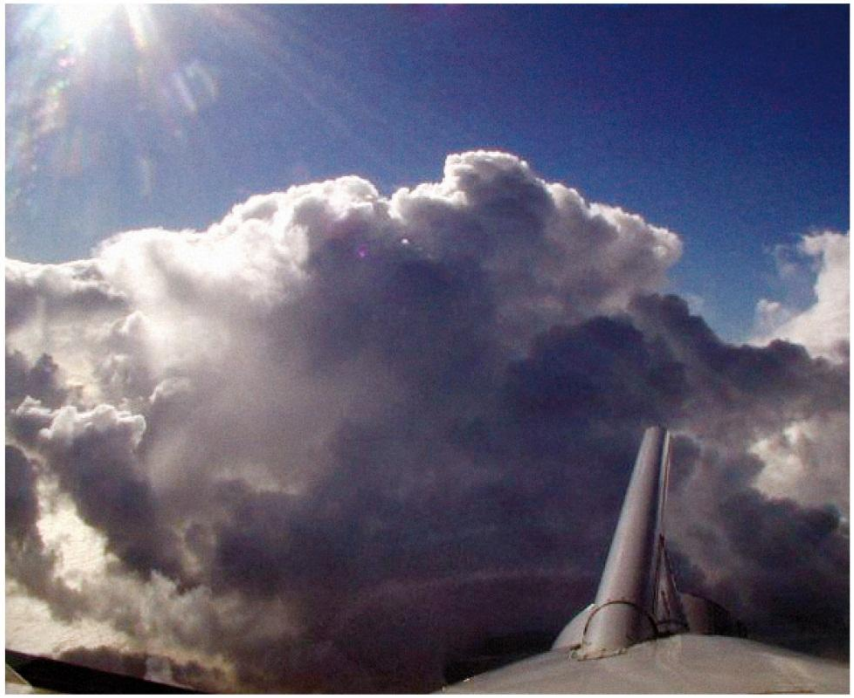
Edited by
M. Wendisch and J.-L. Brenguier

WILEY-VCH

Airborne Measurements for Environmental Research

Methods and Instruments



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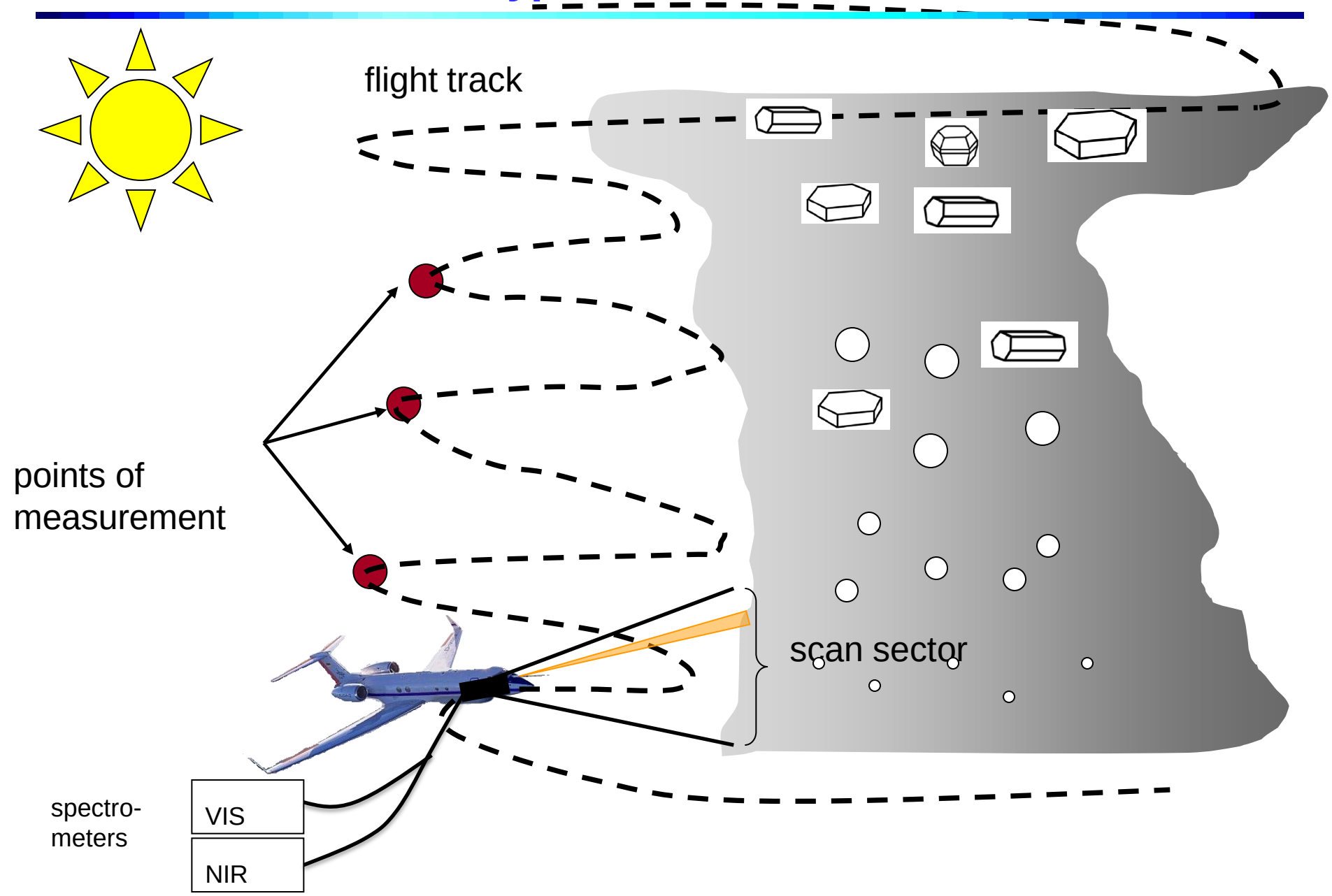
ACRIDICON Mission Type 1: Cloud Vertical Evolution



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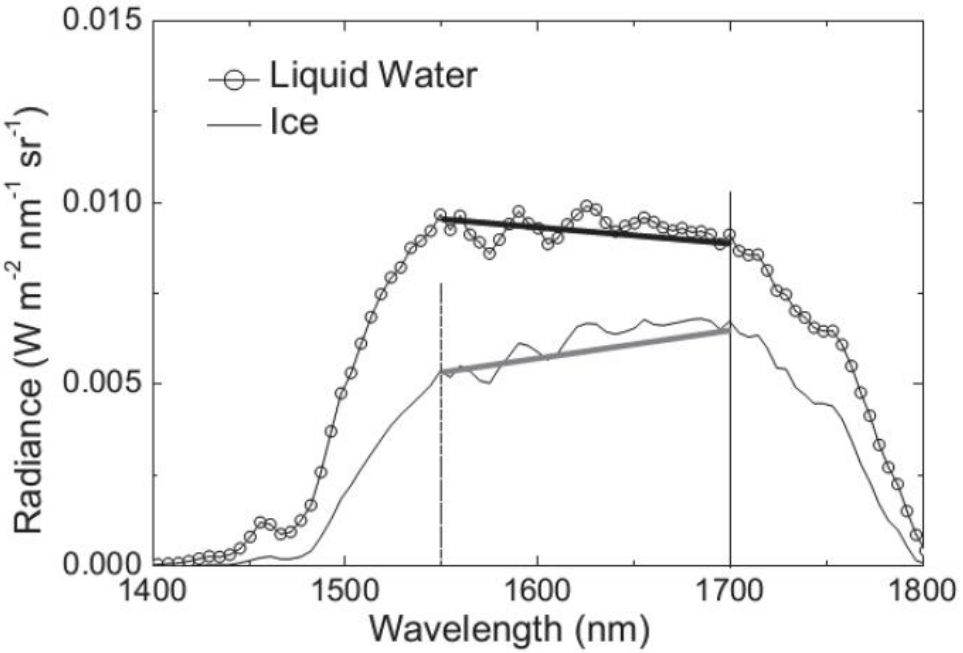

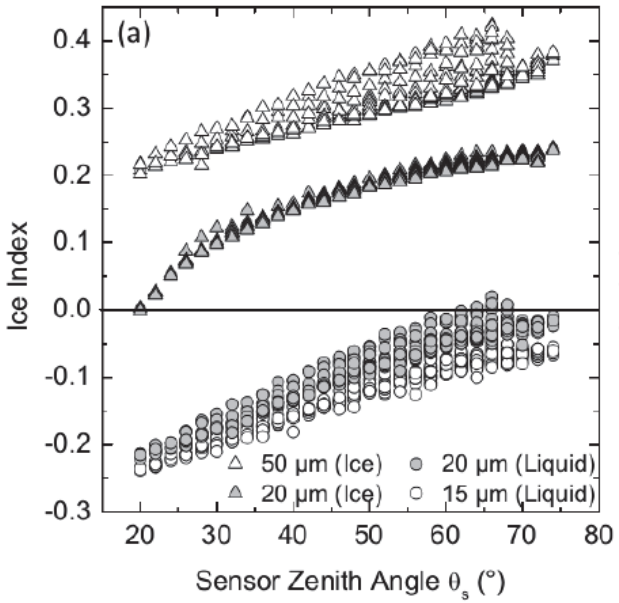

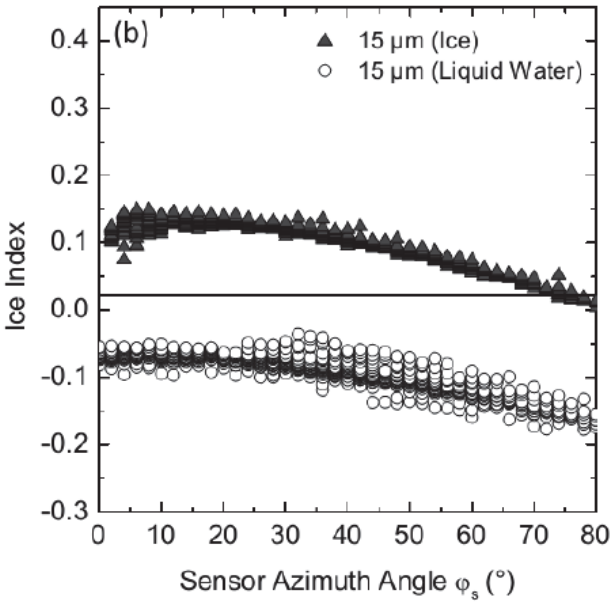

ACRIDICON Mission Type 3: Satellite Validation

- **A-Train:** MODIS (1), AMSR (2), AMSU (3), CloudSat (4), CALIPSO (5), POLDER (6), CERES (7)
- **MSG:** SEVIRI (8)

	Quantity	Airborne Instrument					
		In Situ	SMART	MWR	Cloud Radar	POLIS	AMSSP
Primary	Spectral Solar Radiance (1,6,7,8)		■				
	Radar Reflectivity (4)				■		
	Microwave Radiation (2,3)			■			
	Polarized Spectral Solar Radiance (6)						■
	Lidar Attenuated Backscatter (5)					■	
Product	Cloud Top Alt./Pressure/Temp. (1,2,3,4,5,6,8)	■	■	■	■	■	■
	Cloud Optical Thickness (1,6,8)	▒	■			▒	■
	Cloud Particle Diameter (1,6,8)	■	■				■
	Cloud Liquid Water Path (2,3,4)			■	■		
	Cloud Ice Water Path (4)				■		
	Cloud Phase (1,5,6,8)	■	■		■	■	■
	Vertical Distribution (2,3,4)	■		■	■	▒	
	Aerosol Properties (1,5,6)	■				■	■
	Energy Budget (7)		■				

Mini-DOAS, SMART-PRO: *LWP* and *IWP*

ACRIDICON Mission Type 4: Vertical Transport & Mixing

Strategy:

- Tagging of inflow by artificial tracer (e.g., Perfluorocarbon C_6F_{12} combined with SO_2, and CO)
- Wait ...
- Characterize inflow
- Vertical profiling
- Penetrate anvil
- Characterize outflow downwind the anvil
- Scavenging and wet removal: Concentration relative to inert tracer