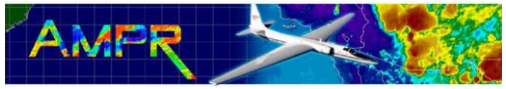
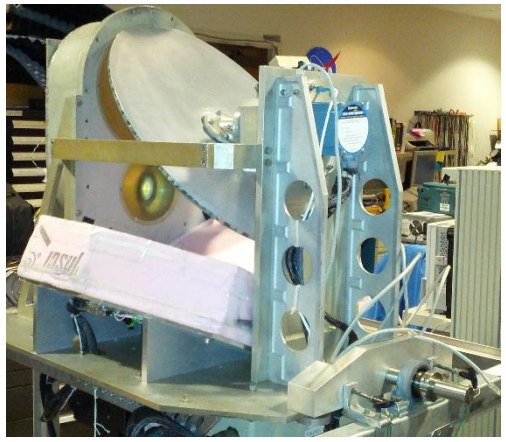
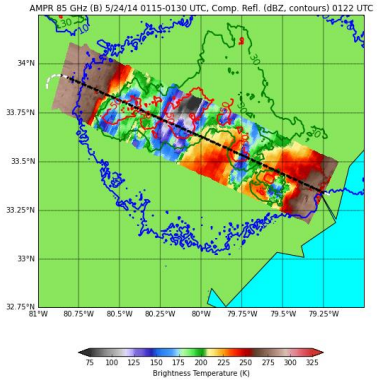
ORACLES (ObseRvations of Aerosols above CLouds and their intEractionS)

Instrumentation & Models

NASA Earth-Venture-Suborbital-2 project







Instrument/Model name / PI:

AMPR (Advanced Microwave Precipitation Radiometer)

T. Lang, NASA MSFC

Data/Measurements/Retrievals:

- Passive microwave radiometer – Retrieve surface emission, cloud liquid water, precipitation rate, water vapor, ice scattering, and more
- Four frequencies - 10.7, 19.35, 37.1, 85.5 GHz, with 2 variable polarization channels apiece (Channel A: V -> H and Channel B: H -> V)
- Cross-track scanning, polarization state varies according to scan angle

Previous deployments: IPHEx, MC3E, CAMEX 1-4, TCSP, TC4, KWAJEX, TRMM/LBA, TOGA-COARE, FIRE-III, TEFLUN-A

Notable publications:

Leppert II, K. D., and D. J. Cecil, 2015: Signatures of hydrometeor species from airborne passive microwave data for frequencies 10–183 GHz. *J. Appl. Meteor. Climatol.*, **54**, 1313–1334.

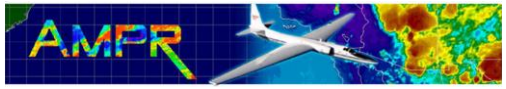
Hood, R. E., D. J. Cecil, F. J. LaFontaine, R. J. Blakeslee, D. M. Mach, G. M. Heymsfield, F. D. Marks Jr., E. J. Zipser, and M. Goodman, 2006: Classification of tropical oceanic precipitation using high-altitude aircraft microwave and electric field measurements. *J. Atmos. Sci.*, **63**, 218–233.

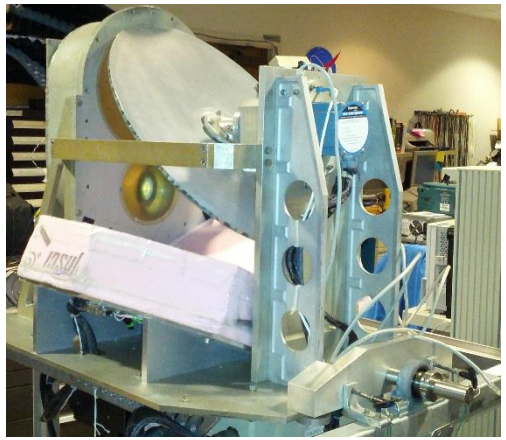
Spencer, R. W., R. E. Hood, F. J. Lafontaine, E. A. Smith, R. Platt, J. Galliano, V. L. Griffin, and E. Lobl, 1994: High-resolution imaging of rain systems with the advanced microwave precipitation radiometer. *J. Atmos. Oceanic Technol.*, **11**, 849–857.

ORACLES (ObseRvations of Aerosols above CLouds and their intEractionS)

Instrumentation & Models

NASA Earth-Venture-Suborbital-2 project





Instrument/Model name / PI:

AMPR (Advanced Microwave Precipitation Radiometer)

T. Lang, NASA MSFC

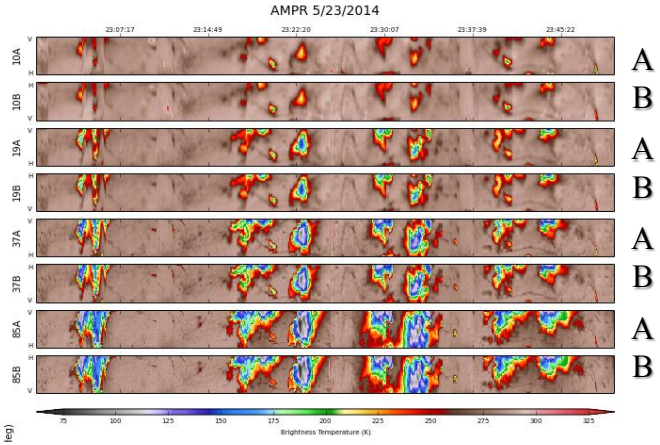
Link to ORACLES science objectives:

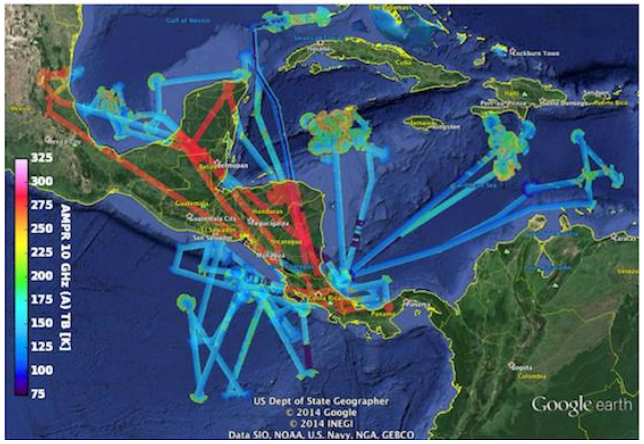
Data product	ORACLES science objectives
Microwave Brightness Temperatures (10, 19, 37, 85 GHz) – 2 channels per frequency (variable polarization) Applications: Precipitation & Cloud Microphysical Structure, Ocean Surface Temperature & Near-Surface Wind Speed	O2-3 (Cloud changes due to aerosol-induced heating), O3-2 (Cloud changes due to aerosol mixing) O3-3 (Cloud changes due to aerosol-suppressed precipitation):

Primary Data Examples:

Left: Strip chart time series of T_B for every channel/frequency from 5/23/14 IPHEx flight.

Right: 10 GHz (A) T_B for every TCSP (2005) flight.

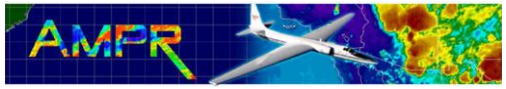


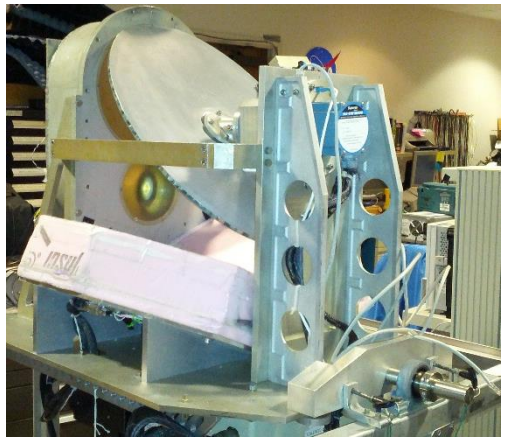


ORACLES (ObseRvations of Aerosols above CLouds and their intEractionS)

Instrumentation & Models

NASA Earth-Venture-Suborbital-2 project





Instrument/Model name / PI:

AMPR (Advanced Microwave Precipitation Radiometer)

T. Lang, NASA MSFC

Instrument Requirements:

- **Sampling requirements**
  - All-weather, traditionally flown at high altitudes (e.g., 65 kft) over clouds, can slow down scanning for slower-speed P-3, resolution function of altitude
  - Can provide sea-surface information when under cloud (in-cloud -> ?)
  - Cross-track scanning, polarization varies with scan angle (dual-pol enabled)
  - Real-time data capability with network connection
  - Impact of APR-3 collocation on 37-GHz channel uncertain
- **Coordination with other platforms/instruments**
  - Requirement: Liquid water content/path (LWC/LWP; 0.05 g m^{-3} / 10 g m^{-2})
  - APR-3 + AMPR (10 g m^{-2} LWP) – Retrieval done in post-processing