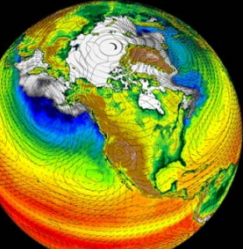
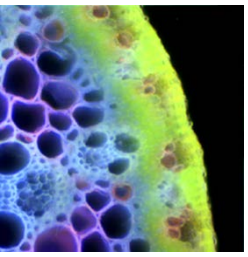
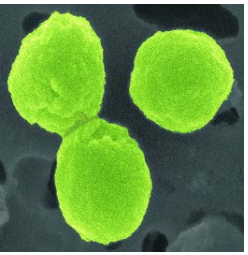


Green Ocean Amazon (GOAmazon)

Atmospheric Component

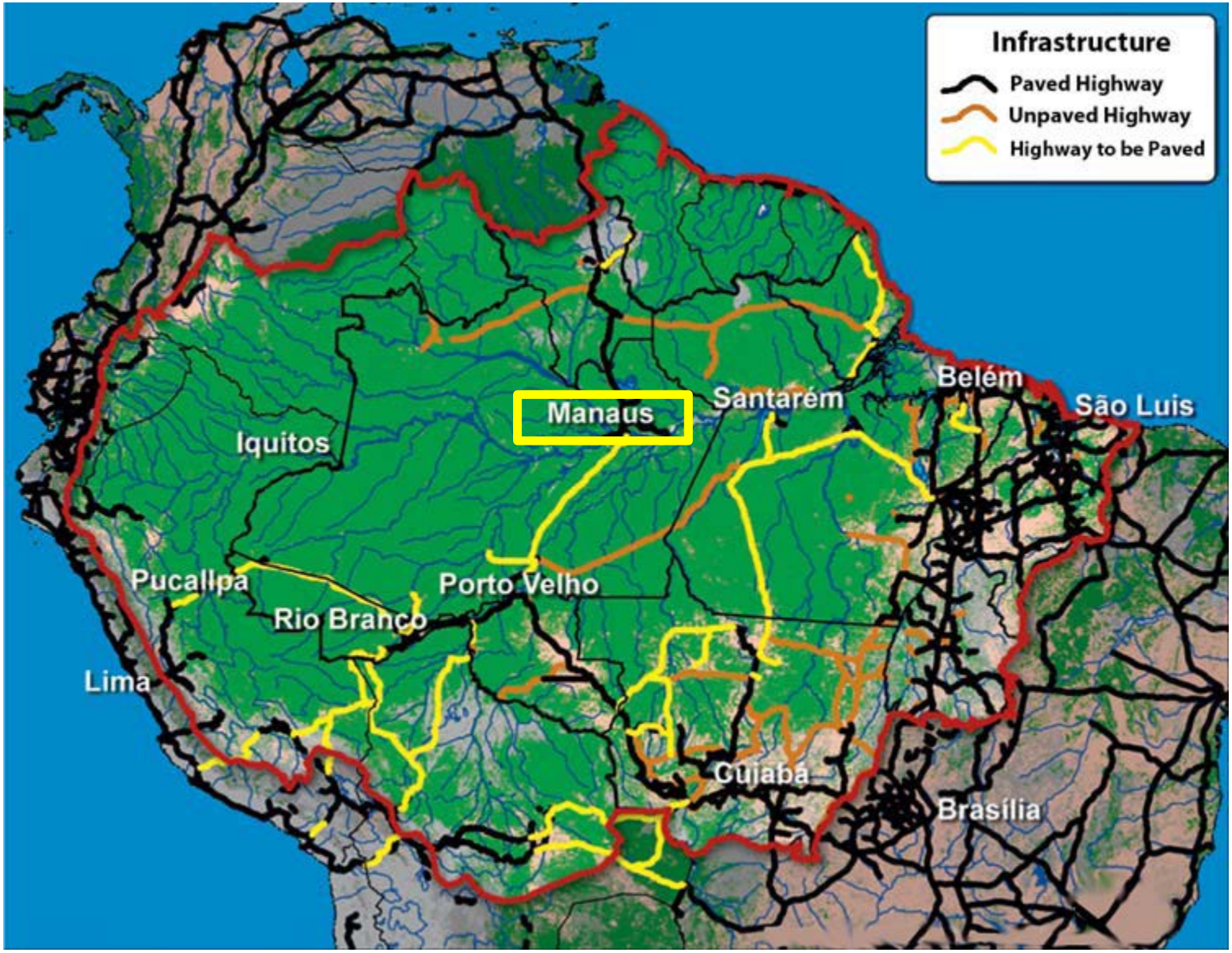
Sally McFarlane (ASR)

with

Wanda Ferrell (ARM), Renu Joseph (RGCM), Daniel Stover (TES), Ashley Williamson (ASR), Dorothy Koch (ESM)

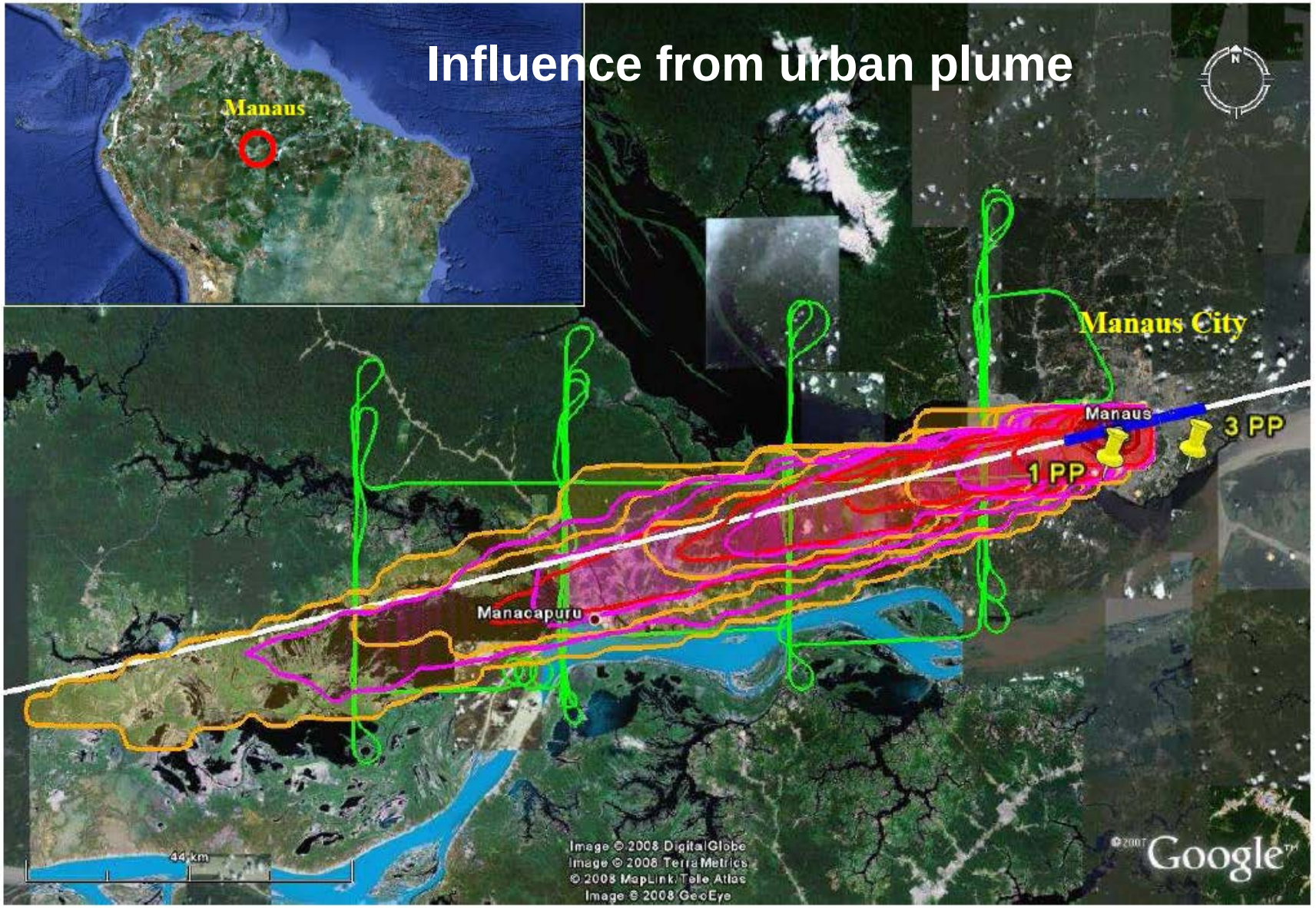
Background

- The Amazon Basin is one of the Earth's primary heat engines and must be simulated robustly in earth system models.
- Tropical deep convection is poorly understood and modeled, with insufficient observational data sets for model constraint.
- Aerosols strongly influence cloud processes and in the Amazon aerosols are dominated by vegetative sources. Thus there is a strong and little understood connection between terrestrial ecosystems and the atmosphere.
- The ARM Mobile Facility will be located downwind of the mega-city of Manaus, allowing a comparative study of the pristine environment outside of the plume and polluted environment within the plume
- GOAmazon PI: Scot Martin, Harvard University

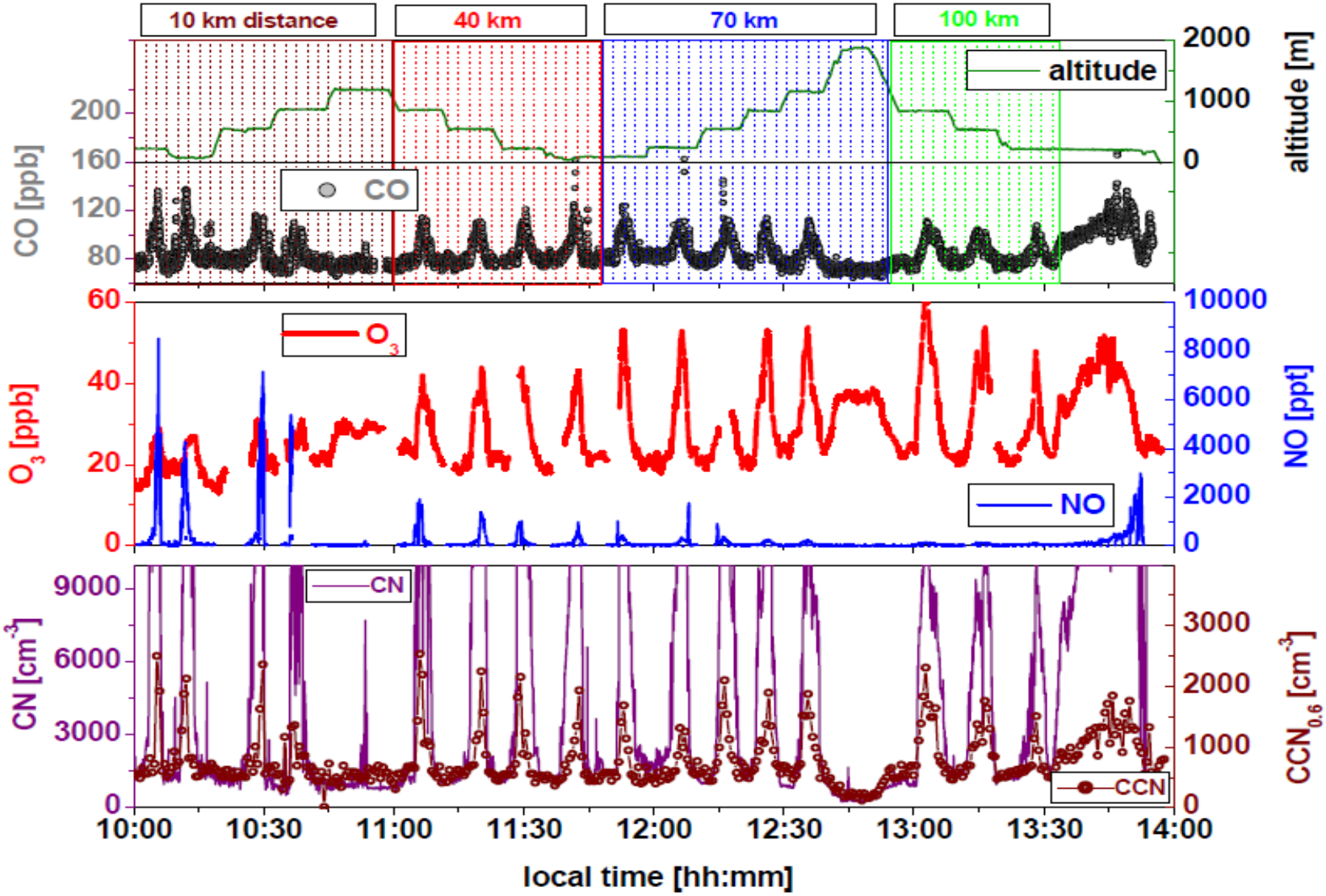

Infrastructure
Paved Highway
Unpaved Highway
Highway to be Paved
Manaus
Santarém
Belém
São Luis
Iquitos
Pucallpa
Porto Velho
Rio Branco
Lima
Cujaba
Brasília

Manaus is a large source of pollution

Influence from urban plume



Reference: Kuhn, U.; Ganzeveld, L.; Thielmann, A.; Dindorf, T.; Welling, M.; Sciare, J.; Roberts, G.; Meixner, F. X.; Kesselmeier, J.; Lelieveld, J.; Ciccioli, P.; Kolle, O.; Lloyd, J.; Trentmann, J.; Artaxo, P.; Andreae, M. O., "Impact of Manaus City on the Amazon Green Ocean atmosphere: Ozone production, precursor sensitivity, and aerosol load," *Atmos. Chem. Phys.* **2010**, *10*, 9251-9282.



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Science Questions

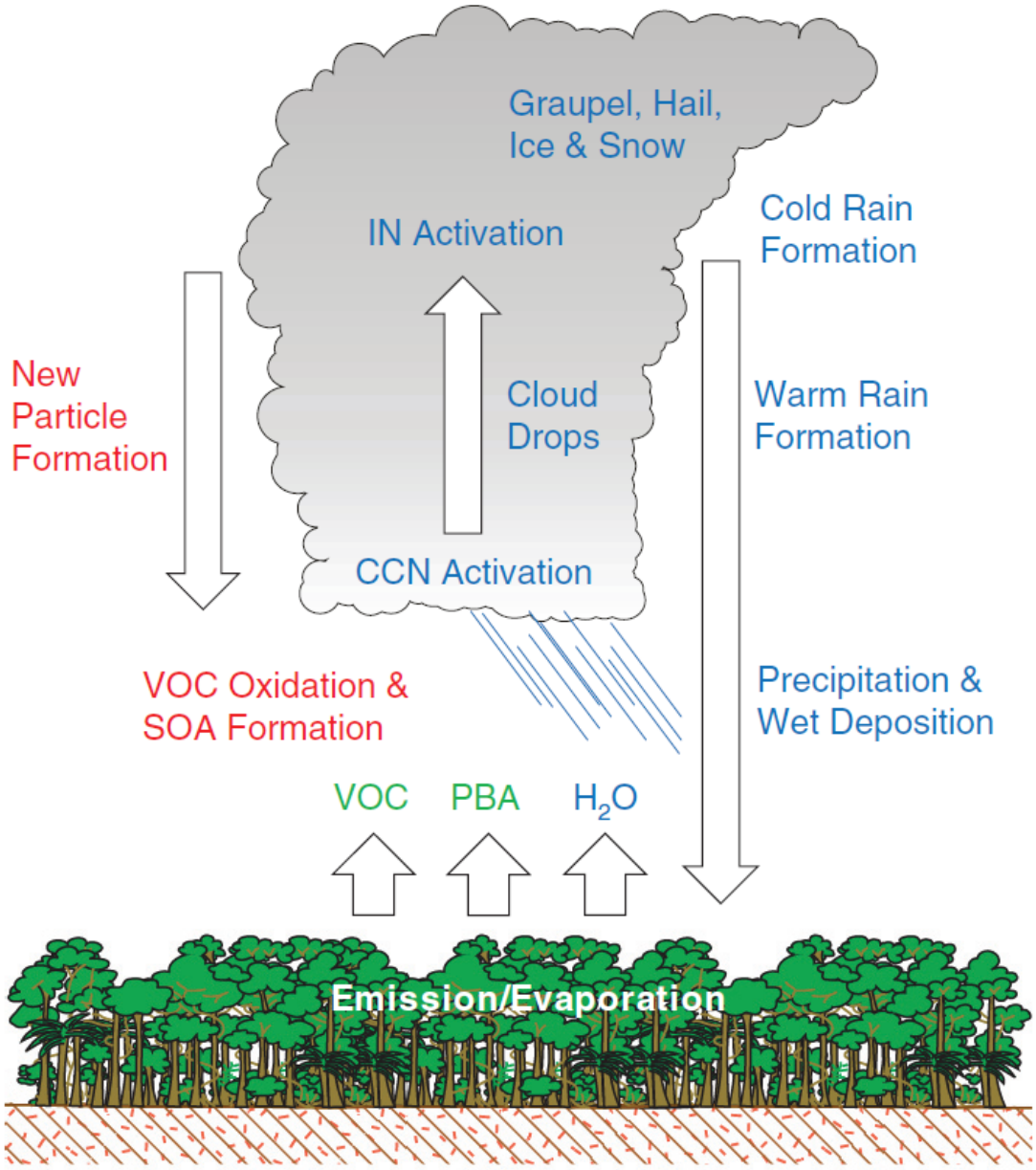
- What are the interactions of an urban pollution plume with **biogenic volatile organic compounds** (BVOCs), especially the impact on the production of **secondary organic aerosol** (SOA), the formation of **new particles**, and **biogenic emission**s of aerosols and their precursors?

- What are the influences of **anthropogenic activities** in the tropics on **aerosol** microphysical, optical, cloud condensation nuclei (CCN), and ice nuclei (IN) **properties**?

- What is the role of the daily transition of convection from **shallow to deep,** including the effects of landscape heterogeneity on the evolution and dynamics of convective cloud systems?

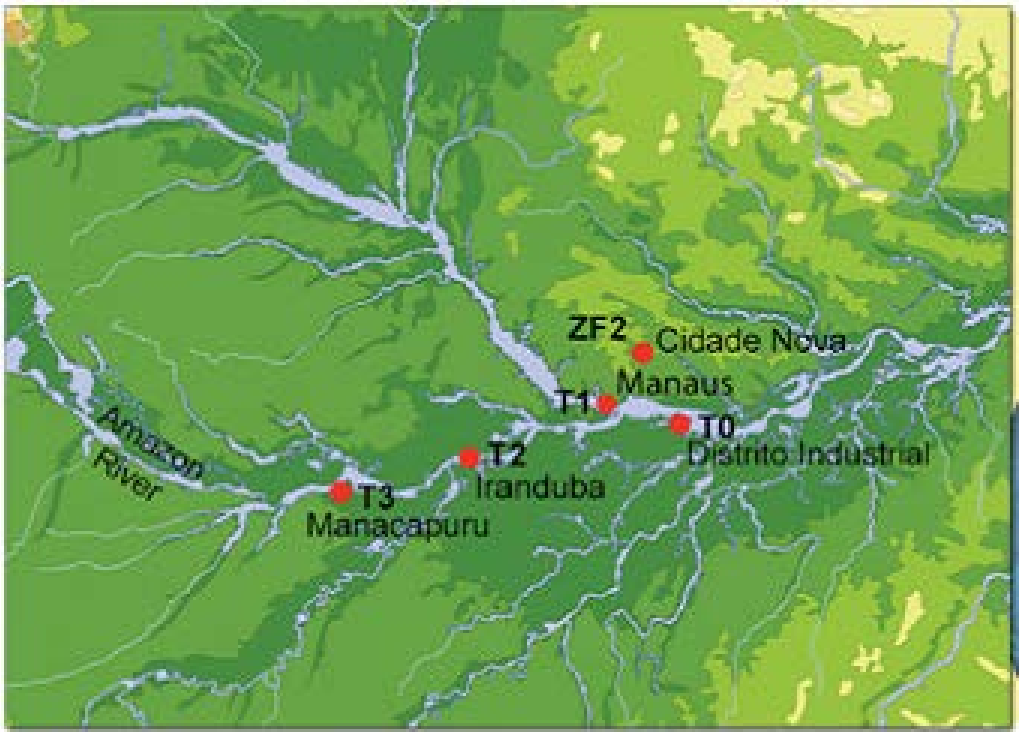
- What are the **effects of aerosols on convective clouds and precipitation** under different aerosol and synoptic regimes?

Science Questions



- What is the effect of pollution on these cycles and the coupling between them?

Ground Sites



- **T3, Manacapuru –** the ARM Mobile Facility + Mobile Aerosol Observing System + guest instruments

- **T0, Amazonian Tall Tower Observatory** - joint German/Brazilian aerosol
- **T1, National Institute from Amazonian Research in Manaus –** aerosol and meteorological measurements
- **T2, Iranduba** – University of São Paulo measurements of aerosol, CO2, SO2
- **ZF2, Terrestrial Ecosystem Science measurement sites –** surface flux instrumentation provided by DOE's Terrestrial Ecosystem Science program.
- **CHUVA** - radar, radiometers, additional soundings

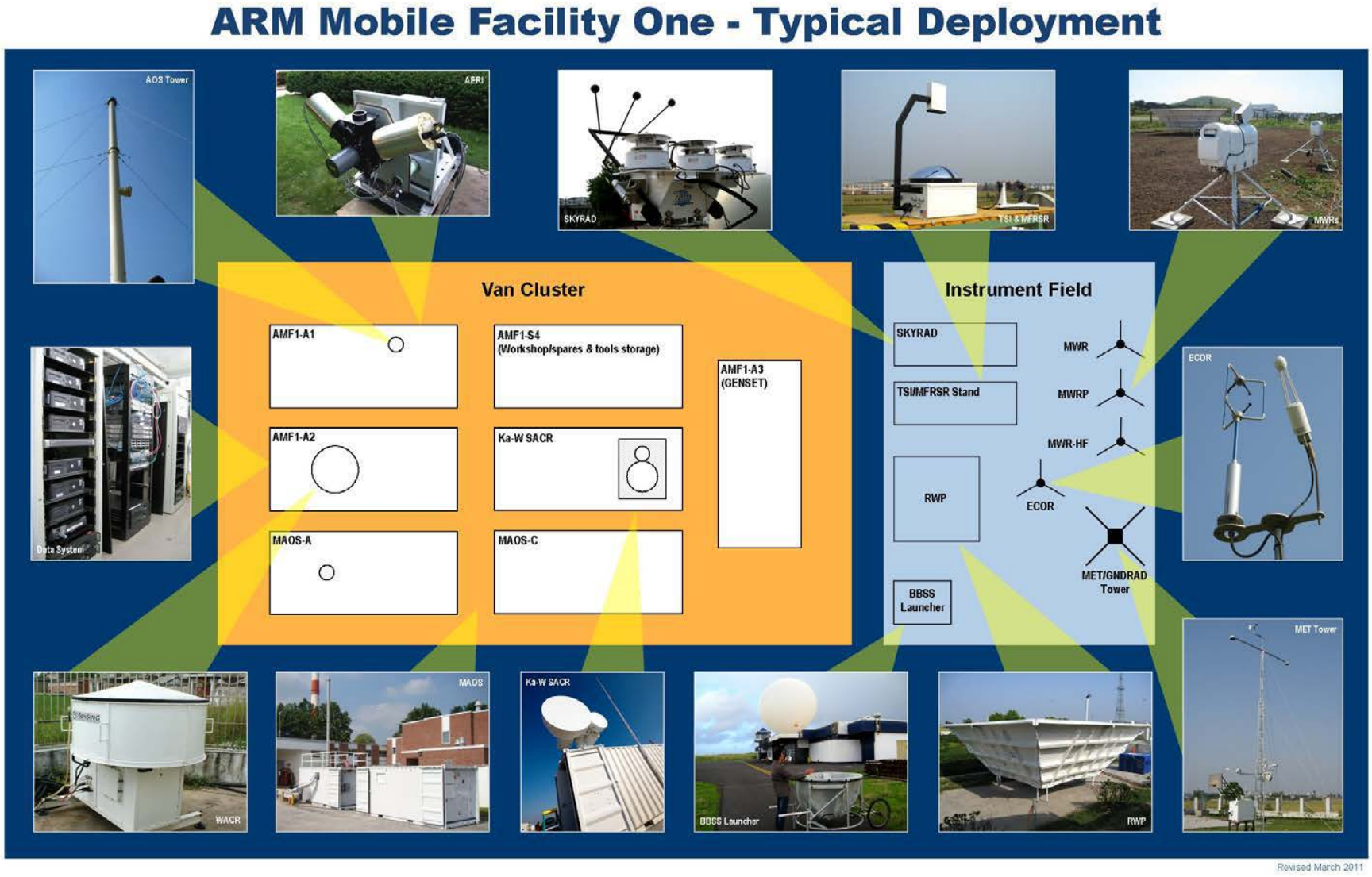
Deployment Timeline

- GOAmazon Campaign: **Jan, 2014 – Dec, 2015**
- Intensive Observational Periods:
  - wet season: 1 Feb - 31 Mar 2014
  - dry season: 15 Aug - 15 Oct 2014

- ARM Mobile Facility + guest instruments shipped to Brazil: Nov, 2013
- ARM Mobile Facility Installation: Dec, 2013 (in progress)
- GOAmazon Opening Ceremony: Feb, 2014

AMF Installation in Progress at T3

ARM Mobile Facility



AMF1

AMF1 – 7 x 20' sea containers
1 full-time on-site technician

- Precision Spectral Pyranometer (PSP) x 2
- Precision Infrared Radiometer (PIR) x 2
- Shaded Black & White Pyranometer (B/W)
- Shaded Precision Infrared Pyrgeometer (PIR)
- Normal Incidence Pyrhiliometer (NIP)
- Infrared Thermometer (IRT) x 2
- Multi-Filter Rotating Shadowband Radiometer (MFRSR)
- Narrow Field of View Zenith Radiometer (NFOV)
- Optical Rain Gauge (ORG)
- Anemometers (WND)
- Temperature/Relative Humidity Sensor (T/RH)
- Barometer (BAR)
- Present Weather Detector (PWD)
- Eddy Correlation Flux Measurement System (ECOR)
- Shortwave Array Spectrometer (SAS-He, SAS-Ze)
- Microwave Radiometer (MWR)
- Microwave Radiometer Profiler (MWRP)
- Microwave Radiometer 90/150 (MWR-HF)
- Doppler Lidar (DL)
- Ceilometer (CEIL)
- Balloon Borne Sounding System (BBSS)
- W-band ARM Cloud Radar - 95GHz (WACR)
- Ka-W Scanning ARM Cloud Radar (SACR)
- Atmospheric Emitted Radiance Interferometer (AERI)
- Total Sky Imager (TSI)
- Aerosol Observation System (AOS)
  - CCNC
  - PSAP
  - Nephelometers X 2
- Radar Wind Profiler – 1290MHz (RWP)
- Cimel Sunphotometer (CSPHOT)

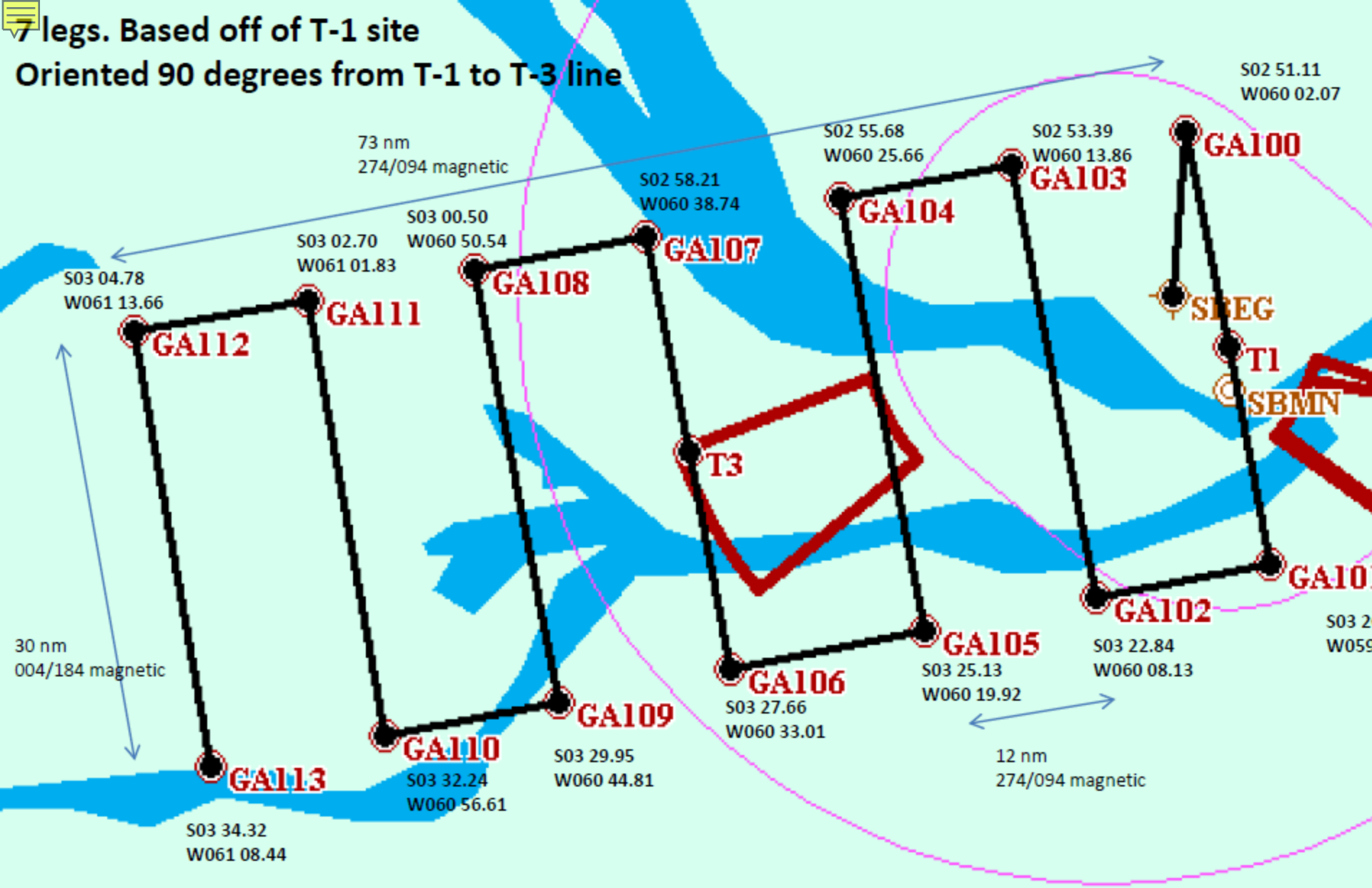
LANL Solar Fourier Transform Spectrophotometer (FTS) (Dubey) (OCO-2 validation)

MAOS

Mobile Aerosol Observing System (MAOS) – 2 x 20' sea containers (MAOS-A & MAOS-C); technician + 2 x full time post-docs (supplied by ARM) ; Guest operational personnel (up to 5)

- SOnic Detection And Ranging (SODAR) System (1000 to 4000 Hz)
- Ultra-High Sensitivity Aerosol Spectrometer (enhanced) - Senum
- Dual Column Cloud Condensation Nuclei Counter (CCN) - Senum
- Single Particle Soot Photometer (SP2) - Sedlacek
- Scanning Mobility Particle Sizer (SMPS) - Kuang
- Photo-Acoustic Soot Spectrometer (PASS), 3 Wavelength –Dubey and Aiken
- Trace Gas Instrument System (Research-Grade) (CO, NO, NO_2, NO_y, O_3, SO_2) - Springston
- Particle Into Liquid Sampler-Ion Chromatography-Water Soluble Organic Carbon (PILS-IC-WSOC) - Watson and Lee
- Particle Soot Absorption Photometer (PSAP), 3 Wavelength – Springston
- Condensation Particle Counter (CPC), 10 nm to >3000 nm particle size range - Kuang
- Condensation Particle Counter (CPC), 2.5 nm to >3000 nm particle size range - Kuang
- Hygroscopic Tandem Differential Mobility Analyzer (HTDMA) - Senum
- Proton Transfer Mass Spectrometer (PTRMS) - Watson
- 7-Wavelength Aethelometer - Sedlacek
- Weather Transmitter (WXT-520) - Springston
- Aerosol Chemistry Speciation Monitor (ACSM) - Watson
- Ambient Nephelometer (3 wavelength) – Senum
- Controlled RH Nephelometer (3 wavelength) - Senum
- DMA-CCN – Wang
- HR-ToF-AMS – Alexander

ARM Aerial Facility



Flight Plan #7

IARA – Intensive Airborne

1:35 to complete one pattern

AAF Payload (1)

Platform Position/Velocity/Altitude			
Instrument	**Trimble DSM**	**Trimble TANS 10 Hz**	
Measurement	position/velocity at 10 Hz	pitch/roll/azimuth	
Atmospheric State			
Instrument	**Rosemont 102 probe**	**Rosemount 1201F1**	**Rosemont 1221F2 (3)**
Measurement	temperature	static pressure	differential pressure (dynamic, alpha, beta)
Instrument	**GE-1011B chilled-mirror hygrometer**	**AIMMS-20**	
Measurement	dew-point temperature	5-port air motion sensing: true air speed, altitude, angle-of-attack, side-slip, temperature, relative humidity	
Aerosol Measurements			
Instrument	**TSI 3025 ultrafine condensation particle counter (UCPC)**	**TSI 3010 condensation particle counter (CPC)**	**fast integrated mobility spectrometer (FIMS)**
Measurement	total particle concentration (>3 nm)	total particle concentration (>10 nm)	aerosol particle size distribution (30 to 100 nm)
Instrument	**passive cavity aerosol spectrometer probe (PCASP)**	**particle/soot absorption photometer (PSAP)**	**TSI Nephelometer**
Measurement	aerosol particle size distribution (100 to 3000 nm)	aerosol particle light absorption at 3 wavelengths	aerosol particle light scattering at 3 wavelengths
Instrument	**Aerodyne HR-ToF-AMS**	**DMT Dual Cloud Condensation Nuclei Counter (CCNC)**	**isokinetic inlet (heated)**
Measurement	size-resolved particle composition	CCN concentrations at two supersaturations	sample stream of dry aerosol, sizes < 2.5 µm
Gas Measurements			
Instrument	**Ionicon Quadrupole PTR-MS**	**carbon monoxide analyzer**	**oxides of nitrogen instrument**
Measurement	real-time VOCs	CO	NO, NO_2, NO_y
Instrument	**Thermo environmental model 49i**	**Picarro cavity ringdown spectrometer**	
Measurement	O_3	CO_2, CH_4, H_2O	

AAF Payload (2)

Cloud Measurements			
Instrument	HVPS-3	2DS	Fast-CDP
Measurement	cloud droplet size distribution (400 to 50000 µm)	cloud droplet size distribution (10 to 3000 µm)	cloud droplet size distribution (2 to 50 µm)
Instrument	CIP	SEA WCM-2000	
Measurement	images of cloud particles (2 to 1000 µm)	liquid water content and total water content	
Radiation			
Instrument	SPN-1 unshaded	SPN-1 unshaded	
Measurement	downwelling shortwave radiation	Upwelling shortwave radiation	
Other Measurements			
Instrument	SEA M300	weather radar	TCAS
Measurement	central data acquisition/ display system	cockpit display of precipitation returns	traffic collision and avoidance system
Instrument	TAWS		
Measurement	terrain awareness and warning system		

Further Information:

http://www.arm.gov/sites/amf/mao/

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About | Science | Campaigns | Sites | Instruments | Measurements | Data | News | Publications | Education

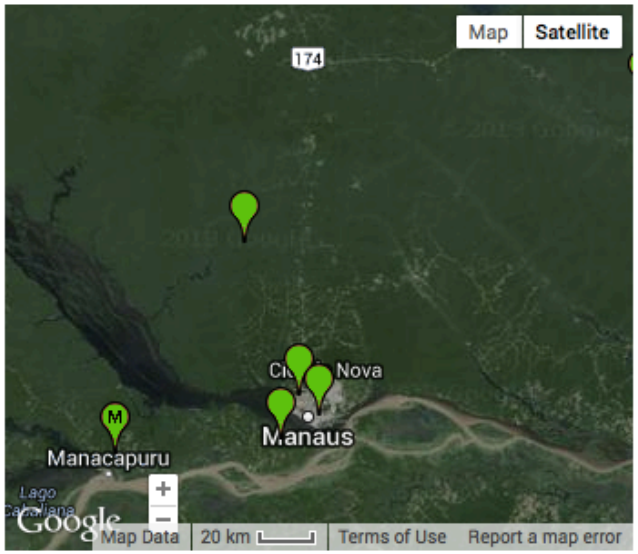
ARM.gov >> Sites >> Mobile Facilities >> AMF Deployment, Manacapuru, Brazil

AMF Deployment, Manacapuru, Brazil

Main site (T3): 3° 12' 46.70" S, 60° 35' 53.0
Altitude: 49.99 meters

The Amazon rainforest in Brazil is the largest broadleaf forest in the world, covering 7 million square kilometers of the Amazon Basin in South America. It represents over half of the planet's remaining rainforests, and comprises the most biodiverse tract of tropical rainforest on the planet. Due to the sheer size of the Amazon rainforest, the area has a strong impact on the climate in the Southern Hemisphere.

To understand the intricacies of the natural state of the Amazon rainforest, the Green Ocean Amazon, or GOAMAZON, field campaign is a two-year scientific collaboration among U.S. and Brazilian research organizations. They are conducting a variety of different experiments with dozens of measurement tools, using both ground and aerial instrumentation, including the ARM Aerial Facility's G-1 aircraft. For more information on the holistic view of the campaign, see the Department of Energy's GOAMAZON website.



This view shows the location of the Manacapuru, Brazil, ARM Mobile Facility.

Manacapuru Deployment

- AMF Home
- Manacapuru Home
- GOAMAZON Home

Experiment Planning

- Abstract and Related Campaigns
- Science Plan (PDF, 1.4MB)

Deployment Operations

- Baseline Instruments and Data Plots at the Archive

Outreach

- News & Press
- Educational Flyer