Overview and Highlights of the ARM Aerial Facility data during the CACTI field campaign

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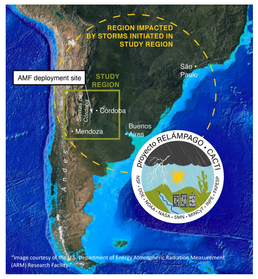
Introduction

CACTI

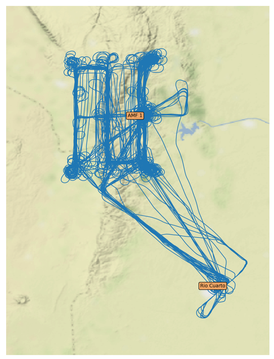
The Cloud, Aerosol, and Complex Terrain Interactions (CACTI) campaign occurred from 1 October 2018 to 30 April 2019 in north-central Argentina near the Sierras de Cordoba mountains. A ground site was stationed near Villa Yacanto and contained many instruments, including radars, lidars, disdrometers, an aerosol observing system, and radiosondes launched multiple times per day.



AAF G-1

The ARM Aerial Facility (AAF) Gulfstream 159 (G-1) was deployed during an intensive operation period (IOP) from 4 November to 8 December 2018 to study the pre-storm environmental conditions, as well as the cumulus clouds that had potential to form into storms. The aircraft was highly instrumented with more than 40 instruments to study trace gasses, aerosol properties, liquid water content, and cloud microphysics.

The AAF G1 flew 22 flights during the IOP in various conditions from clear air to cumulus and stratiform clouds to drizzle. Typical flight patterns involved multiple legs over the AMF 1 ground site, over the Sierras de Cordoba, and over Villa Dolores on the western side of the mountain range.



Data is available June 15! Visit Data Discovery or the ARM CACTI webpage to find our data!

Measurements

Aircraft State

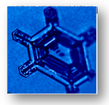
- **IWG**
  - Merged dataset containing navigation, air speed, aircraft position, temperature, pressure, wind information, relative humidity, data flags, and much more
  - Frequency: 1 Hz
  - Mentor: Fan Mei
- **Navigation**
  - VectorNav, C-MIGITS
  - Frequency: 10 Hz (C-MIGITS, b1 level nav dataset)
    40 Hz (VecNav)
  - Mentor: Alyssa Matthews

Water Content

- **WCM-2000**
  - Total water content from a hot wire, and liquid water contents from two different sized wires
  - Mentor: Alyssa Matthews
- **PVM**
  - Cloud liquid water content
  - Mentor: Jason Tomlinson
- **CAPS Hotwire**
  - Cloud liquid water content
  - Mentor: Jason Tomlinson

Cloud Microphysics

- **HVPS-3**
  - Mentor: Fan Mei
- **2-DS**
  - Mentor: Fan Mei
- **CPI**
  - High quality images
  - Mentor: Fan Mei
- **FCDP**
  - Frequency: 10 Hz
  - Mentor: Fan Mei
- **CIP**
  - Mentor: Jason Tomlinson

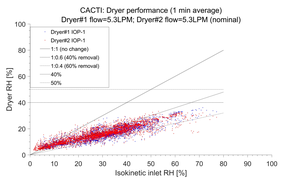


Instrument	Cloud Droplet Size Range (um)											
	2	10	25	50	100	250	500	1000	2500	5000	10000	20000
FCDP	■	■	■	■								
CAS-DPOL	■	■	■	■								
CIP			■	■	■	■	■	■				
2DS		■	■	■	■	■	■	■	■			
HVPS-3						■	■	■	■	■	■	■

Sample Collection (Inlets)

Mentor: Mikhail Pekour

- **IsoKinetic Inlet**
  - Sample stream of dry aerosols
- **CVI Inlet**
  - Sampling of cloud droplet residuals
- **OPCs**
  - Aerosol size distribution (0.7 to 15 um) to monitor inlet performance
  - One behind each inlet
- **Sample Conditioning**
  - Drier and Diluter



Aircraft and Atmos. State

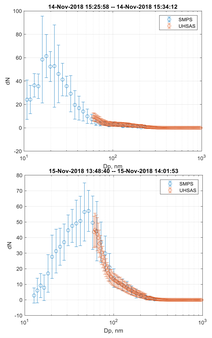
- **AIMMS** (Aircraft Integrated Meteorological Measurement System)
  - Provides both atmospheric and aircraft state measurements (position, attitude, vertical winds, temperature, etc.)
  - Frequency: 1 - 20 Hz
  - Mentor: Alyssa Matthews

Remote Sensing

- **Forward Facing Camera** (P1347)
  - Mentor: Alyssa Matthews

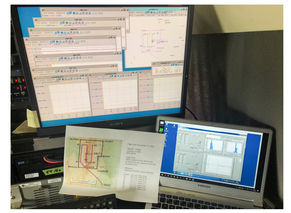
Cloud and Aerosol

- **CAS**
  - Measures both cloud and aerosol particle sizes. Corrections must be applied to current data to get aerosol measurements
  - Mentor: Lexie Goldberger | Jason Tomlinson



Atmospheric State

- **Gust Probe**
  - Temperature, pressure, moisture, velocity
  - Frequency: 1, 10, and 100 Hz
  - Mentor: Lexie Goldberger
- **Chilled Mirror Hygrometer**
  - Dewpoint
  - Mentor: Lexie Goldberger
- **TDL-H** (Tunable Diode Laser Hygrometer)
  - Absolute humidity (ppmv)
  - Mentor: Mikhail Pekour



Trace Gases

- **N_2O/CO-23r**
  - CO, N_2O, H2O
  - Mentor: Stephen Springston
- **Ozone**
  - Mentor: Stephen Springston
- **SO_2**
  - Mentor: Stephen Springston
- **LICOR**
  - CO_2, H_2O
  - Mentor: Jason Tomlinson

Aerosols

- **CPCs**
  - Ultrafine CPC 3025
  - 2 CPC 3772s behind CVI and Isokinetic inlets
  - Mentor: Fan Mei
- **SMPS**
  - Mentor: Fan Mei
- **UHSAS**
  - Mentor: Jason Tomlinson
- **PCASP**
  - Mentor: Jason Tomlinson
- **CCN**
  - Cloud condensation nuclei at 2 super-saturations
  - Mentor: Fan Mei
- **Ice Spectrometer Filters**
  - Concentration of ice nucleating particles
  - Mentor: Paul DeMott
- **Mini-SPLAT II**
  - Single particle mixing state, aerosol size, density, and shape
  - Mentor: Alla Zelenyuk-Imre
- **PSAP**
  - Mentor: Mikhail Pekour | Connor Flynn
- **STAP**
  - Aerosol absorption
  - Mentor: Mikhail Pekour | Connor Flynn
- **SP2**
  - Soot spectrometry
  - Mentor: Art Sedlacek
- **3 wavelength integrating Nephelometer**
  - Aerosol scattering
  - Mentor: Connor Flynn

Instrument	Aerosol Size Range (um)										
	0.002	0.01	0.025	0.1	0.25	0.5	1	2.5	5	10	15
CPC 3025	■	■	■	■	■	■					
CPC 3772 IsoK		■	■	■	■	■					
CPC 3772 CVI		■	■	■	■	■					
OPC IsoK						■	■	■	■	■	■
OPC CVI						■	■	■	■	■	■
PCASP		■	■	■	■	■					
CAS-DPOL				■	■	■	■	■			
UHSAS			■	■	■	■	■	■			
SMPS		■	■	■	■						

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