



**Pacific
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The Cloud, Aerosol, and Complex Terrain Interactions (CACTI) Campaign

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and PI Meeting

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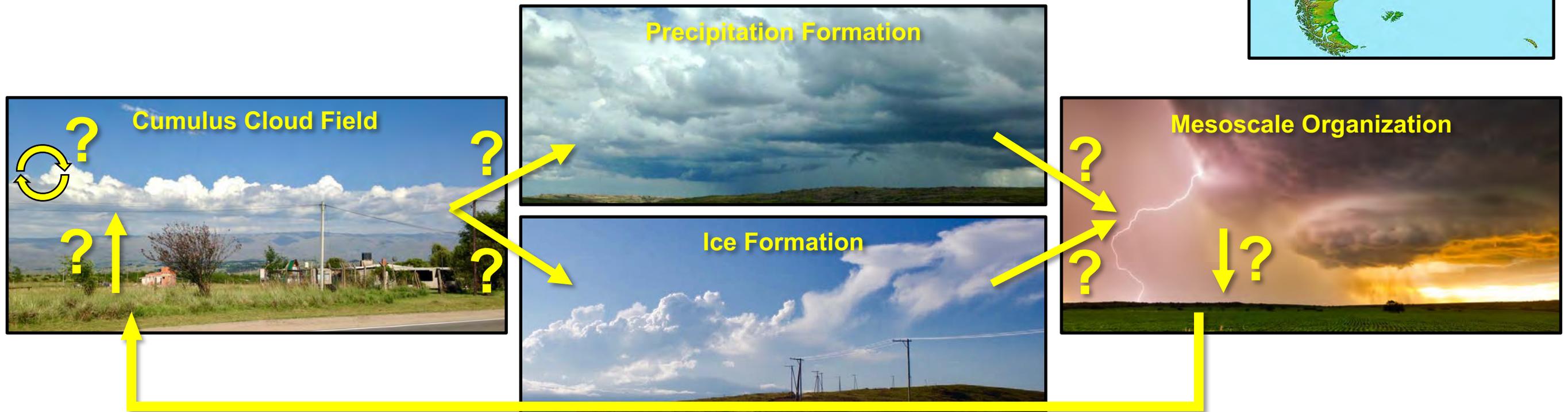
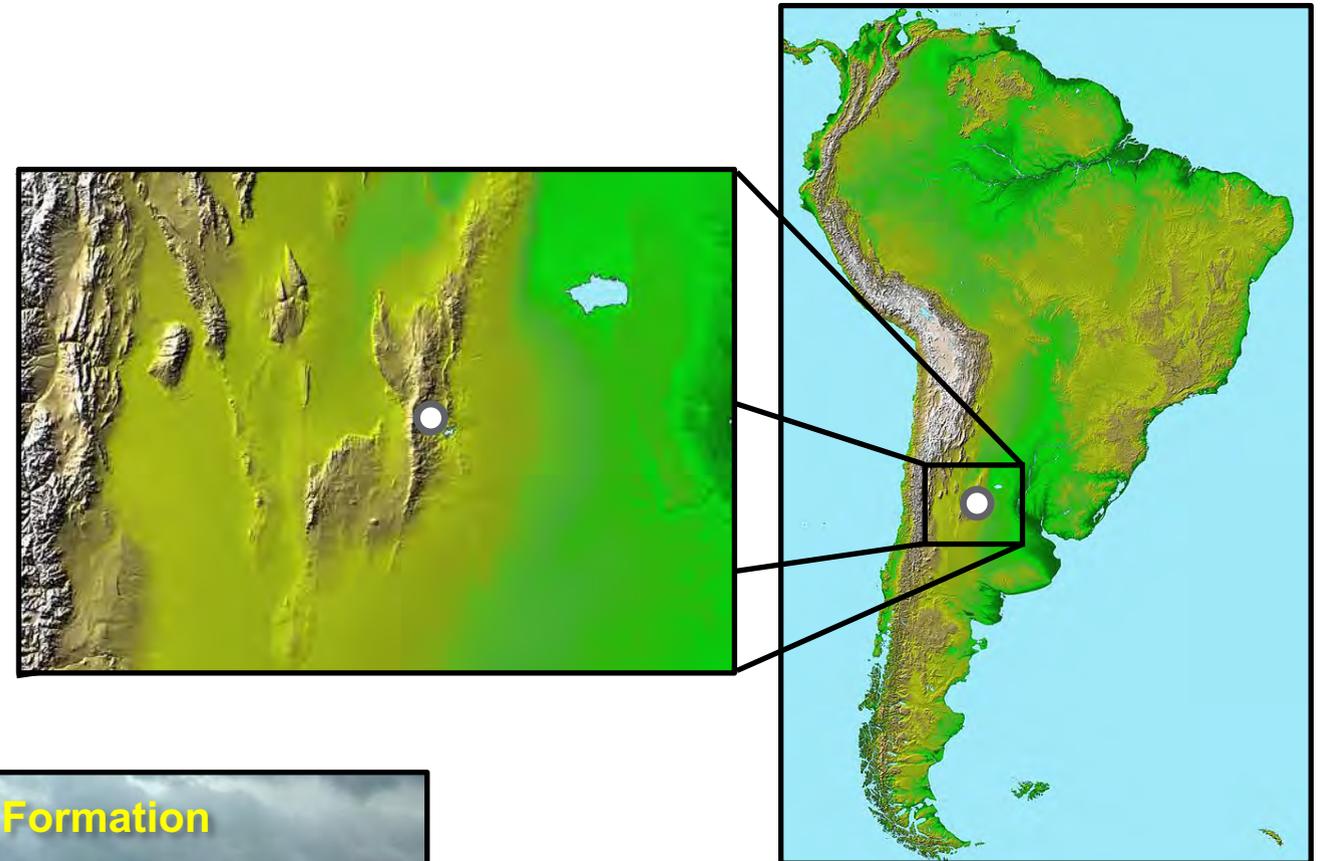
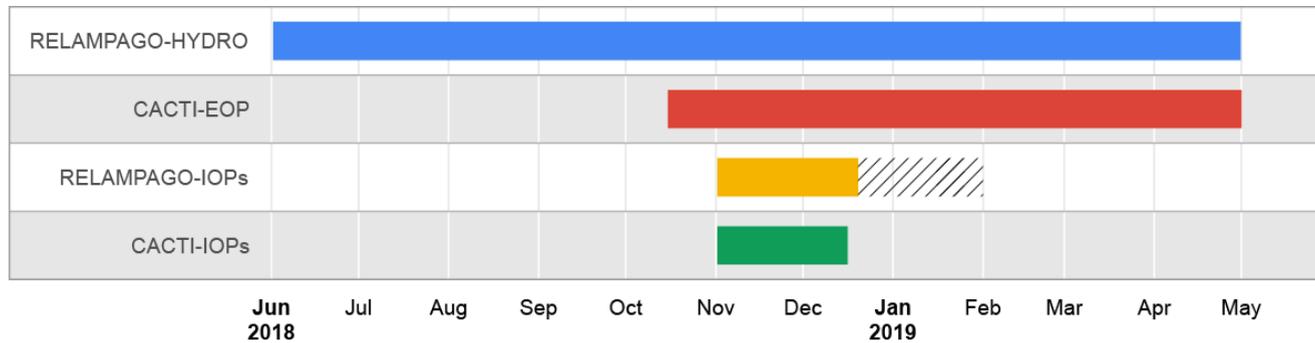


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Broad Overview of CACTI

Facilities: DOE ARM AMF-1 (> 50 instruments), C-SAPR2 radar, G-1 aircraft (IOP, ~40 in situ instruments), and supplemental sites

Primary Goal: Quantify the sensitivity of convective cloud system evolution to environmental conditions for the purposes of evaluating and improving model parameterizations



Siting

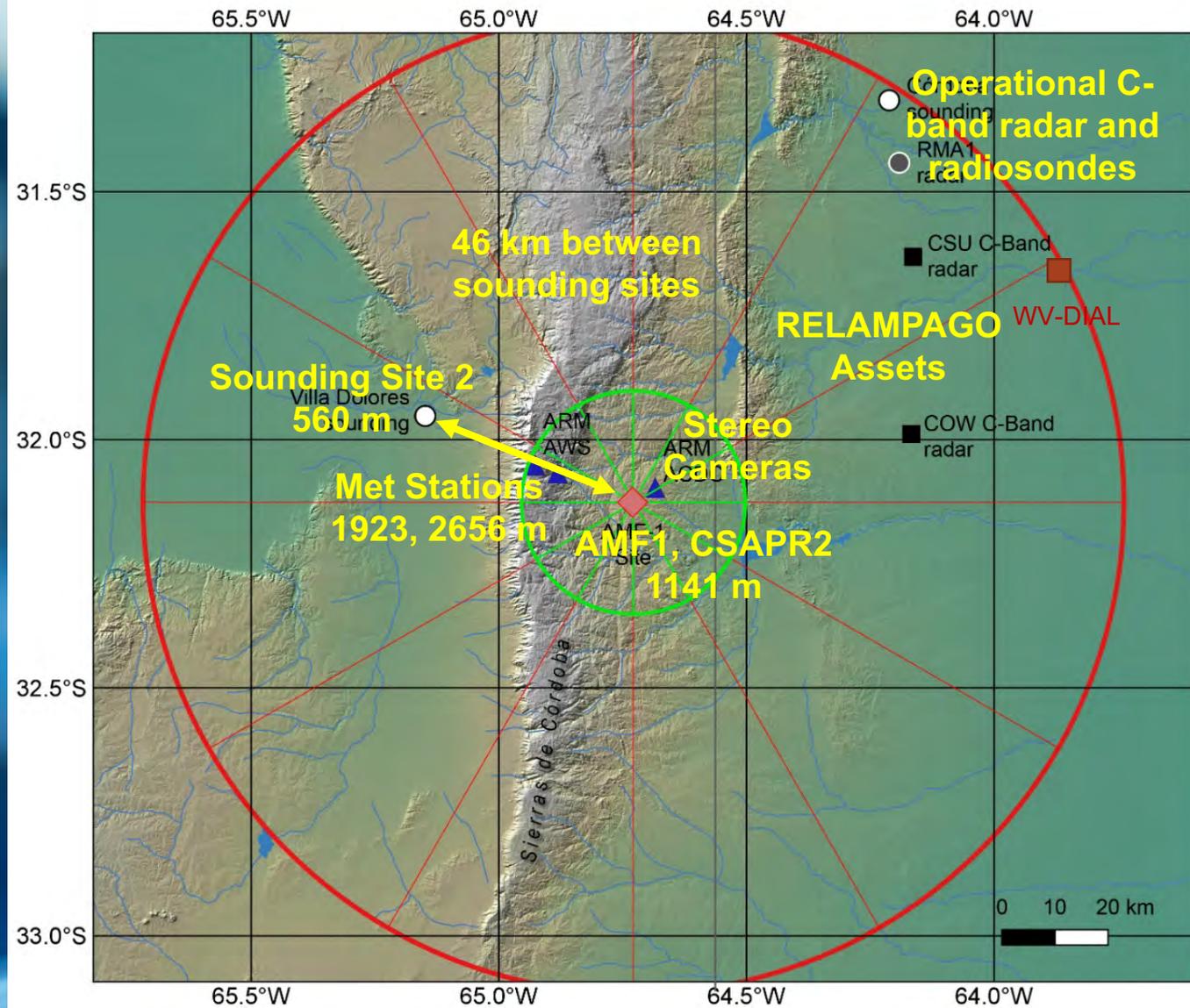
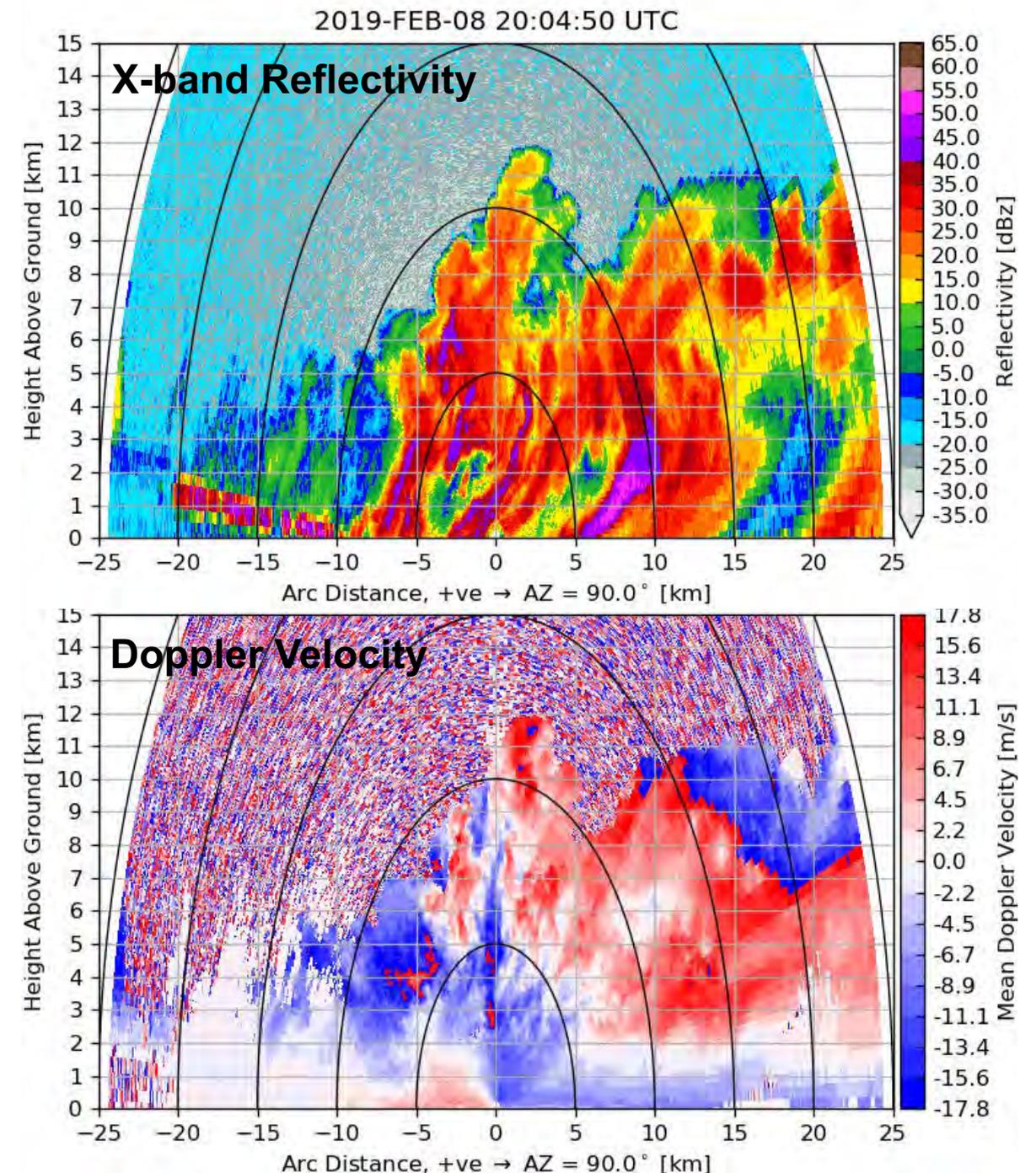


Figure courtesy of Steve Nesbitt



Ground Measurements

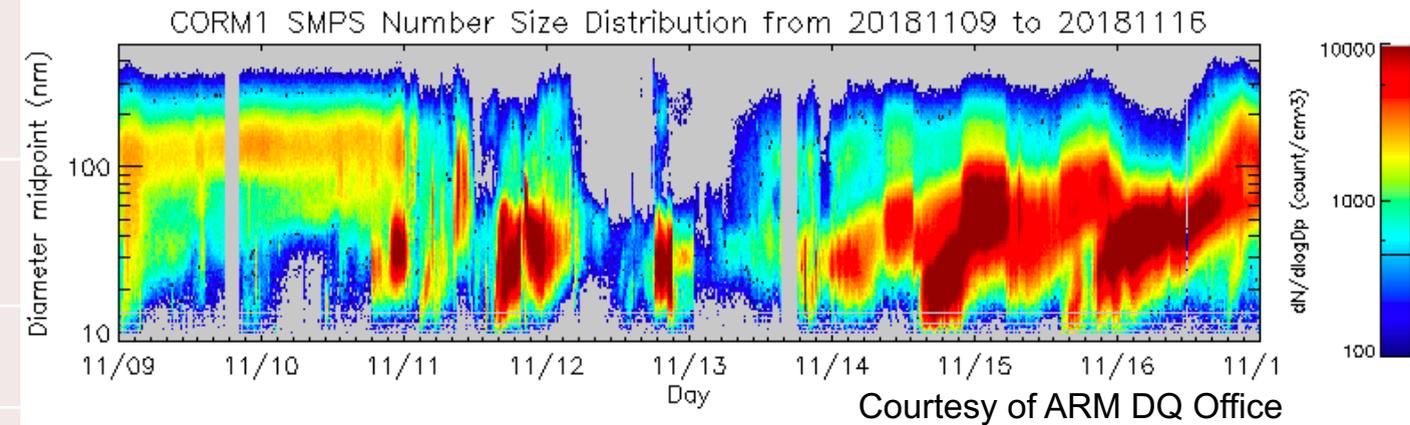
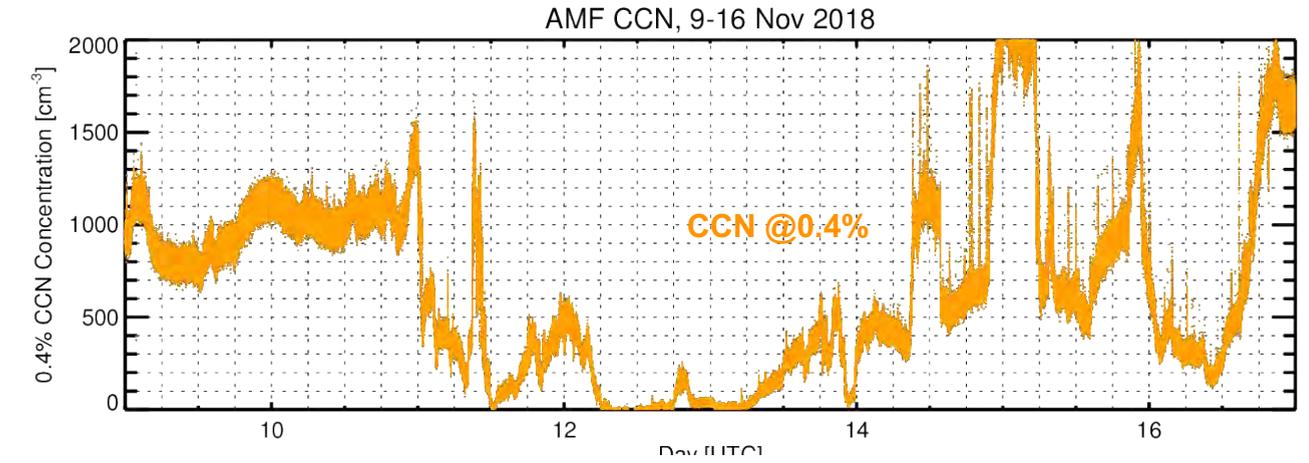
Property	Instrument
Hydrometeor radar reflectivity, Doppler velocity and spectra, cloud/precipitation kinematic and microphysical retrievals	C-band Scanning ARM Precipitation Radar Ka/X-band Scanning ARM Cloud Radar Ka-band ARM Cloud Radar Radar wind profiler
Heights of cloud bases and tops, cloud sizes and vertical velocities	ARM Cloud Digital Cameras
Cloud base height	Ceilometer
Cloud scene/fraction	Total Sky Imager
Raindrop size distribution, fall speeds, rainfall	Laser disdrometer 2D video disdrometer Tipping bucket rain gauge Weighing bucket rain gauge Optical rain gauge Present Weather Detector
Liquid water path, precipitable water	2-Channel Microwave Radiometer High-Frequency Microwave Radiometer
Surface pressure, temperature, humidity, winds, visibility	Surface meteorological instrumentation (x4)
Vertical profiles of temperature, humidity, winds	Balloon-borne sounding system (x2) Radar wind profiler Microwave radiometers
Boundary layer winds and turbulence	Doppler lidar Sodar
Surface latent and sensible heat fluxes, CO ₂ flux, turbulence, soil moisture, energy balance	Eddy Correlation flux measurement system Surface Energy Balance System



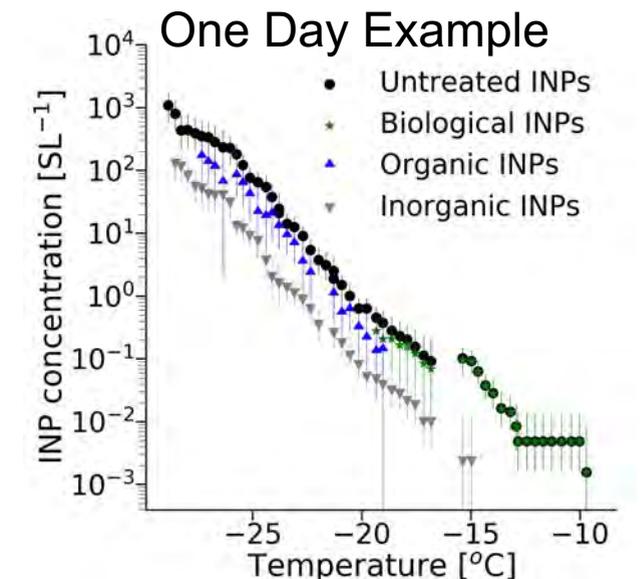
Plots courtesy of Joseph Hardin and Nitin Bharadwaj

Ground Measurements

Property	Instrument
Upwelling and downwelling radiation	Surface Energy Balance System Infrared thermometer – ground and sky Atmospheric Emitted Radiation Interferometer Sky radiation radiometers Ground radiation radiometers Hemispheric Shortwave Array Spectroradiometer Zenith Shortwave Array Spectroradiometer Multifilter radiometer Multifilter Rotating Shadowband Radiometer Cimel Sun Photometer
Aerosol backscatter profile	Micropulse lidar Doppler lidar Ceilometer
Aerosol optical depth	Cimel Sun photometer Multifilter Rotating Shadowband Radiometer
CCN concentration	Dual Column Cloud Condensation Nuclei counter
CN concentration	Condensation Particle Counters
INP concentration	Filters processed in CSU ice spectrometer
Aerosol chemical composition	Aerosol Chemistry Speciation Monitor
Black carbon	Single Particle Soot Photometer
Aerosol extinction	Ambient and variable humidity nephelometers
Aerosol absorption	Particle Soot Absorption Photometer
Aerosol particle size distribution	Ultra-High Sensitivity Aerosol Spectrometer Scanning Mobility Particle Sizer Aerodynamic Particle Sizer
O ₃ , CO, N ₂ O, H ₂ O concentration	Trace gas instrument system



Plot to right courtesy of Paul DeMott, Thomas Hill, Sonia Kreidenweis (CSU), and Baptiste Testa (U. Lyon)

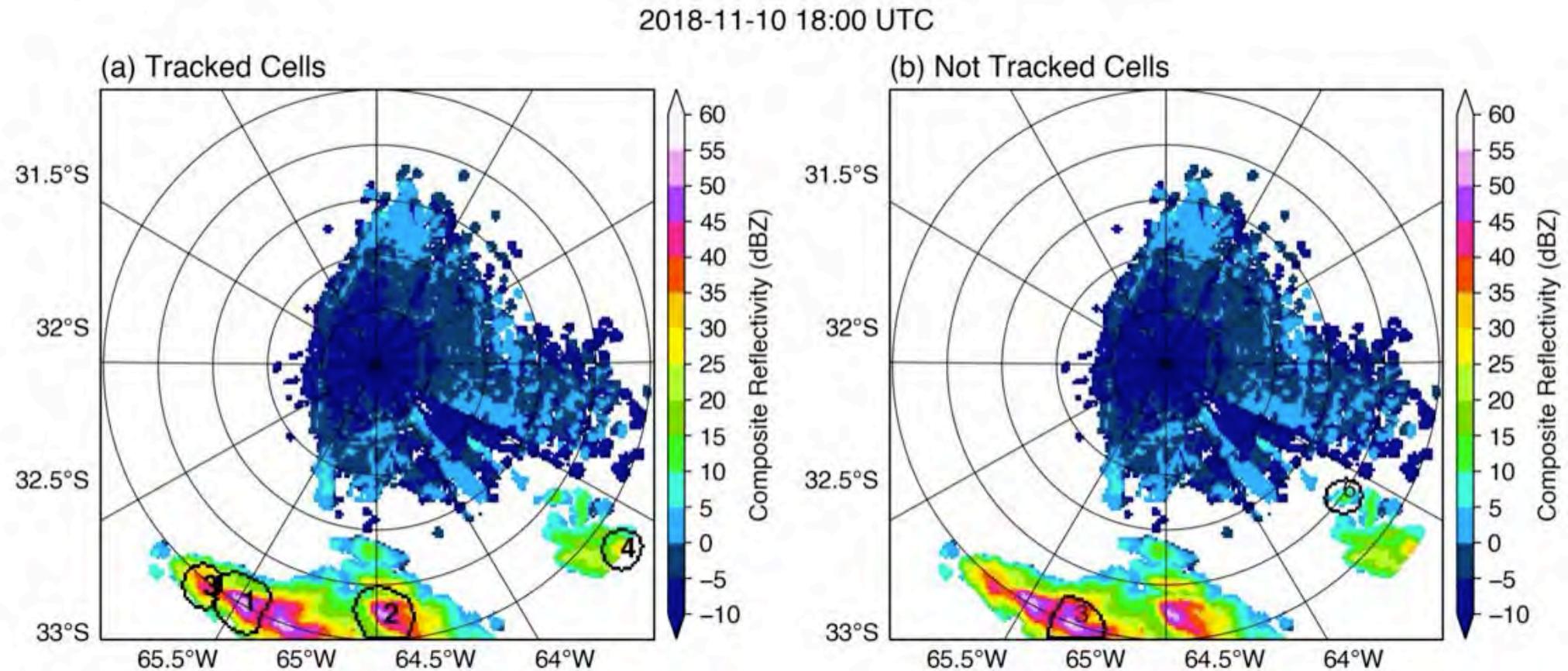


G-1 Measurements

Property	Instrument
Position/Aircraft parameters	Gust probe: Rosemount 1221F2
	AIMMS-20
	GPS (Global Positioning System) DSM 232
	C-MIGITS III (Miniature Integrated GPS/INS Tactical System)
	VectorNav-200 GPS/INS
	Video Camera P1344
Meteorology	Aircraft Integrated Meteorological Measurement System
	Tunable diode laser hygrometer
	GE-1011B Chilled Mirror Hygrometer
	Licor LI-840A
	Rosemount 1201F1
	Rosemount E102AL
Aerosol optical properties	Single Particle soot Photometer
	3-wavelength Integrating Nephelometer, Model 3563
	3-wavelength Particle Soot Absorption Photometer
	3-wavelength Single channel Tricolor Absorption Photometer
Chemical composition	Single Particle Mass Spectrometer (MiniSPLAT II)
Trace Gas measurements	N ₂ O/CO -23r
	O ₃ Model 49i
	SO ₂ Model 43i

Property	Instrument
Hydrometeor size distribution	Fast Cloud Droplet Probe
	2-Dimensional Stereo Probe
	High Volume Precipitation Sampler 3
	Cloud Particle Imager
	Cloud Imaging Probe
	Cloud and Aerosol Spectrometer
Cloud liquid water content	Particle Volume Monitor 100-A
	Multi-Element Water Content System
	Hot-wire probe from CAPS
Aerosol sampling	Aerosol Isokinetic Inlet
	Counterflow Virtual Impactor
Aerosol size distribution	Ultra-high Sensitivity Aerosol Spectrometer
	Scanning Mobility Particle Sizer
	Passive Cavity Aerosol Spectrometer
	Optical Particle Counter Model CI-3100
	Cloud and Aerosol Spectrometer – Dual Polarized
CN concentration	Ultrafine Condensation Particle Counter Model 3025A
	Condensation Particle Counter Model 3772
CCN concentration	Dual-column cloud condensation nuclei counters
INP concentration	Filter collections for CSU Ice Spectrometer

Extensive Radar Products Targeting Convective Processes



Figures provided by Zhe Feng

- Calibrated b1 scanning Ka/X/C-band radar data and LDQUANTS are available on the ARM archive
- ARSCL, Cartesian gridded SACR, and VDISQUANTS data will be available soon
- V1 Taranis retrievals and Cartesian gridded C-band and X-band PPI volumes are completed and being analyzed
- V1 Cell tracks from C-band PPI volumes are completed and being analyzed.
- And more in progress along with a long list of ARM VAPs



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Resources

CACTI Background, Science Plan, and Final Report:
www.arm.gov/research/campaigns/amf2018cacti

CACTI Datasets (some retrievals still in progress):
www.archive.arm.gov
www.arm.gov/research/campaigns/amf2018cacti

RELAMPAGO Field Catalog/Datasets:
https://www.eol.ucar.edu/field_projects/relampago

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Photo by Vagner Castro

