Scanning ARM Cloud Radar

SACR in CACTI

- Specifications
- Capabilities
- Research opportunities in CACTI
- Discussion

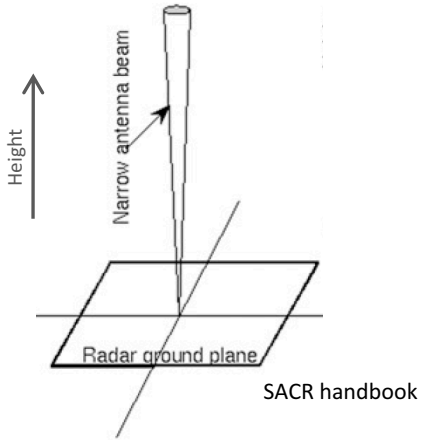
Specifications

	X-SACR	Ka-SACR
Center Frequency [GHz]	9.71	35.5
Pulse Width [ns – μs]	100 – 40	50 – 13
PRF [kHz]	up to 10	up to 10
Dynamic Range [dB]	> 80	> 80
Sampling Rate [MHz]	120	120
Antenna Diameter [m]	1.82	1.82
3 dB Beam Width [°]	1.40	0.33
Azimuth Scan Rate [°/s]	up to 36	up to 36
Elevation Scan Rate [°/s]	up to 20	up to 20

Ka/X – SACR

SACR handbook

Scan Strategies / Research Opportunities



SACR handbook

Vertically Pointing Mode

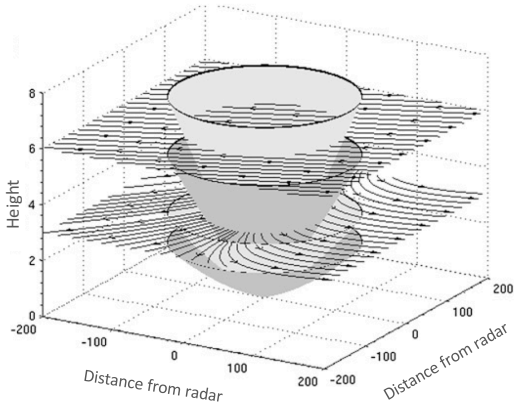
(VPT)

- Statistically significant information over time
- Synergy with collocated observations from AMF-1
- Eddy Dissipation Rate
- Microphysics Analysis (Doppler Spectra)

Scan Strategies / Research Opportunities

Plane Position Indicator

(PPI)



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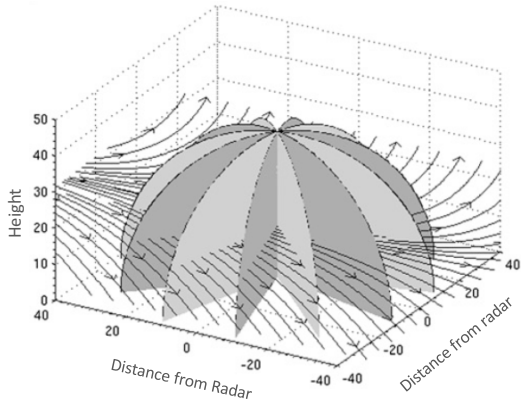
- Synoptic/Mesoscale context
- Water Vapor

Scan Strategies / Research Opportunities



SACR handbook

Hemispherical Sky Range-Height Indicator

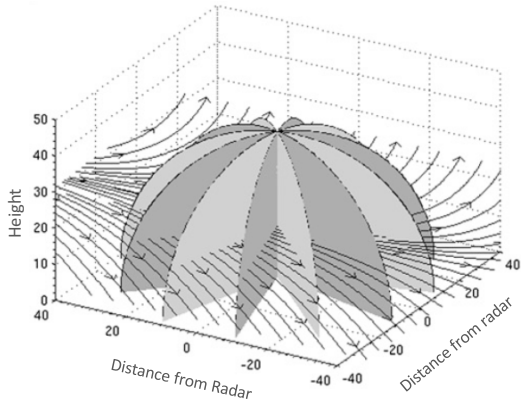
(HS-RHI or “domer”)

- Retrieval of Horizontal Wind

Scan Strategies / Research Opportunities

Hemispherical Sky Range-Height Indicator

(HS-RHI or “domer”)



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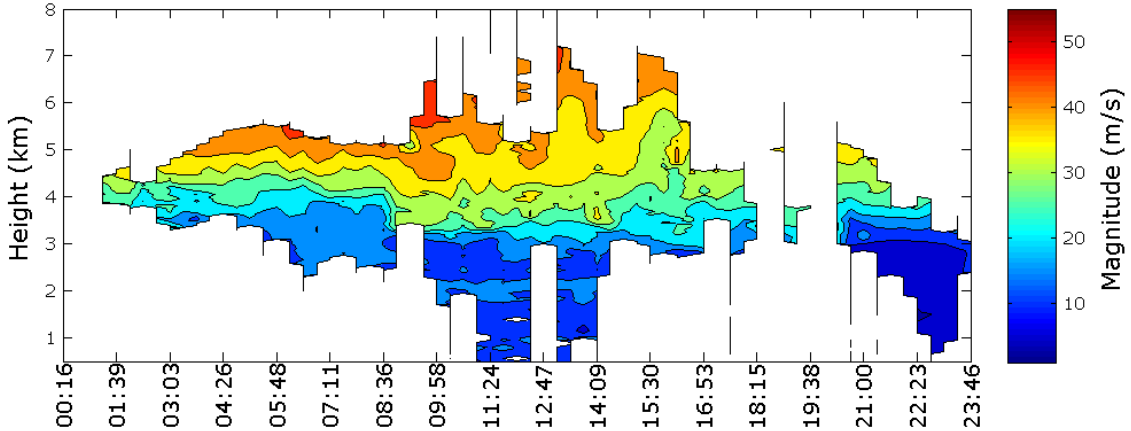
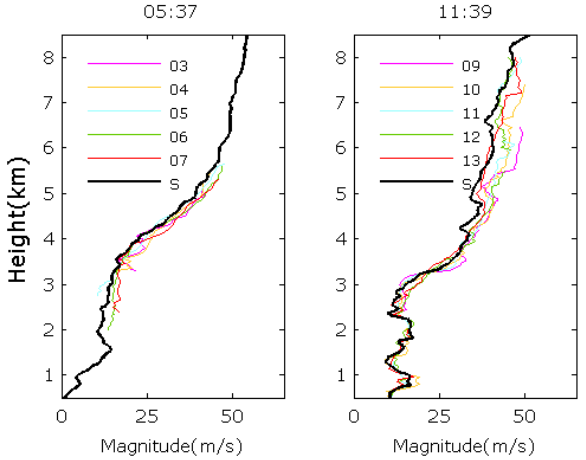
- Retrieval of Horizontal Wind



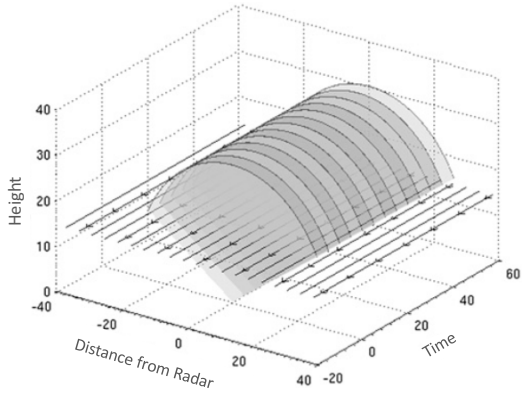


Kollias, P., et al. 2014: Scanning ARM cloud radars. Part II: Data quality control and processing. *J. Atmos. Oceanic Technol.*, **31**, 583–598

Scan Strategies / Research Opportunities

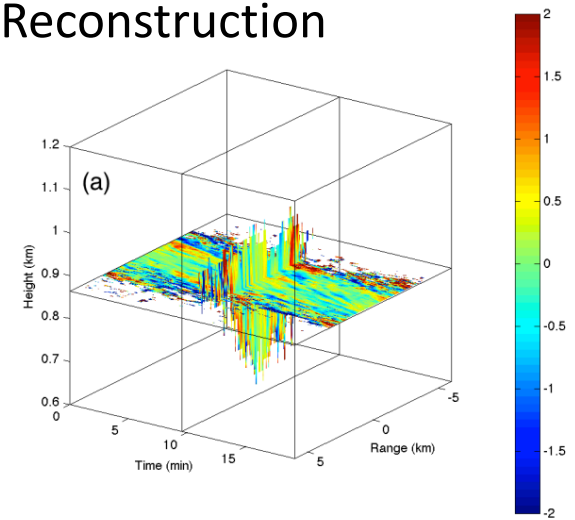
Cross Wind Range-Height Indicator

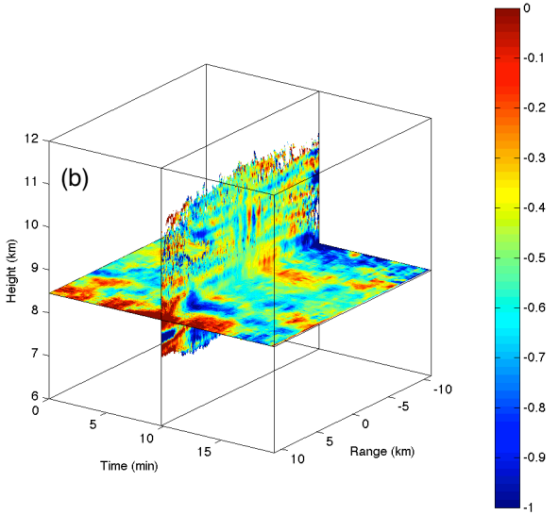
(CW-RHI)



SACR handbook

- 3-D Cloud Reconstruction

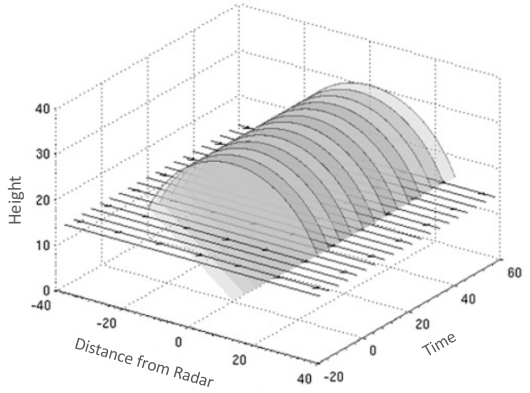




Lamer, et al. 2014:., Tatarevic: Evaluation of gridded scanning ARM cloud radar reflectivity observations and vertical doppler velocity retrievals, Atmos. Meas. Tech., 7, 1089-1103

Scan Strategies / Research Opportunities

Along Wind Range-Height Indicator (AW-RHI)



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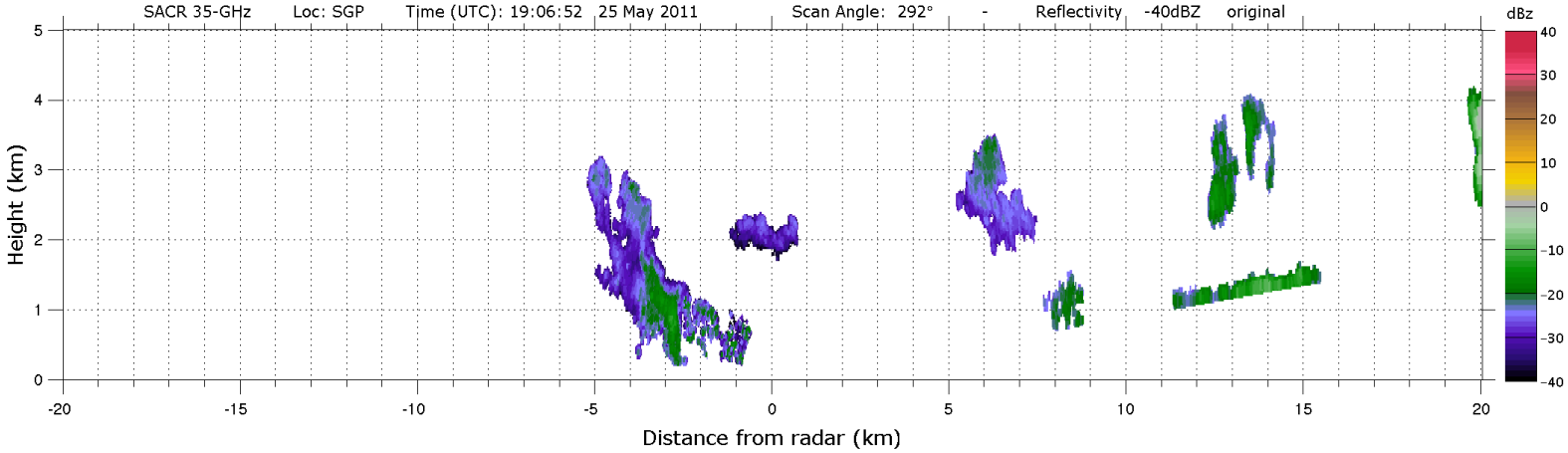
- Cloud Evolution

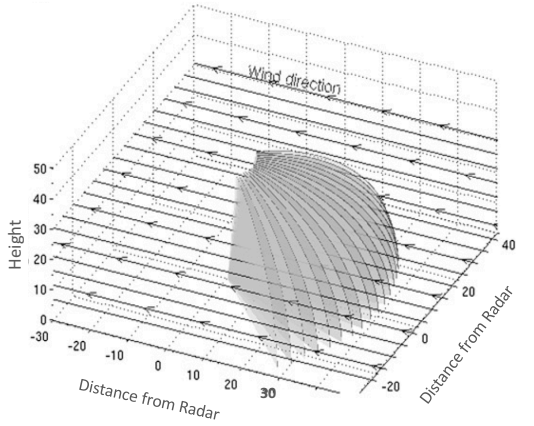


Borque, P., et al. 2014: First observations of tracking clouds using scanning ARM cloud radars. J. Appl. Meteor. Climatol., 53, 2732–2746

Scan Strategies / Research Opportunities

Boundary Layer Range-Height Indicator

(BL-RHI)

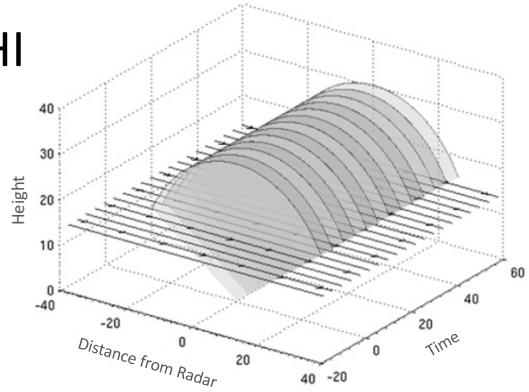


SACR handbook

- 3-D Cloud Reconstruction
- Cloud Evolution

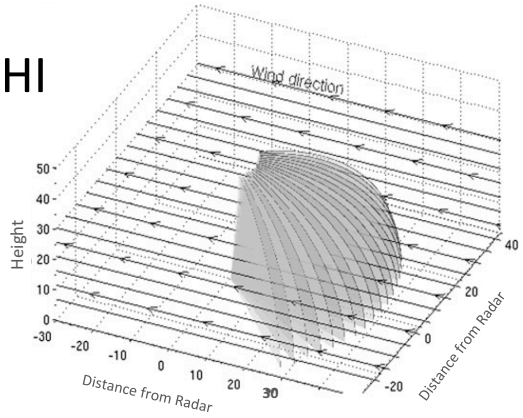
Cloud Evolution

AW-RHI



- Fast revisit time
- Able to track ‘fast’ moving clouds
- Wind direction
- Little-to-no wind shear

BL-RHI

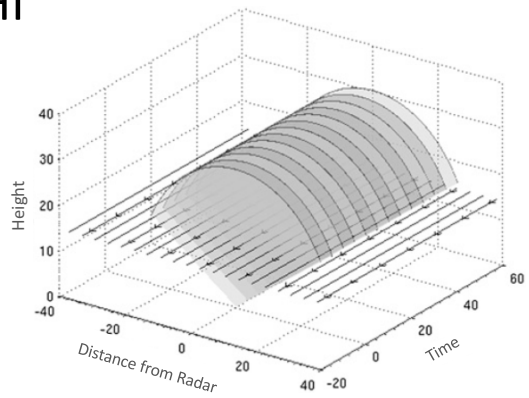


- Wind is less of a constrain
- Adds context to cloud field
- Slower revisit time
- Smaller horizontal coverage

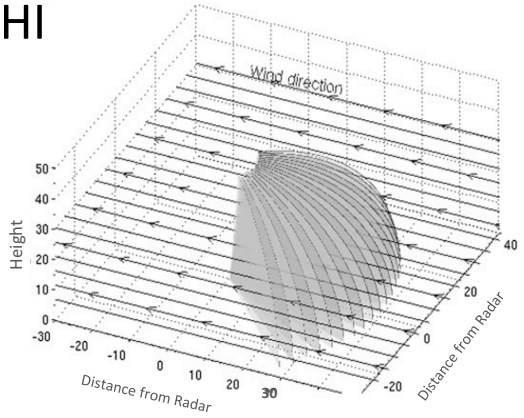
Best strategy to study cloud lifecycle depends on cloud type and environmental conditions

3-D Cloud Reconstruction

CW-RHI



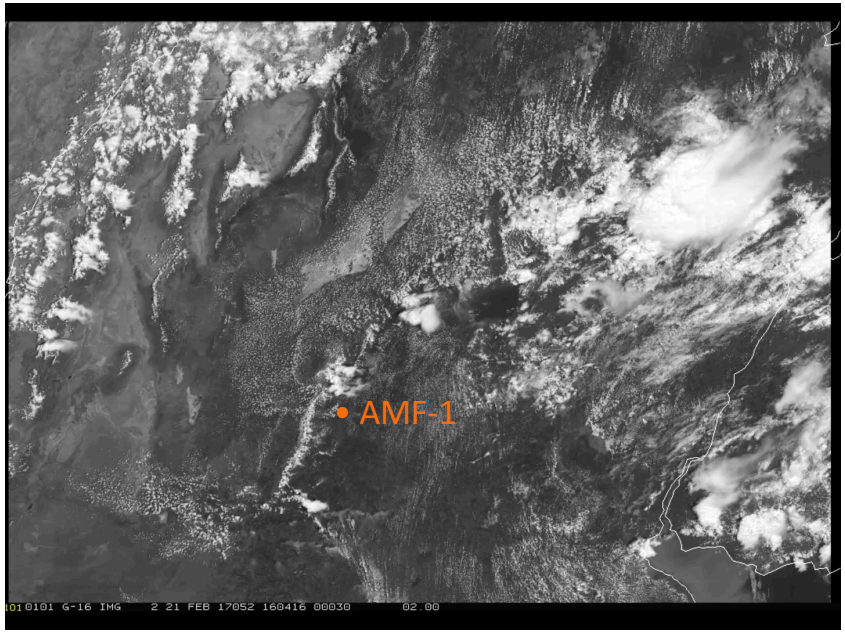
BL-RHI



Similarly, the best strategy for the optimal three dimensional cloud reconstruction depends on cloud type and environmental conditions and proximity to topography

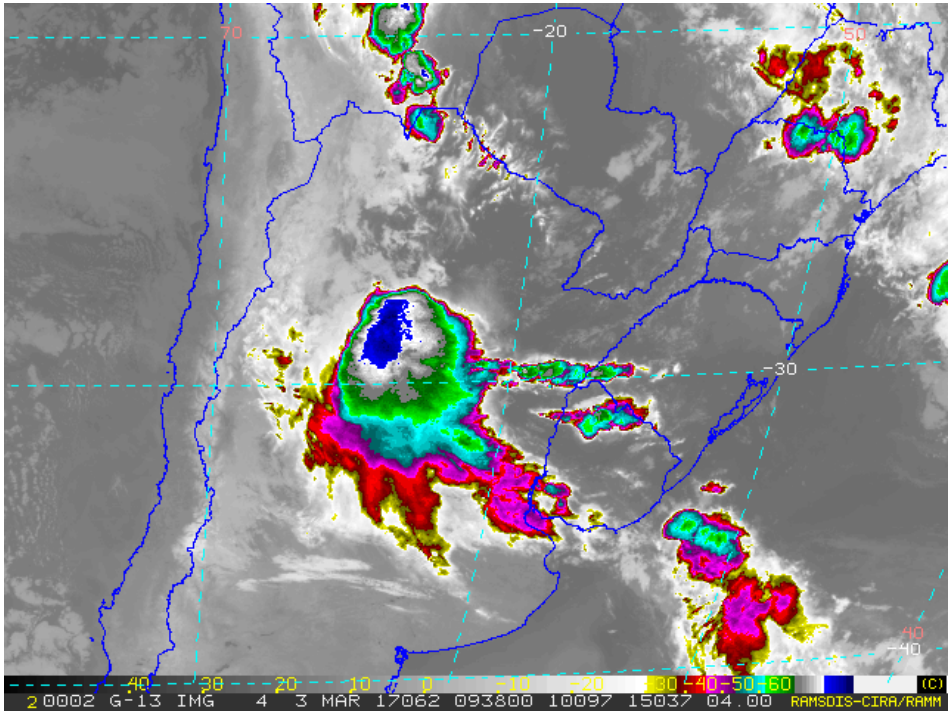
Optimal Scan Strategies during CACTI

GOES-16 testing 21 Feb 2017 (30 s, 500 m vis imagery)

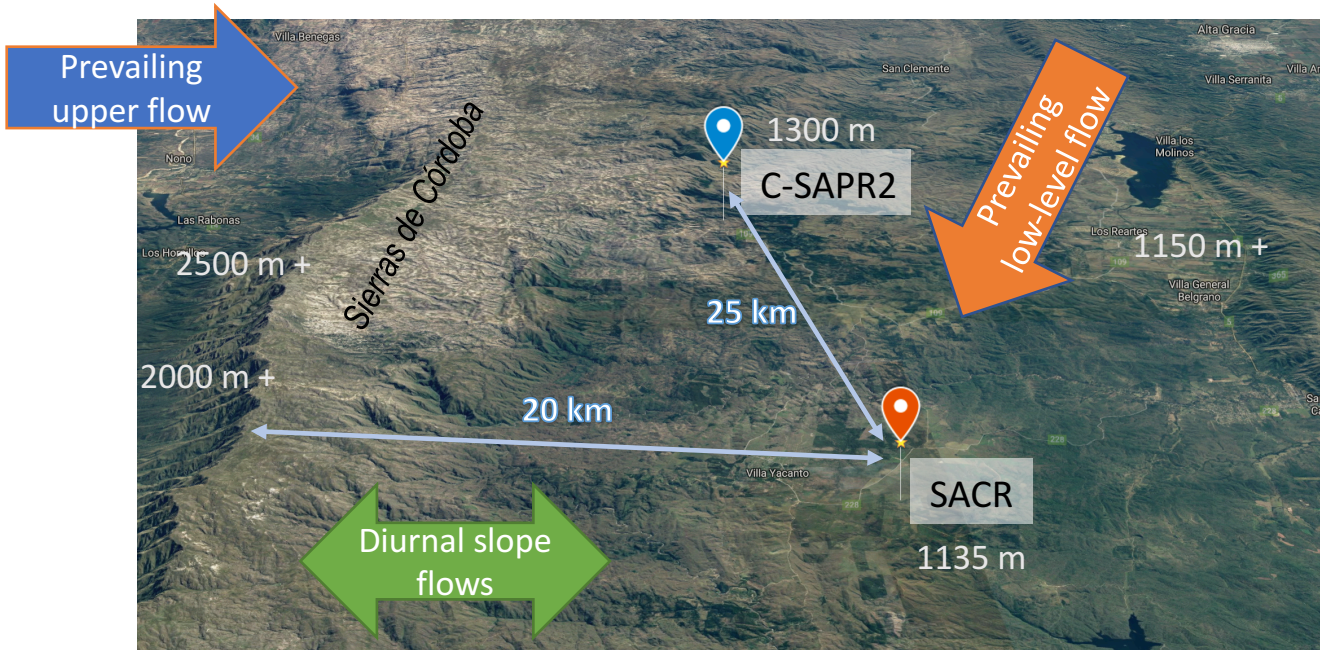


Courtesy Steve Goodman NOAA/NASA

GOES-13 IR 3 Mar 2017



Optimal Scan Strategies during CACTI



What is the optimal scan strategy to capture terrain-forced cloud initiation (~west) and upscale growth/decay (~east)?