#128

Combined analysis of observed and simulated convective and stratiform rain structures, convective dynamics, and microwave radiances on May 20th during MC3E

Ann Fridlind/GISS • Di Wu, Toshihisa Matsui, Wei-Kuo Tao/GSFC • Andrew Ackerman/GISS • Kirk North/McGill • Scott Collis/ANL

C-SAPR at SGP

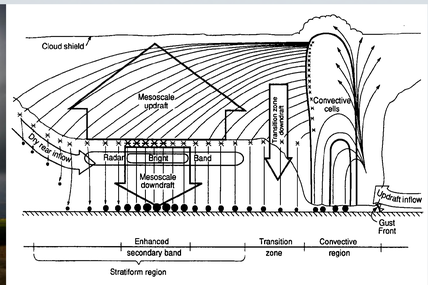
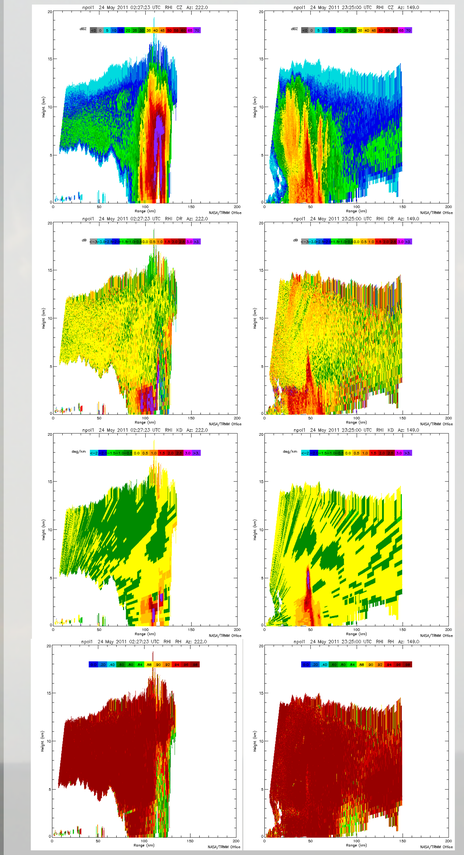


FIG. 1. Conceptual model of precipitation particle trajectories and mean vertical motions through the trailing stratiform region of a squall-line system.

Biggerstaff and Houze (1993)

A = 3D C-SAPR polarimetric obs

- ***Goal***—Observationally evaluate high-resolution model (HRM) simulations of MC3E convective systems
- ***Problem***—Ice particle fountain source is strong updrafts, where no in situ observations exist
- ***Solution***—Use evidence of microphysical processes in scanning C-band polarimetric radar fields
- ***Approach***—Forward-calculate radar fields from HRM
- ***First task***—Develop well-observed case studies



Horizontal reflectivity

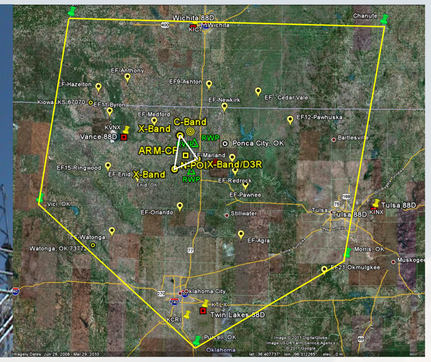
Differential reflectivity

Specific differential phase

Cross-correlation coefficient

Example: NPOL at MC3E (Source: W. Peterson)

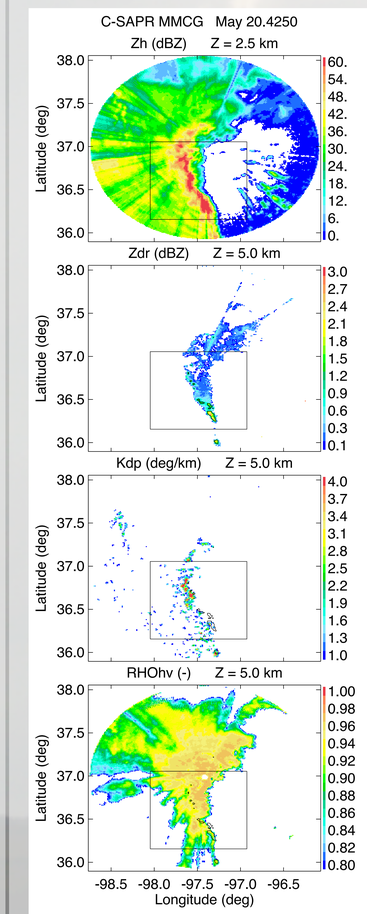
Southwest X-SAPR



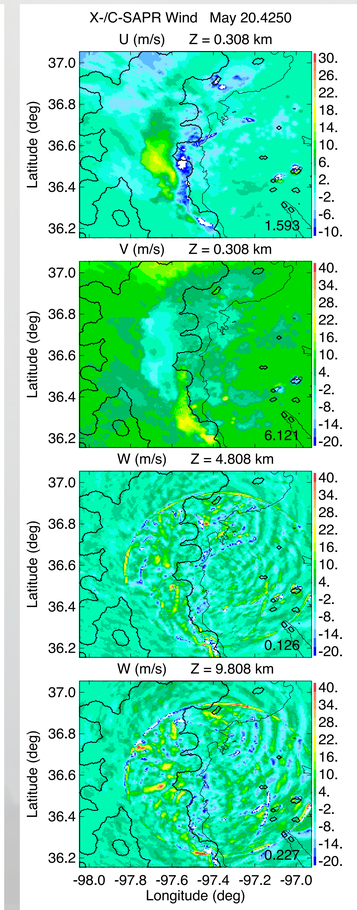
X-/C-SAPR array at SGP

B = 3D wind vector retrievals

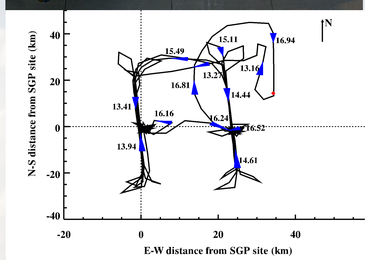
- ***Problem***—Simulated updraft microphysical processes are closely coupled with dynamical fields, not constrained by C-SAPR alone
- ***Solution***—Use X-/C-SAPR wind vector retrievals
- ***Approach***—Combined objective analysis focused on updrafts
- ***Example***—C-SAPR Zdr > 1 dBZ at 5 km in X-/C-SAPR domain

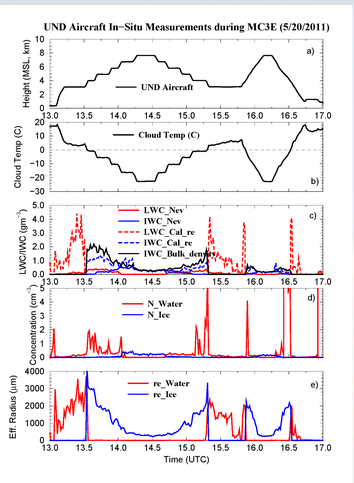


C-SAPR MMCG VAP



X-/C-SAPR Wind Retrieval





UND Citation, flight track, measurements (Source: X. Dong)

C = 0D/1D/2D aircraft + ground data

- ***Problem***—Aerosol and hydrometeor size distributions and properties are required to fully constrain HRM inputs and outputs
- ***Solution***—Use ancillary point, profile, layer data sources
- ***Approach***—Do not generally assume statistical robustness
- ***Focus (collaborators)***—Number size distribution properties and mass mixing ratios of cloud droplets, raindrops, ice by largest dimension (X. Dong, C. Williams, A. Tokay, W. Peterson); properties of ice (G. McFarquhar); microwave radiances (G. Liu)

SOURCE	4/25	4/27	5/1	5/20	5/23	5/24
C-SAPR	A	A	A	A	A	A
X-/C-SAPR	B			B	B	
NPOL	C	C	C		C	C
Cit/Aerosol	C	C	C	C	C	C
Cit/Cloud Phys	C	C	C	C	C	C
C-SAPR/Precip	C	C	C	C	C	C
Disdrometer	C	C	C	C	C	C
NOAA S-Prof	C	C	C	C	C	C
Sat/Microwave	C	C	C	C	C	C

Acknowledgments

- ***Funding***—2012-2015 DOE ASR Grant, NASA RSP
- ***Observations***—ARM data archive, NASA PPM
- ***Computations***—DOE NERSC, NASA HEC/SMD