Characterizing Convective and Stratiform Precipitation Regimes observed during MC3E using C-SAPR Radar

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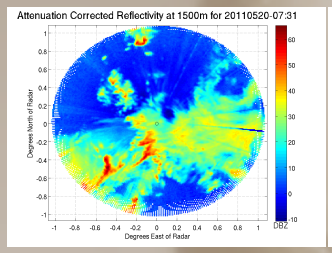
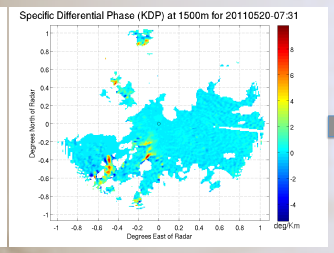
Observations

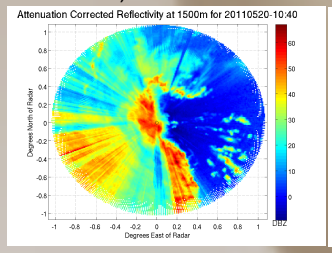
Observations gathered from the new ARRA funded, C-band (5.6 GHz) scanning radar (C-SAPR) located at the Oklahoma, SGP site, during the 2011 Mid-latitude Continental Convective Cloud Experiment (MC3E) are used to partition precipitation events into convective cloud and widespread stratiform rainfall regimes. These results are then compared with independent measurements of precipitation from collocated instruments.

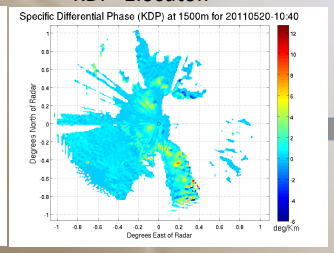




Max 45, Min 15 DBZ cutoff

KDP>1.0cutoff





Reflectivity (Z)

The CSAPR Radar scans above were first processed and moments gridded in the ARM MMCG Product. Traditional radar reflectivity (Z)-based precipitation classification methods (Steiner et al 1995) may suffer due to attenuation of Z during intense storms.

See Poster by Scott Collis.

Specific Differential phase (KDP)

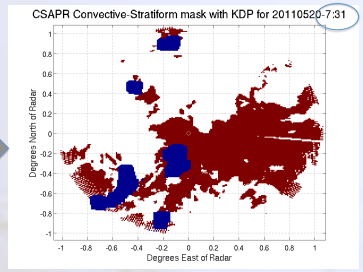
KDP is a polarimetric variable derived from the phase shift occurring with various hydrometeor shapes. Since it is unaffected by attenuation, the addition of KDP allows an unbiased, improved retrieval of precipitation regimes (Straka et al 2000).

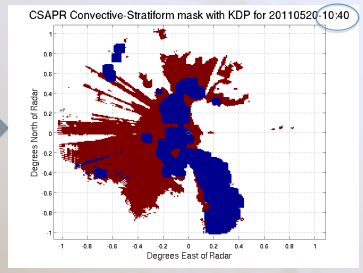
See Poster by Scott Giangrande.

Product

Convective-Stratiform Precipitation Mask

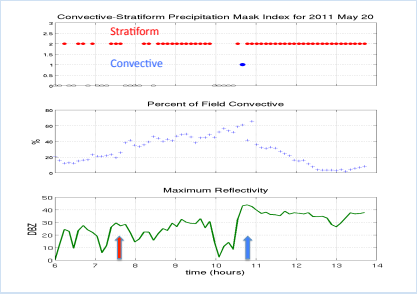
The radar Reflectivity and KDP information is combined to produce a spatial precipitation mask which is unaffected by attenuation or calibration errors.



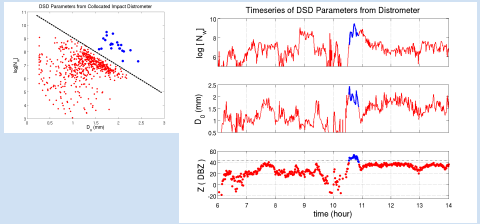


Radar scans are used to produce a spatial precipitation mask (above) every 7 minutes. The 1500 meter height is used to avoid contamination of Z from the melting layer. Convective regimes are marked in blue, Stratiform in red.

Validation

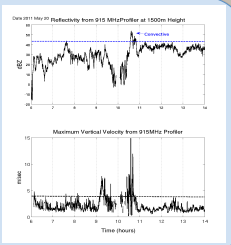


Daily time series of Convective-Stratiform Mask results over the SGP site for May 20, 2011. The times of the two CS-Masks presented (left) are noted.



Partitioning agrees well with collocated surface-based impact disdrometer data to reveal multiparameter bulk drop size distribution (Bringi et al 2009) linked to the assigned radar-based regimes.

Results of the precipitation mask partitioning also agree with those from a nearby, 915 MHz Wind Profiler radar. This non-attenuating radar provides insights into vertical velocity structure and validates the 45 dBZ cutoff.



Bringi, V. N., C.R. Williams, M. Thurai and P.T. May, 2009: Using Dual-Polarized Radar and Dual-Frequency Profiler for DSD Characterization: A Case Study from Darwin, Australia. J. Atmos. Oceanic Technol., **26**, 2107-2122.

Steiner, M., R. A. Houze and S.A. Yuter, 1995: Climatological Chatacterization of Three-Dimensional Storm Structure from Operational Radar and Rain Gauge Data. *J. Appl. Meteor.*, **34**, 1978-2006.

Straka, J. M., D.S. Zrnic and A. V. Ryzhkov, 2000: Bulk Hydrometeor Classification and Quantification Using Polarimetric Radar Data: Synthesis of Relations. *J. Appl. Meteor.*, **39**, 1341-1372.