# FAst-physics System TEstbed and Research Project (FASTER)

# Convective-Stratiform Precipitation and Vertical Velocity Products


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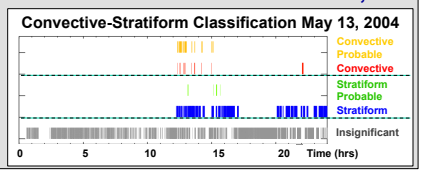
## 1. Motivation:

The objective of the FASTER project is to use continuous ARM observations to enhance and accelerate evaluation and improvement of parameterizations of fast processes in GCMs. Convective-stratiform precipitation separation is necessary for model development and evaluation.

## 2. Dataset: MMCR-based Convective-Stratiform Classification for SGP, 1999 – 2007:

The long-term record of vertically pointing millimeter wavelength cloud radar (MMCR) at SGP is used to classify precipitation type.

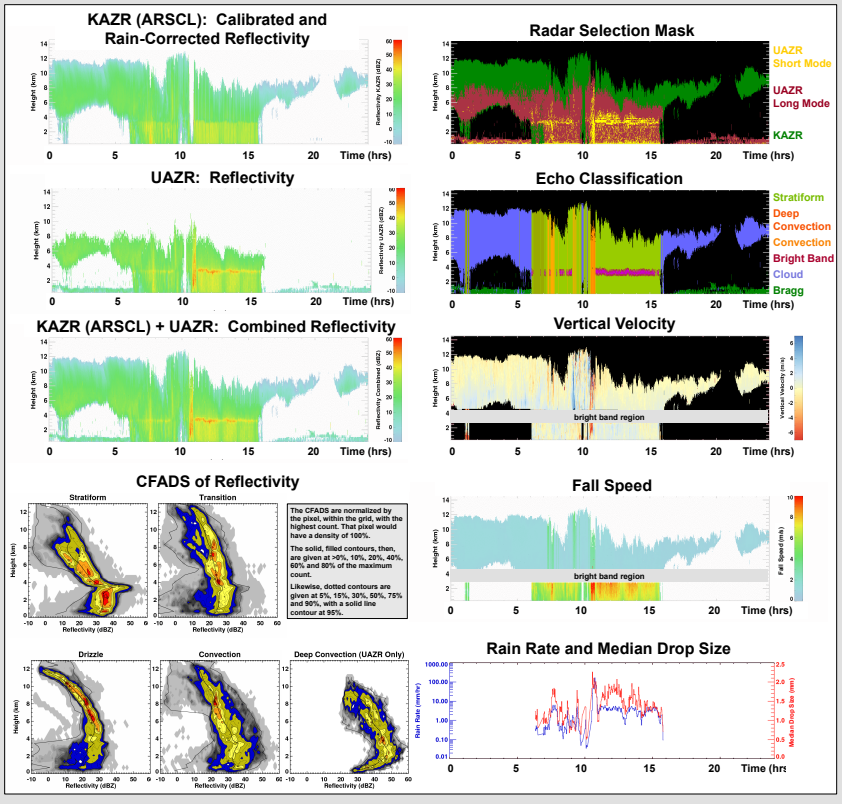
An applied algorithm recognizes attenuation caused by convective cores, using reflectivity and mean doppler velocity thresholds.




## 3. Dataset: KAZR/UAZR/Disdrometer Convective-Stratiform Classification for SGP, April 22 – May 6, 2011 (MC3E):

To evaluate the MMCR-based method, in terms of its classification effectiveness over the SGP, Ka-band ARM Zenith Radar (KAZR) and UHF ARM Zenith Radar (UAZR) observations from the 2011 Midlatitude Continental Convective Clouds Experiment (MC3E) are constrained with JWD impact disdrometer measurements, and integrated to exploit their unique sensitivities. The result allows identification of regions of cloud, stratiform precipitation, drizzle, convective cores, and elevated convection.

Illustrated below are some of the capabilities of the dataset for the MC3E rain event on **May 20, 2011**:





**Summary:** In support of the FASTER project, convective-stratiform rain classification products have been developed using data from the ARM radars at SGP. A partitioning method applied to the long-term record of MMCR measurements (1999 – 2007) is evaluated using comprehensive KAZR, UAZR and NEXRAD observations from MC3E.

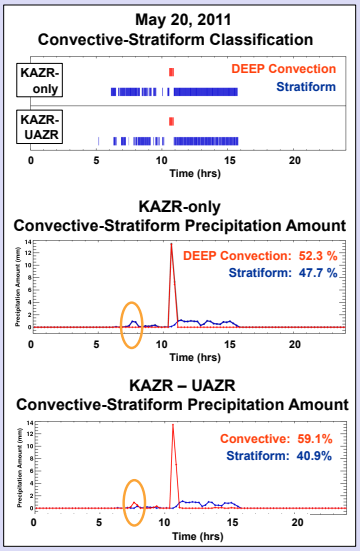

## 4. Algorithm Evaluation of MMCR-based Classification:

The combined KAZR-UAZR classification is compared to results from the attenuation-based classification of KAZR-only data, providing insights into the performance of the 1999 – 2007 MMCR-based partitioning.

The KAZR-only method does well picking up deep convection, but does not pick up weak/elevated convection.

Other classification methods were applied to the dataset:

- Requiring a surface KAZR reflectivity threshold of 40+ dBZ for convection yields the following percentages of precipitation amount:
  - **Convective: 51.0 %**
  - **Stratiform: 49.0 %**
- A simple disdrometer threshold of 10+ mm/hr yields:
  - **Convective: 51.6 %**
  - **Stratiform: 48.4 %**




## 5. Spatial Evaluation of KAZR-UAZR Classification:

Both datasets described provide convective-stratiform classification over the SGP site only. In order to determine how representative the site is to the surrounding area, the following evaluation was performed using the UND NExt-generation weather RADar (NEXRAD) Convective-Stratiform partitioning (X. Dong):