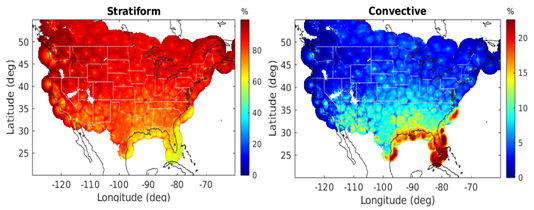
Spatial, seasonal, and diurnal variations of convective and stratiform precipitation in the US

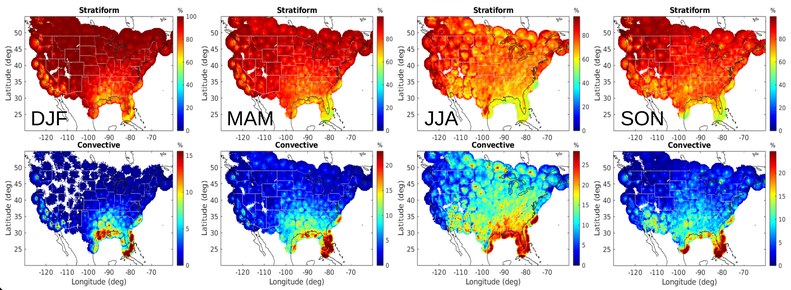
Ulrike Romatschke romatsch@ucar.edu, Michael Dixon

Convective and stratiform precipitation in the US

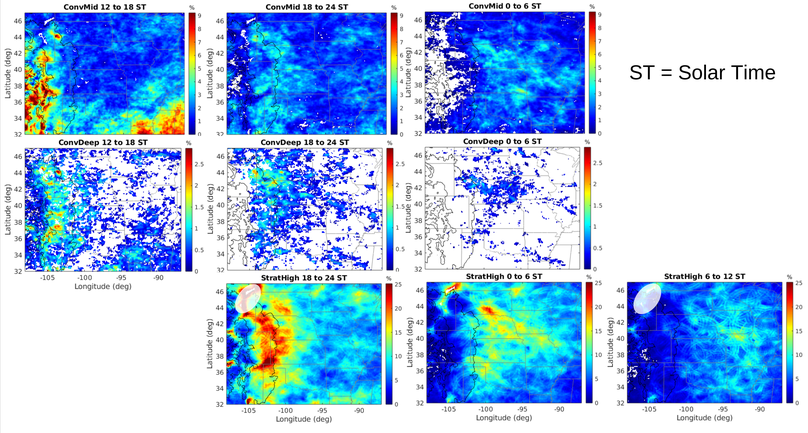
Total occurrence of precipitation type
- US precipitation is mostly stratiform by area.
- Convective precipitation occurs mostly in the south, particularly in the southeast, but also over the Great Plains.



Seasonal occurrence of precipitation type
- Winter precipitation is mostly stratiform, especially in the north.
- Convective precipitation increases northward during the warm season.



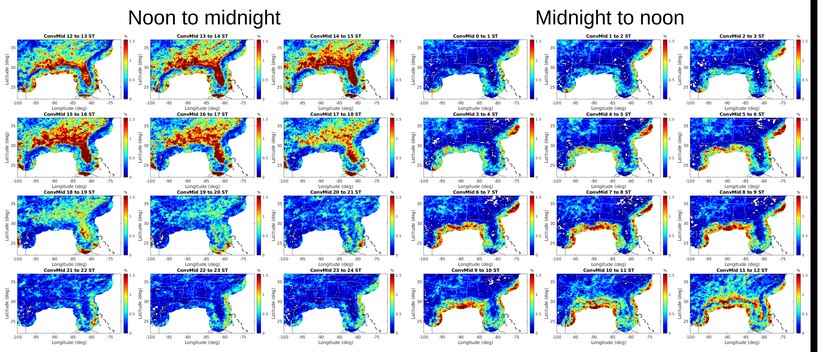
Diurnal cycle of summer precipitation over the Great Plains



ST = Solar Time

- Storms develop in the afternoon as convective systems (convMid, convDeep) in the south.
- They develop further north in the evening.
- They mature and develop anvil clouds (stratHigh) during the evening.
- They move east during the night an dissipate in the morning.

Diurnal cycle of summer precipitation in the Southeast



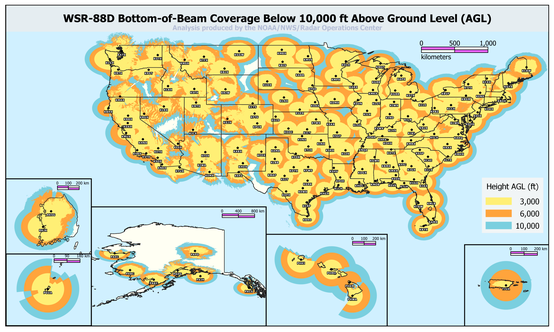
Continental convective systems
- Form near the coast in the late morning, likely because of diurnal heating and sea breeze effects
- Increase and spread north in the afternoon
- Dissipate in the evening

Maritime convective systems
- Form in the early evening near the coast of Florida, likely because of land breeze effects
- Form at night over all other coasts
- Increase in the morning and move offshore

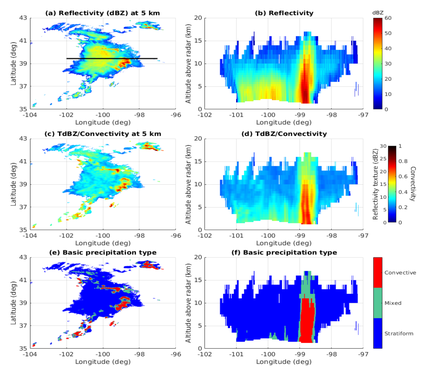
Data

Multi-Radar/Multi-Sensor System (MRMS) 3D gridded radar observations
- Three years: 2021-2023
- Horizontal resolution: 1 km
- Re-gridded to 0.01 deg latitude/longitude grid
- 31 vertical levels
- Temporal resolution: 6 minutes

The availability of this high-resolution data set allows for a detailed study of storm structure and evolution.

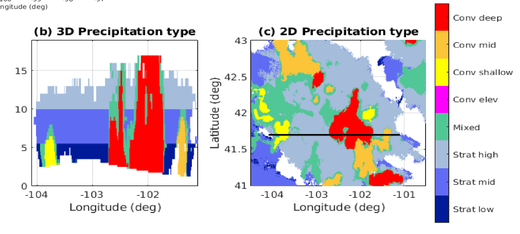


ECCO



The Echo Classification from COnvectivity (ECCO) algorithm provides
- 3D convectivity values
- 2D horizontal column maximum convectivity values
- 3D convective/stratiform echo classifications
- 2D horizontal convective/stratiform echo classifications

The advanced classification subdivides echoes based on their maximum depth (convective) and altitude (stratiform).



Conclusions and future work

The ECCO algorithm was applied to three years of MRMS data.
- The 3D convective/stratiform echo classification can be used to investigate the characteristics, structure, and evolution of precipitation.
- Summer storms form over the Rocky Mountains, grow into Cumulonimbus clouds and Mesoscale Convective Systems near the foothills, advect over the Great Plains, and dissipate in the east.
- Summer storms in the southeast form over land near the coasts during the day and offshore during the night.

Future work
- The high spatial and temporal resolution of the data allows for the tracking of storms and the investigation of their individual life cycles.

ECCO
- available in LROSE (Lidar Radar Open Software Environment, http://lrose.net)
- Described in Dixon and Romaschke (2022) https://doi.org/10.1175/JTECH-D-22-0018.1

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Three-Dimensional Convective–Stratiform Echo-Type Classification and Convectivity Retrieval from Radar Reflectivity

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