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Springtime Onset of Isolated Convection in the Southeastern United States: Initial Results From a Ten-Year Radar Analysis

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Introduction

Motivation: *How does the summer regime of isolated convection evolve across the U.S.? Does its monthly progression behave like a monsoon? Rickenbach et al. (2019) found in a four-year analysis for the southeast U.S., a clear summer maximum in rain from isolated convection was embedded within a flat annual cycle of total precipitation. How does the transition to the summer isolated convection regime vary each year over a longer ten-year period? Does this monsoon-like behavior occur across the entire U.S.?*

As a first step to evaluate the data to be used, this poster presents an overview of the evolution of monthly averaged precipitation for March-August using an archive of high-resolution Multi-Radar/Multi-Sensor (MRMS) NEXRAD-based precipitation data set over the Continental United States (CONUS).

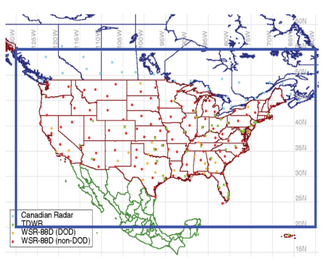
- Currently, we have obtained and processed data for the years 2010 and 2011.
- The MRMS NEXRAD dataset consists of hourly gridded precipitation across the US, and is produced at the National Oceanic and Atmospheric Administration's National Centers for Environmental Information (NOAA NCEI) in Asheville, North Carolina, USA.
- This is the first implementation of this dataset, therefore the presented monthly averaged precipitation maps serve the purposes of (1) quality checking the dataset and (2) comparing the observed averages with that of other datasets.

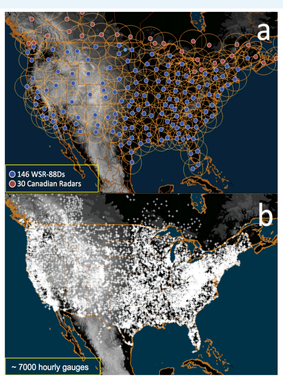
Methodology

Dataset

Data processing was performed using version 2.0.2 of the Grid Analysis and Display System (GrADS).

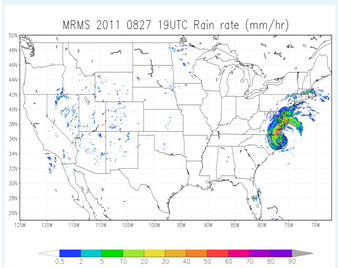
- **Contents:** The MRMS NEXRAD dataset consists of hourly precipitation rate measurements every five minutes in netCDF format.
- **Domain:** The MRMS system extends across the domain of the Continental United States, ranging from 20-55°N and 130-60°W.
- **Resolution:** The MRMS system has a horizontal resolution of 0.01°latitude x 0.01°longitude (1 km x 1 km) (Zhang et al. 2011).
- **Data Source:** A combination of Weather Surveillance Radar 88 Doppler (WSR-88D and Canadian radars, in addition to adjusted rain guage measurements, are the sources of precipitation data for the MRMS system. The MRMS data were produced at NOAA NCEI



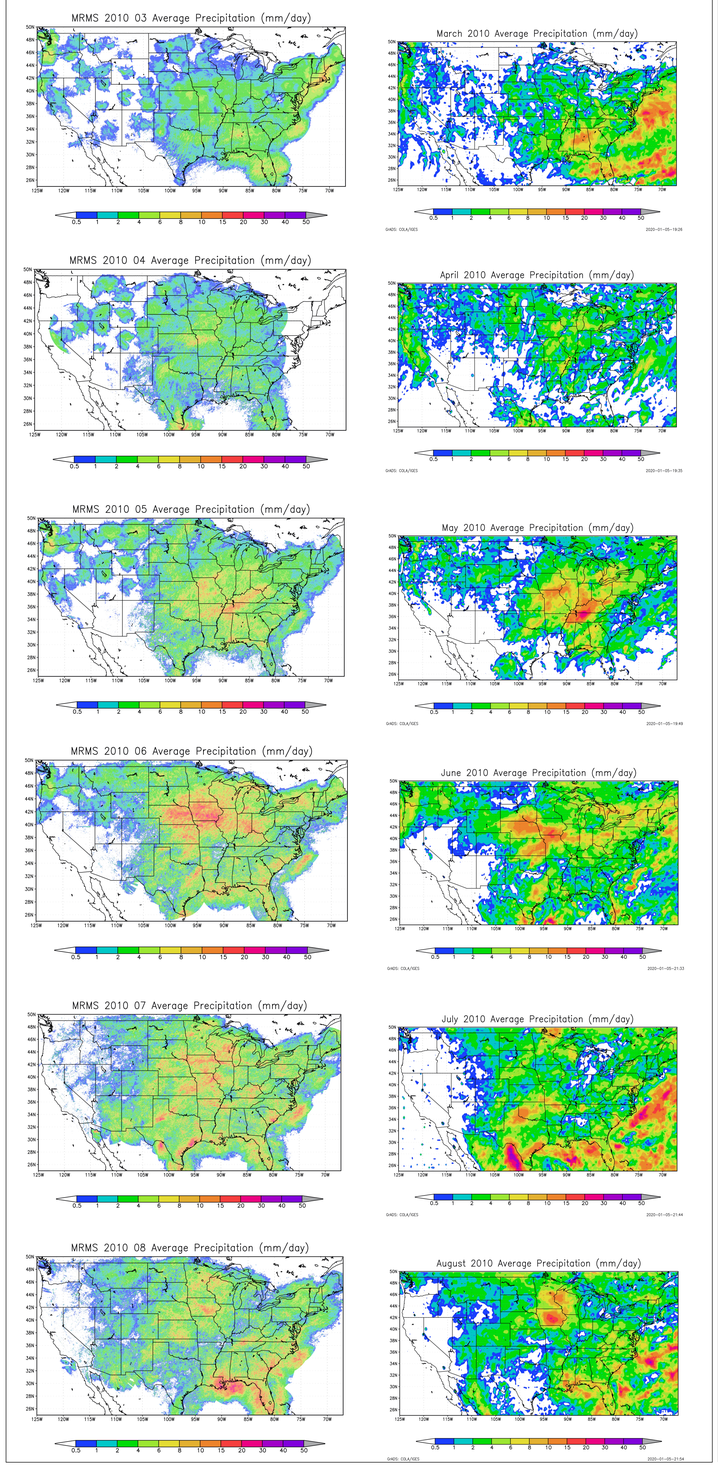


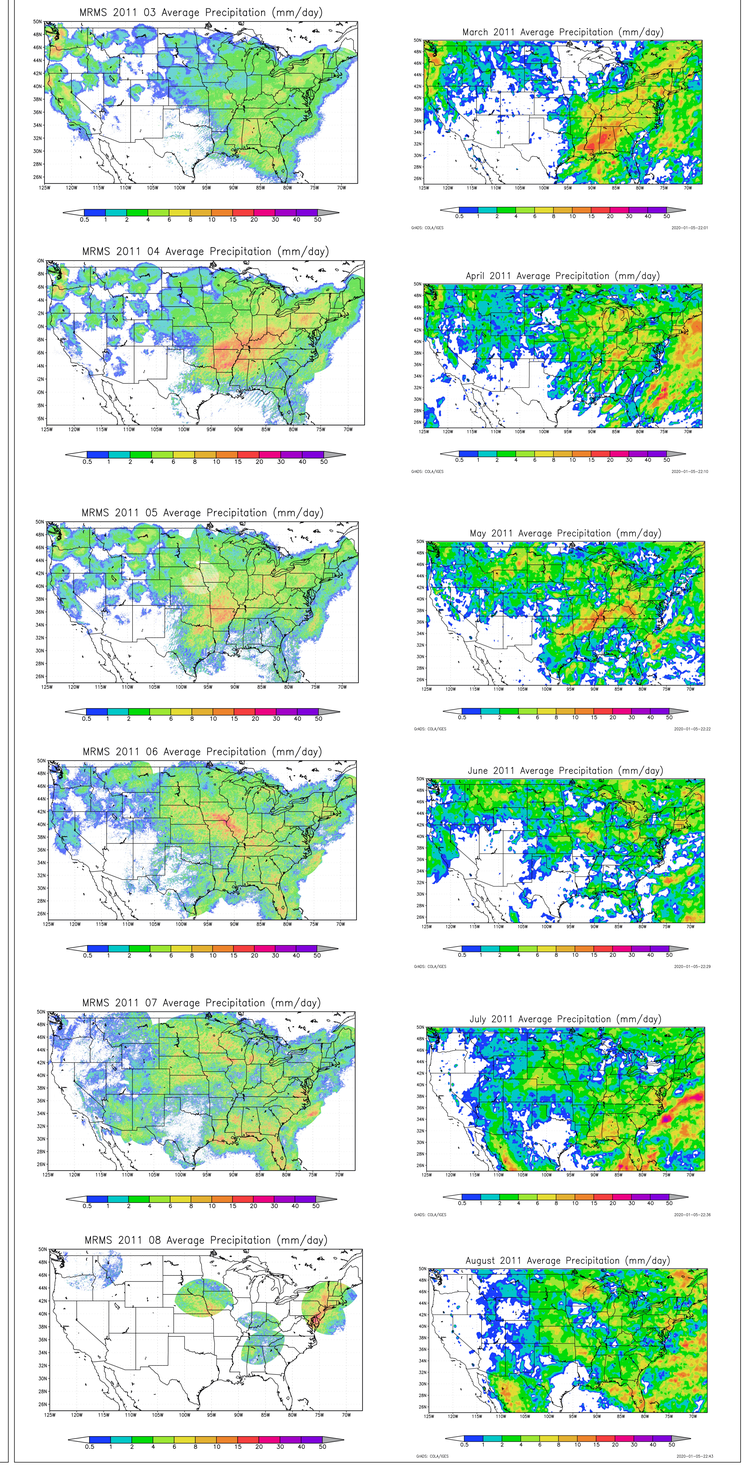
Quality Check and Comparison

- Using GrADS, instantaneous rainfall rates were created each hour to check data file quality.
- To check for consistencies in both average precipitation and spatial variability of precipitation, the MRMS data was compared to that of the Tropical Rainfall Measurement Mission (TRMM) 3B42 Multi-Satellite Precipitation Analysis.



MRMS Daily Average Precipitation Maps: 2010 & 2011





Conclusions

1. Technical errors exist within the data. Most notable in April 2010 and August 2011, the average precipitation indicate that some radars were not included or are missing when the hourly data files were processed in GrADS. Rounded buffers of weaker or no rain indicate the missing data regions.
2. The spatial variability of monthly average precipitation across the United States for the MRMS dataset is comparable to that of the TRMM 3B42 Precipitation Analysis. The primary difference in spatiality is that the highest precipitation rates are typically smaller but more intense in the 3B42 dataset. The MRMS dataset's average values for precipitation tend to be lower than that of the TRMM dataset. The MRMS dataset also does well in quantifying extreme precipitation events across the domain for example the Nashville, TN flood in May of 2010 and the various flood events across the Midwest in mid-June, 2010 (Higgins et al. 2011).
3. Following this work, the next step will be to perform similar quality checking of data for the years of 2002-2009. This will update the current dataset from a two-year to a ten-year archive. With the ten-year data archive, the long-term goal of the future work will be to observe the evolution of the isolated convective season across the continental United States. In the shorter-term, this will involve separating the isolated and mesoscale convective precipitation from total precipitation. This data processing will be performed using Interactive Data Language (IDL) scripts. When completed, preliminary analysis will look at the timing and geographic patterns of the isolated precipitation features as the summer convective season begins.

Acknowledgements

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