

Identifying Extreme Precipitation in GPM for Evaluating Climate Models

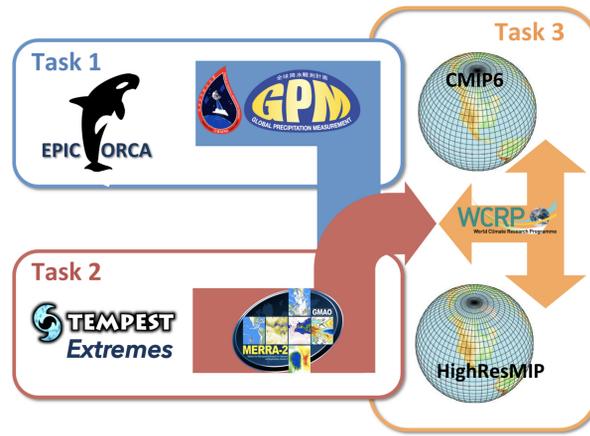
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QUESTIONS

What are the characteristics of convective organization, including frequency, duration, location and spatial extent as observed by satellites? How do organized events, including extreme forms of weather, contribute to the probability distribution of precipitation, especially its extreme tail?

How are extreme precipitation events related to dynamically-driven weather phenomena?

Do high-resolution climate model simulations capture the observed relationships between extreme precipitation and organized convection better than conventional-resolution simulations?

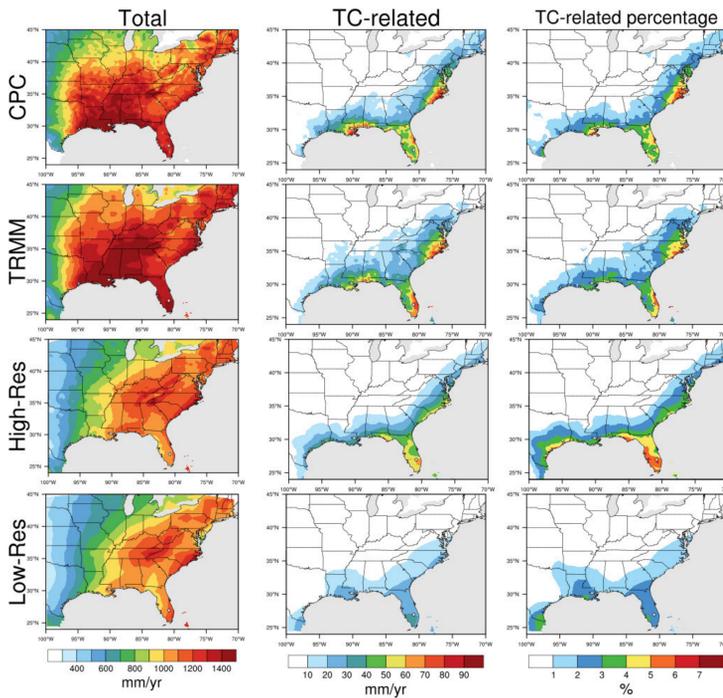


TASKS

Identify organized precipitation events from the GPM and TRMM products using a precipitation-focused approach

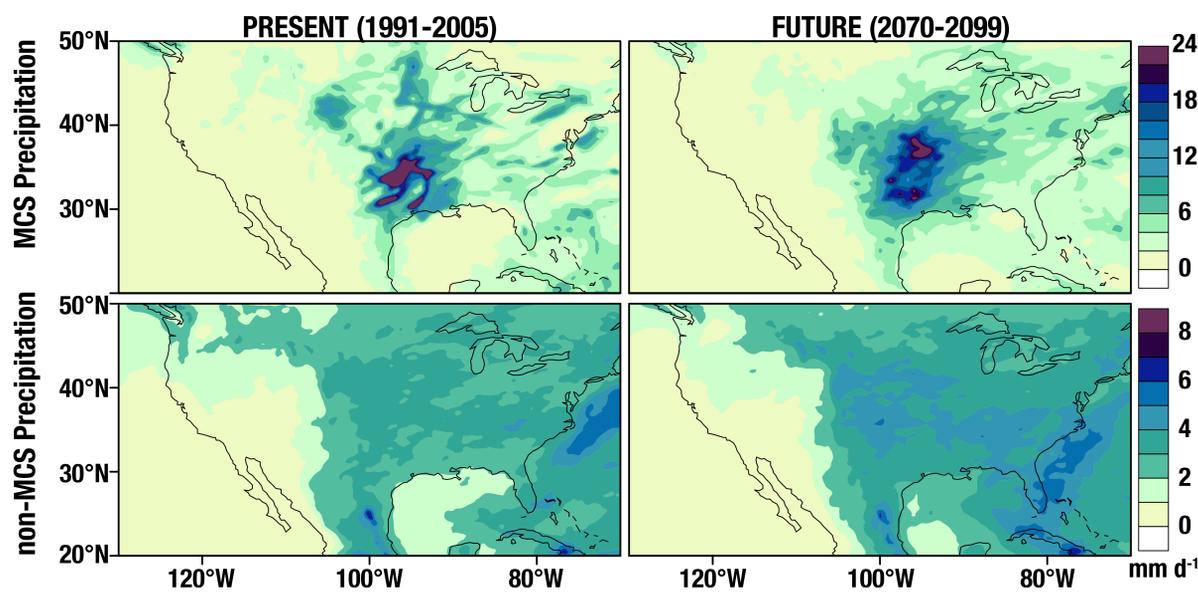
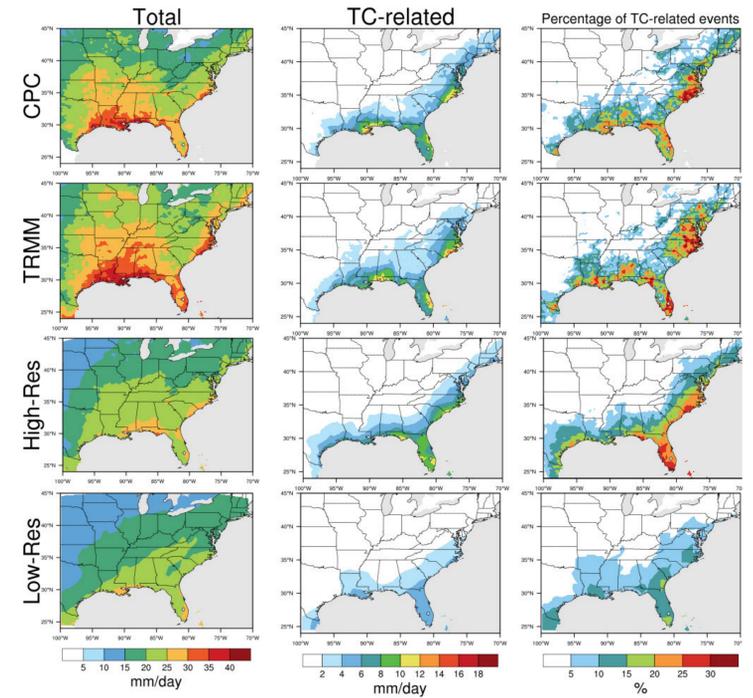
Classify organized precipitation events based on overlap between precipitation- and dynamically-based tracking algorithms

Confront standard- and high-resolution models with observations of organized precipitation

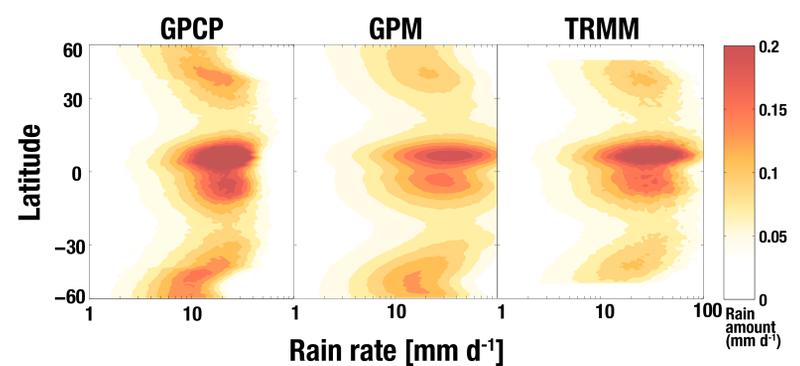


Organized Systems role in extremes

Annual maximum 5-day accumulated precipitation (Rx5day) [mm/yr] (left), TC-related Rx5day [mm/yr] (middle), and percentage of Rx5day events due to TCs (right).

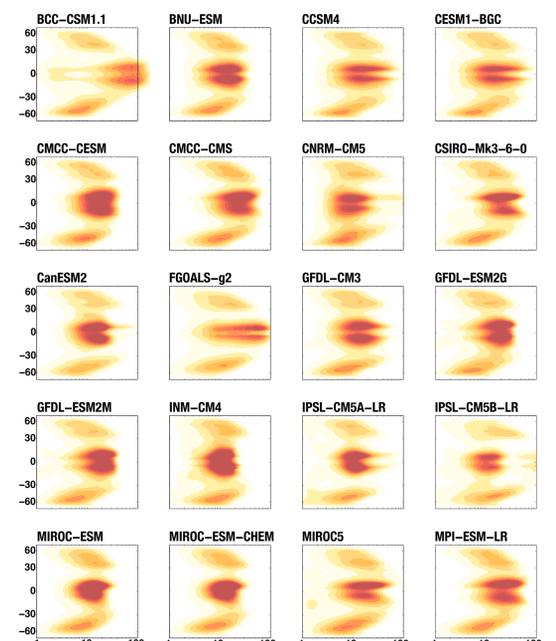


Rain distributions: Models & Observations



Three views of observed rain distributions. Note GPM & TRMM both have rain rates >50 mm d⁻¹, while GPCP does not.

Contrast the observed rain distribution with CMIP5 models. Most of these models have grid spacing around 100 km. There is a large diversity among models, with most being skewed toward lighter rain rates. Is this bias because of a lack of organized convection?



High-impact events

Tracking individual storms (upper: Sandy, lower: Irene) using TempestExtremes to find storm centers from ERA5 pressure. Compare tracks with the EPIC-ORCA tracked 95th percentile IMERGE rainfall.

High-resolution models

Composite May precipitation from CESM1 at 0.25°, separately for Mesoscale Convective Systems (MCS), and other. On the left is present, and on the right is a projection of the late 21st Century.

