

# Strategy for Testing Candidate Convection Schemes at High Resolution

# R:

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## Overview

Candidate convection schemes are being tested using a multi-tier infrastructure that is designed to assess model performance under various configurations. This work describes an economical strategy for testing the schemes at high resolution. It relies on the use of CAPT short-term hindcasts to assess the performance at globally uniform high resolution (ne120). The feasibility of this strategy is illustrated by using the model configuration at low-resolution (ne30), with both multi-year AMIP simulations and short-term hindcasts. The analyses focus on the consistencies of relative performance between candidate schemes in terms of major metrics at spatial and temporal scales for which the hindcasts are suitable. This testing strategy can also be an effective mean for further tuning of the candidate schemes. See also posters by Roesler *et al.* and Tang *et al.* for another economical strategy to test model performance at high resolution by focusing on regional domains.

## Approach

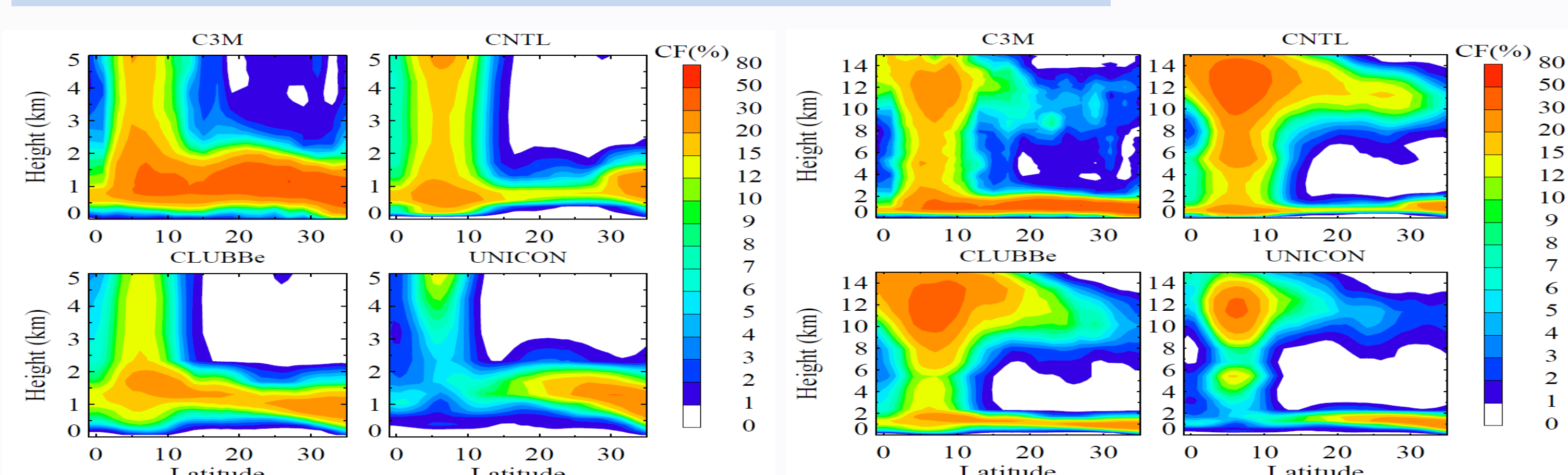
- Multi-year (2008 - 2012) AMIP simulations at ne30 resolution as baselines.
- CAPT (Cloud Associated Parameterization Testbed) framework for short-term (5-day) hindcasts.
- U and V nudging (ECMWF-Interim and default model) to provide initial conditions.
- Hindcasts with ne30 resolution initialized daily for a single season (JJA 2011).
- Sub-sampling (every 5 or 10 days) of the ne30 hindcasts to guide ne120 hindcasts.
- Hindcasts with ne120 resolution for dates coincident with the subset of ne30 hindcasts.
- Analyze the consistency of relative performance of the schemes based on AMIP simulations, and full and subset of CAPT hindcasts.

## Analysis

Results for selected metrics are shown.

More available at <http://portal.nersc.gov/project/m2136/convection/FA>

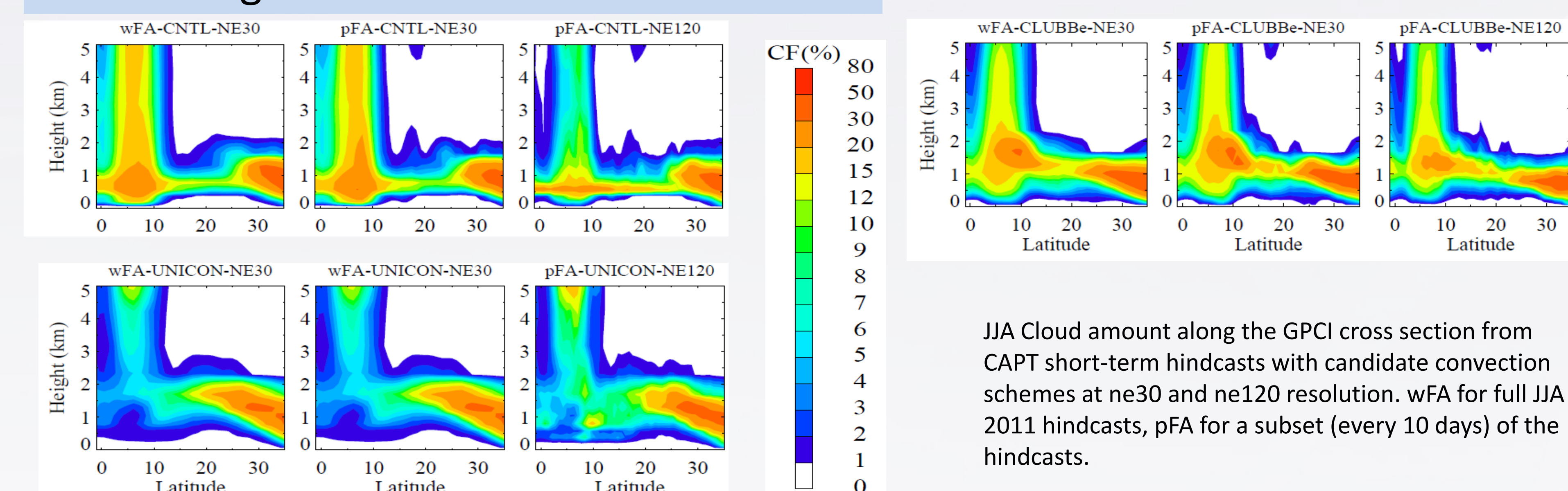
### Cloud along the GPCI Cross Section -- AMIP



JJA Cloud amount along the GPCI cross section from C3M (CERES-CALIPSO-CLOUDSAT-MODIS), and AMIP simulations with candidate convection schemes at ne30 resolution.

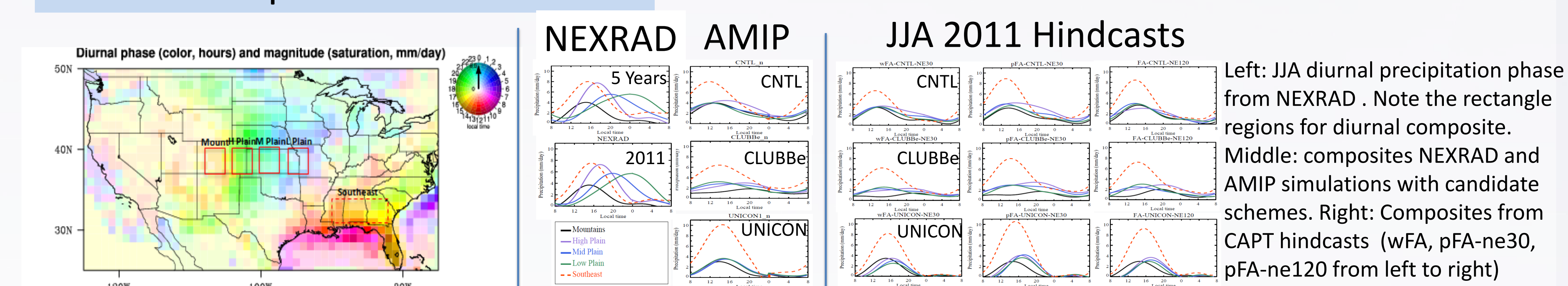
## Analysis – cont.

### Cloud along the GPCI Cross Section -- CAPT



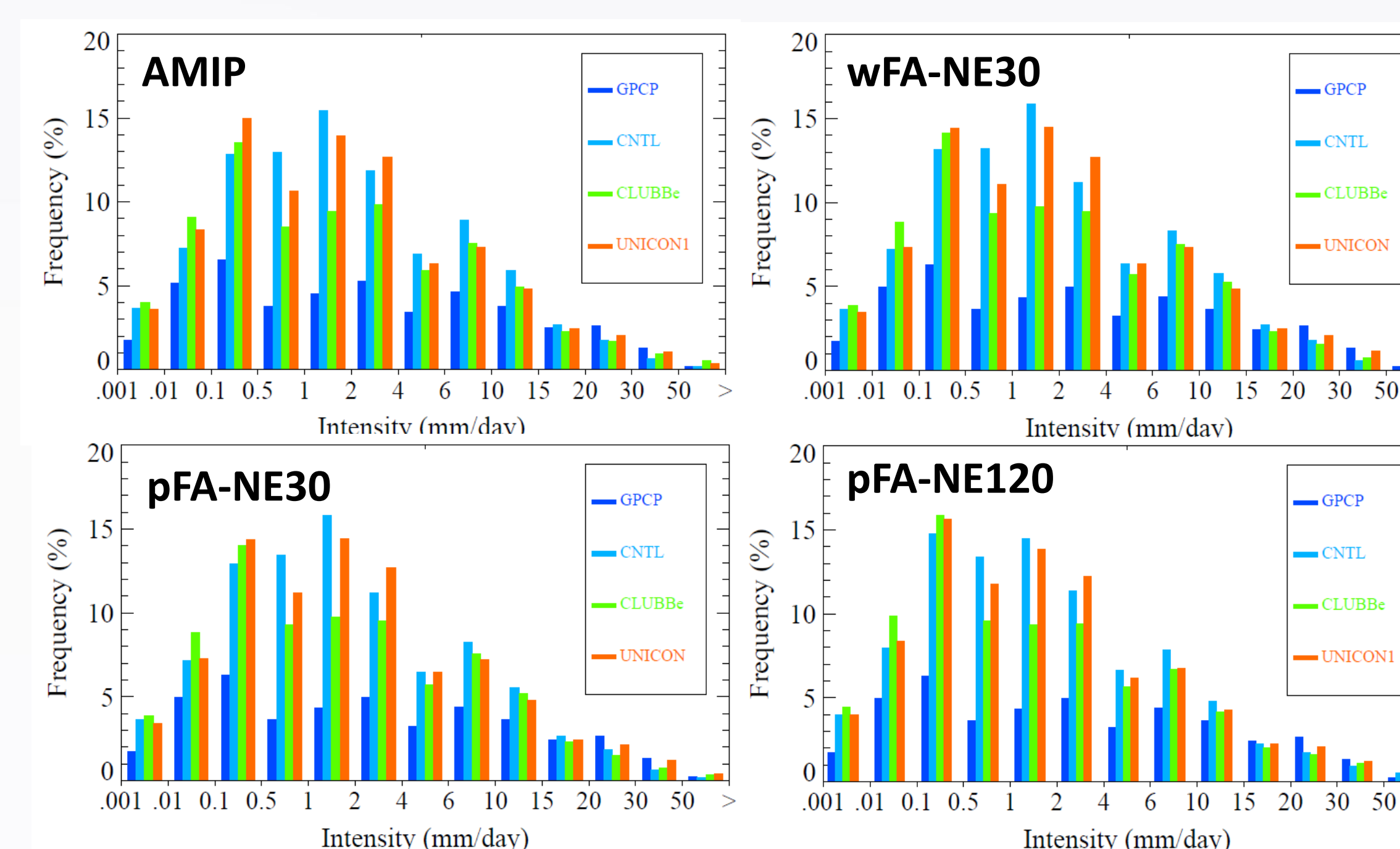
JJA Cloud amount along the GPCI cross section from CAPT short-term hindcasts with candidate convection schemes at ne30 and ne120 resolution. wFA for full JJA 2011 hindcasts, pFA for a subset (every 10 days) of the hindcasts.

### Diurnal Precipitation over CONUS



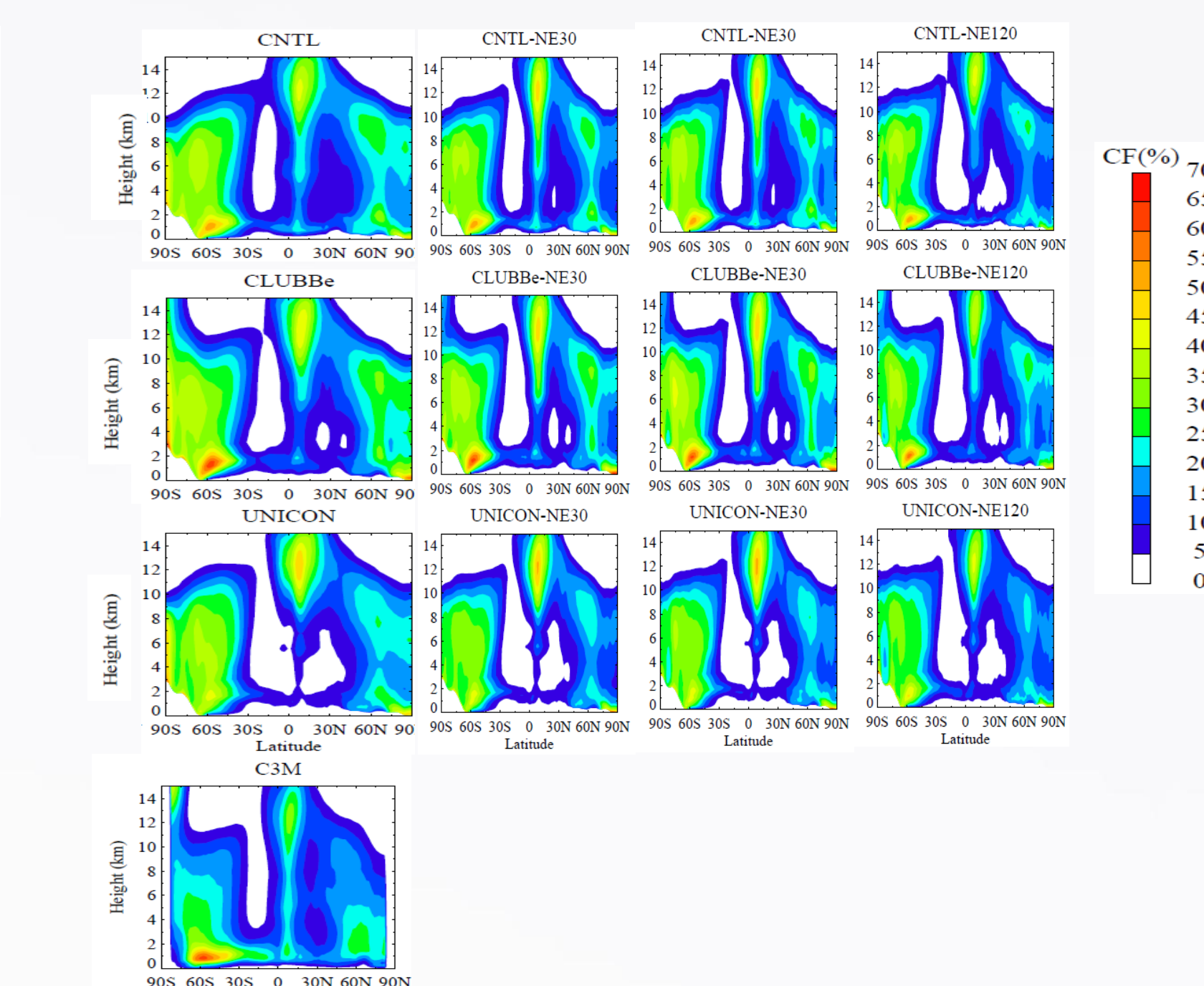
Left: JJA diurnal precipitation phase from NEXRAD. Note the rectangle regions for diurnal composite. Middle: composites NEXRAD and AMIP simulations with candidate schemes. Right: Composites from CAPT hindcasts (wFA, pFA-ne30, pFA-ne120 from left to right)

### Tropical Precipitation Probability Distribution



Frequency distribution of daily mean precipitation in the tropics (30S-30N), from GPCP, AMIP, full JJA 2011 hindcasts (wFA) and subset of hindcasts (pFA)

### Zonal Mean Cloud Fraction



Zonal and vertical distribution of cloud amount from C3M, AMIP, full JJA 2011 hindcasts (wFA) and subset of hindcasts (pFA)

## Conclusion

- The strategy for assessing performance of candidate convection scheme at high resolution using CAPT short-term hindcasts is found to be effective.
- The relative performance of the schemes are qualitatively well preserved with just a mini set of hindcasts in terms of various metrics (mean states and short-term variability).
- The strategy can be used for first-look assessment and further tuning, at both ne30 and ne120.