R: ACME Perturbed Convection Parameter Experiments

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Objective

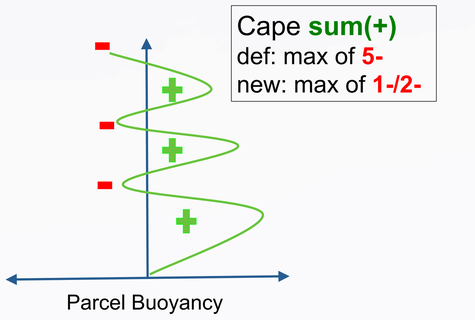
Background

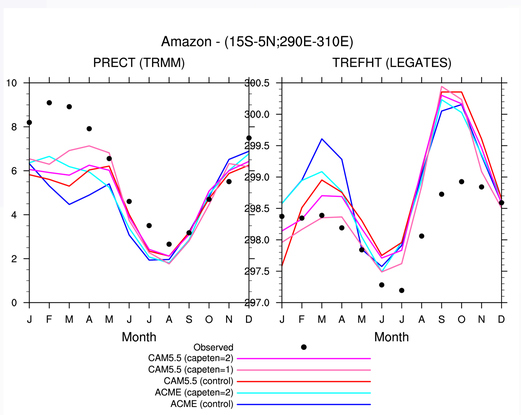
- Significant remaining biases in v1.0 have a potential impact on the global water and biogeochemical cycles: two of ACME's cycle.
- Chief among these biases are those associated with mean tropical precipitation over land and variability throughout the tropics as a whole
- This includes over the Amazon region where persistent dry biases in DJF have a major impact on the productive characteristics of the underlying vegetation.

Tropical Convection

- Dominant process controlling the distribution of precipitation throughout the tropics
- Deep convection in ACME continues to be represented by the Zhang-McFarlane (1995) parameterization scheme which will not change for ACME v1
- There is some advantage in investigating non-standard tuning parameters in the scheme that have not previously been used for tuning or been included in any existing Perturbed Physics Ensemble (PPE) experiment sets.

Approach and Results





Investigating Parameters

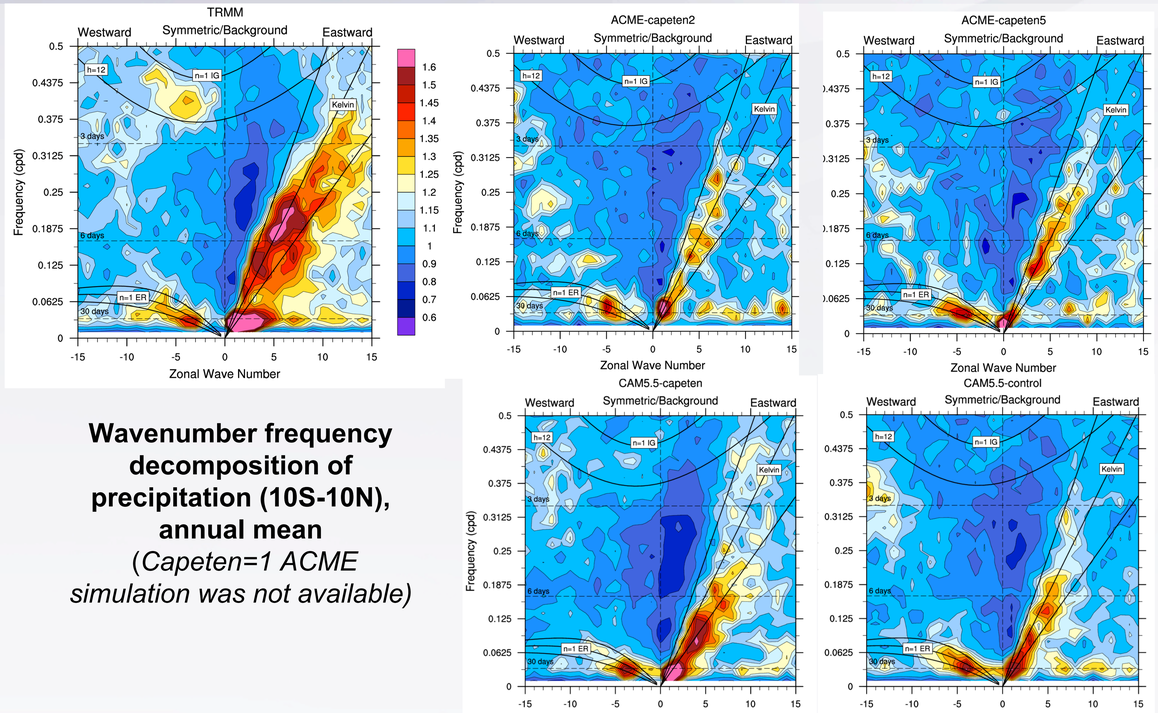
- Determine the sensitivity in the simulation of tropical mean climate and variability compared to similar study in CAM5.5
- These parameters included many aspects of the convective parcel calculation: **parcel temperature**, **assumed microphysical properties**, **downdraft intensity** and **simple measures of organization**.
- Most promising experiment involved modifying a threshold parameter **(capeten)** used in the calculation of the final Convectively Available Potential Energy (CAPE) and the depth of convection.

Amazon Climate

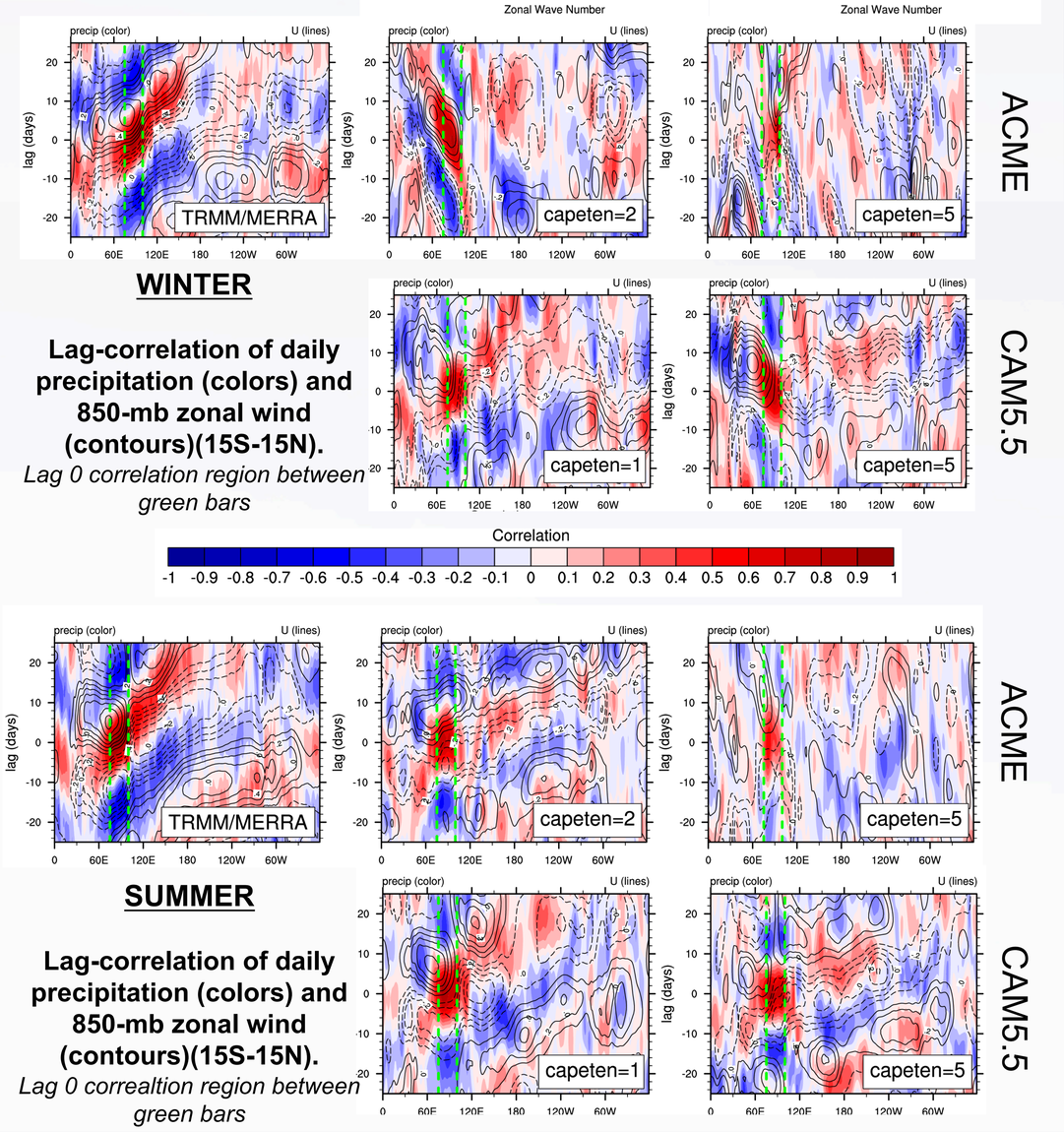
- DJF Amazon rainfall improved, JJA: no change
- CAM5.5 slighly wetter than ACME
- Parallel improvements in surface temperature

Tropical Variability

- Weaker variability in ACME than CAM5.5
- Intraseasonal variability (ISV) weak in ACME
- Reduced capeten strengthens ISV in both models
- Winter: Spurious westard propagation in ACME
- Summer: Much improved MJO signal (fast phase speed)



Wavenumber frequency decomposition of precipitation (10S-10N), annual mean
(*Capeten=1 ACME simulation was not available)*



Lag-correlation of daily precipitation (colors) and 850-mb zonal wind (contours)(15S-15N).
Lag 0 correlation region between green bars

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