Why Does the ACME v1 Model Drizzle Too Much and What Impact Does This Have?

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The Frequent Drizzle Problem

Conditions that Produce Drizzle in the Model

Q: What fraction of the drizzle is due to convective precipitation?
A: More than 80% in the range of "drizzle" (0.1 and 3 mm d⁻¹).

Q: How deep does ZM-convection extend?
A: At precipitation rates > 10 mm d⁻¹, convection reaches above 400 mb, but in the range of "drizzle", it seldom reaches above 700 mb (~3 km).

Q: What is the large-scale circulation?
A: The convective drizzle mostly occurs under large-scale subsidence. Only at higher rates (PRECC > 5 mm d⁻¹) do the conditions become mostly large-scale ascent.

What Happens When the Drizzle Is Suppressed?

Model Experiment
After ZM-convection is called, we diagnose the convective precipitation rate and keep the convection from triggering if it produces PRECC < 5 mm d⁻¹.

Precipitation

Cloud water content

Future directions
- Run the models for longer time periods to verify that the climatological differences are robust.
- Make model modifications, where the convective autoconversion coefficient will contain a minimum threshold on cloud water mixing ratio. We welcome any other suggestions.
- Obtain a better observational estimate of how frequent drizzle occurs.