Improving representation of vertical alignment of cloud and precipitation properties in GCMs

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Improve overlap treatment that links horizontal variability (PDF) in a vertical columns

$R = \exp\left(-\frac{\Delta z}{z_0}\right)$

Observations

Simulations

Correlation length scale ($z_0$, km)

One correlation profile per day of time-height observations

Case #

Height (km)

0 1 55 24

R = rank correlation

CRM simulations

One correlation profile per instantaneous 3D snapshot

ASR PI Meeting, 21 Mar. 2018
$Z_0$ as a function of fall speed

Mean $Z_0$ is highly **correlated** with mean effective **fall speed**

Linear and power-law (square-root) dependencies provide comparable fits

PDF overlap of non-precipitating species (cloud number and mass) is consistent with PDF overlap for air vertical velocity ($W$).