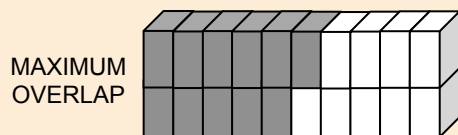


Improving representation of vertical alignment of cloud and precipitation properties in GCMs

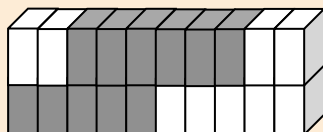
Mikhail Ovchinnikov, Scott Giangrande, Vince Larson, Alain Protat and Christopher Williams

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

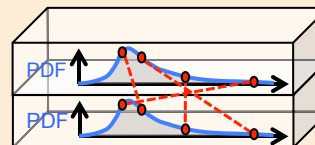
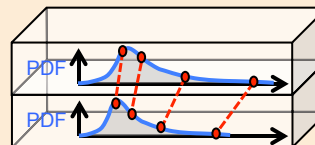
CLOUD OCCURRENCE



RANDOM OVERLAP

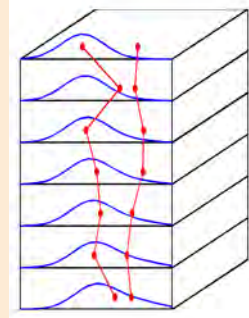


PDF



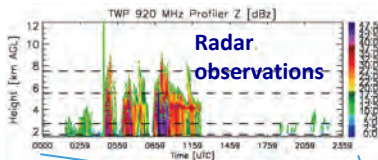
$R = \text{rank correlation}$

$$R = \exp(-\Delta z / z_0)$$



Observations

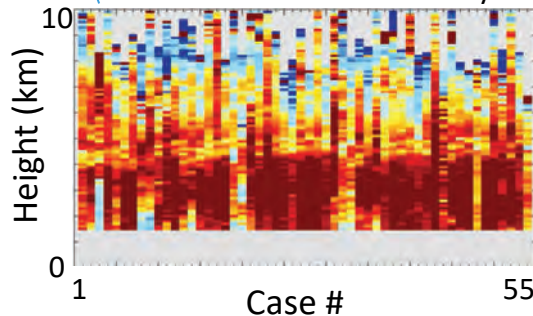
Simulations



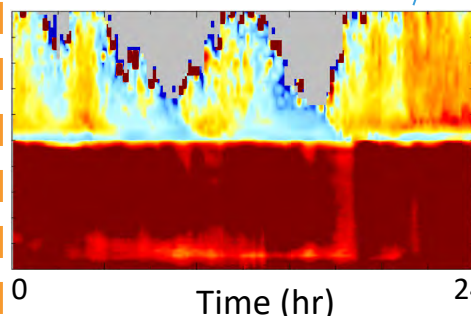
Correlation length scale (z_0 , km)



One correlation profile per day of time-height observations

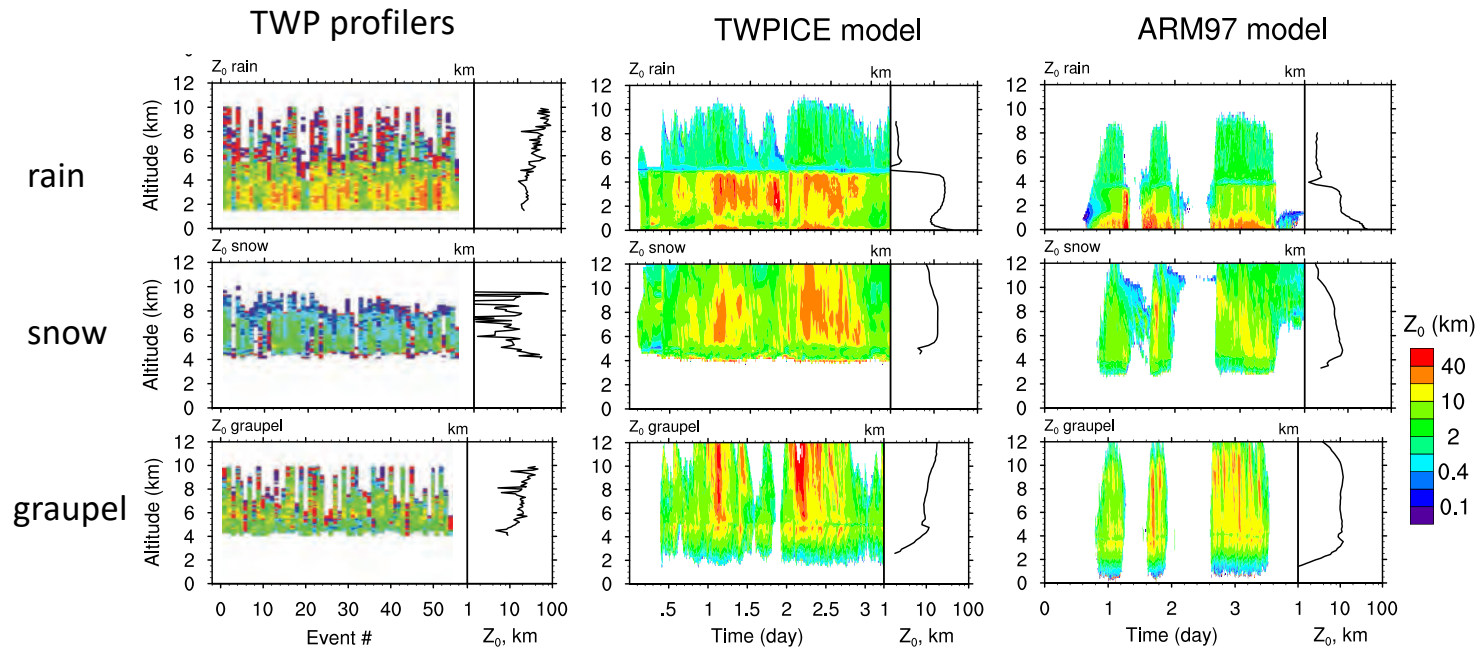


Simulated rain



One correlation profile per instantaneous 3D snapshot

Observed versus simulated Z_0 profiles



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).

