Evaluating Cloud-resolving Model Updrafts with Dual Doppler Radar Retrievals

Adam Varble[1], Edward Zipser[1], Ann Fridlind[2], Scott Collis[3], Alain Protat[3], and Peter May[3]

[1]University of Utah, [2]NASA GISS, [3]Centre for Australian Weather and Climate Research

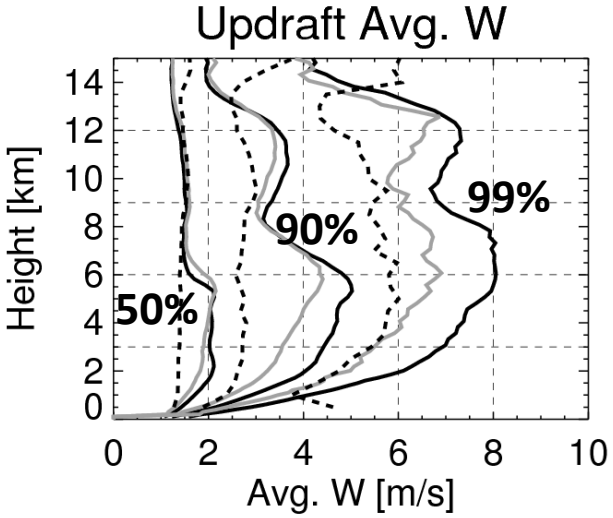
Why is this important?

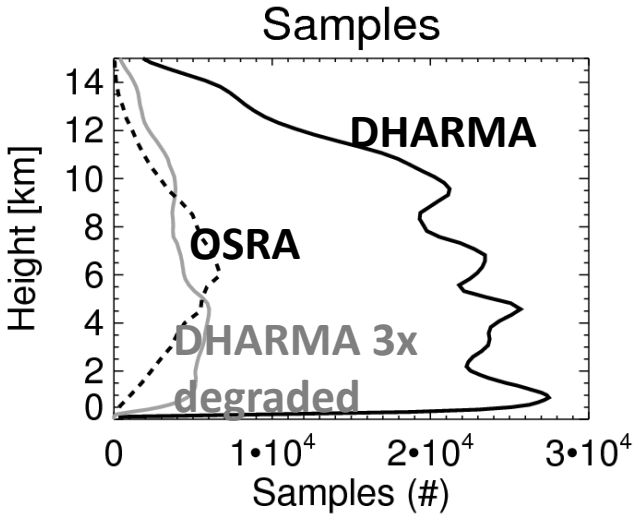
- Cloud-resolving models with bulk microphysics schemes tend to produce too much graupel aloft in tropical oceanic convective cores
  - May factor into insufficient stratiform development
  - Is this mostly due to updraft size and speed or is it mostly due to the microphysics scheme?

Methodology

- We take Scott's OSRA dual Doppler retrieval and compare it to DHARMA cloud-resolving modeling output
  - Define updrafts as all contiguous horizontal grid points of 1 m/s or greater and downdrafts of -1 m/s or less in a 1D constant latitudinal manner (like an aircraft flying east-west through the model at a constant height for every value of latitude)
    - Keep statistics on draft average w, maximum w, and diameter in addition to number of drafts

TWP-ICE "Event A" Comparison

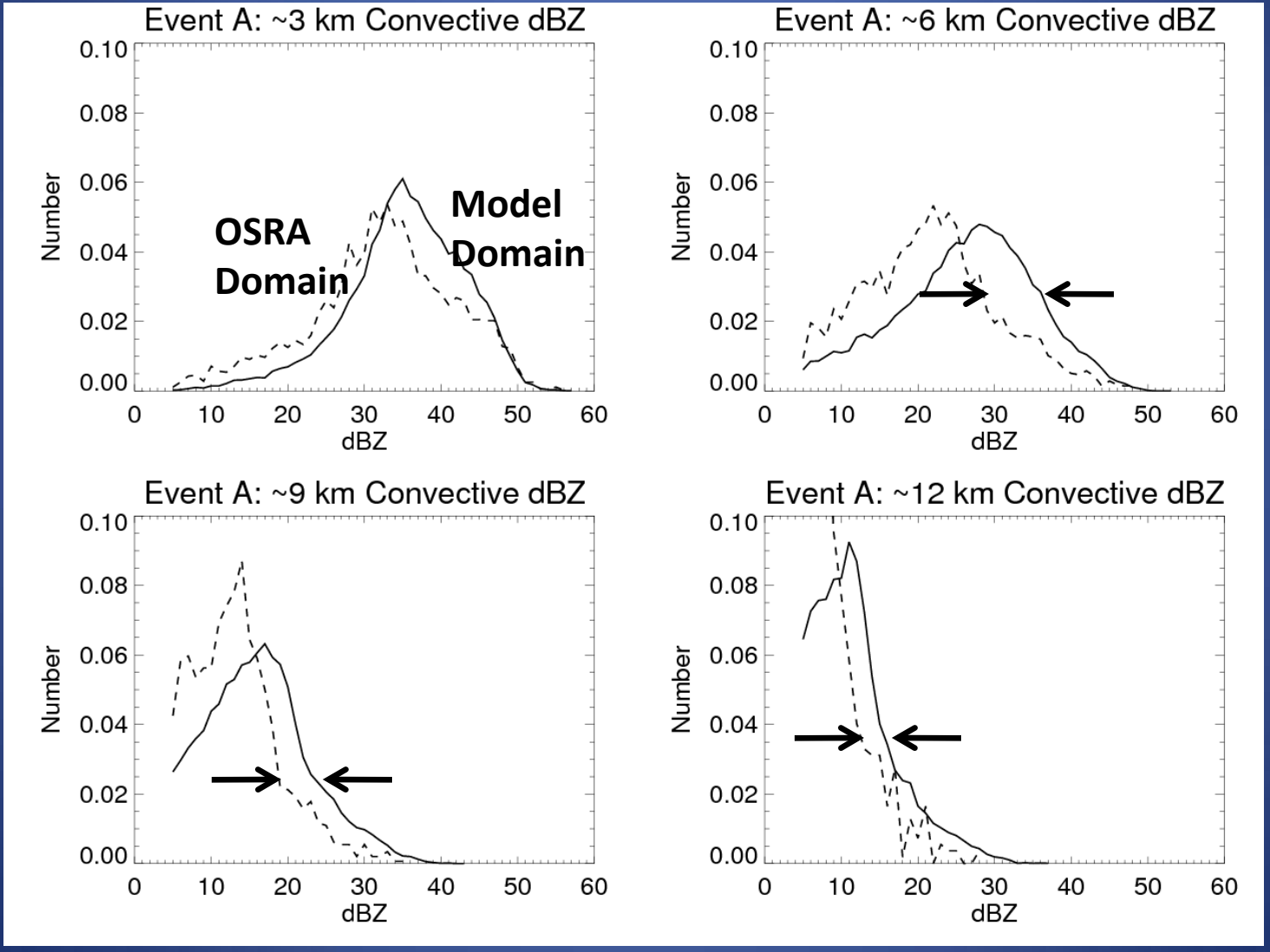




Why the difference?

- Why the difference between dual Doppler and model output?
  - Model is just wrong?
  - Resolution difference?
  - Sampling difference?
  - Dual Doppler assumptions?

Sampling Issues



Summary and Future Work

- Taking sampling, assumptions, and resolution into account, DHARMA (and other models) may be slightly overestimating updraft vertical velocities but not by a gross amount
- We believe that the primary reasons for radar reflectivity differences between models and observations are the microphysics schemes
  - The interplay between those schemes and vertical velocity must be investigated
- We hope to get a larger dual Doppler sample size including significant convection on 23-24 January

Summary and Future Work

- Although this is only comparing one model simulation, we are currently taking part in CRM and LAM Intercomparisons with many more model simulations
  - A key component of this research is to establish the degree to which updraft and downdraft vertical velocity in conjunction with the assumed microphysics properties affect the simulated convective system structures