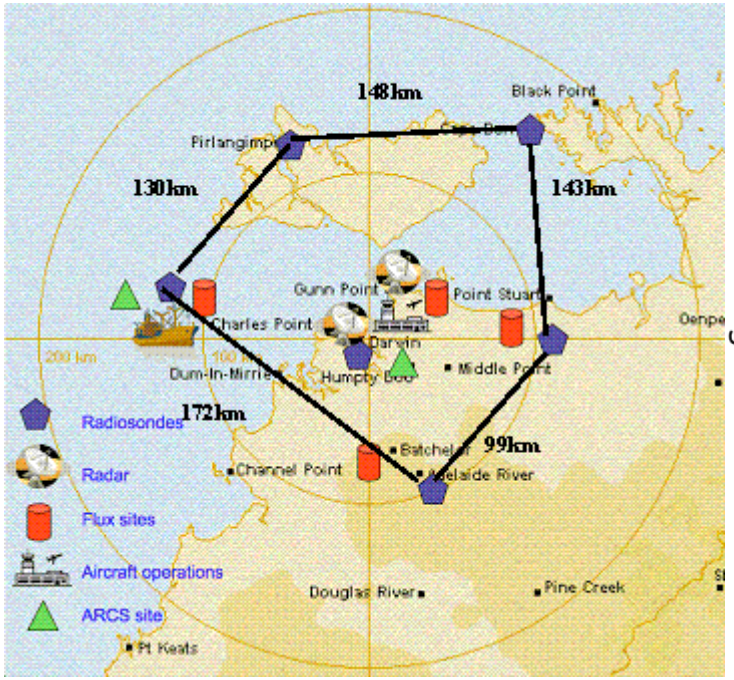
Properties of Stratiform Areas Associated with Tropical Convection in TWP-ICE Observations and Simulations by Four CRMs— Evaluating GCM Components in a FASTER Framework



Source: Shaocheng Xie

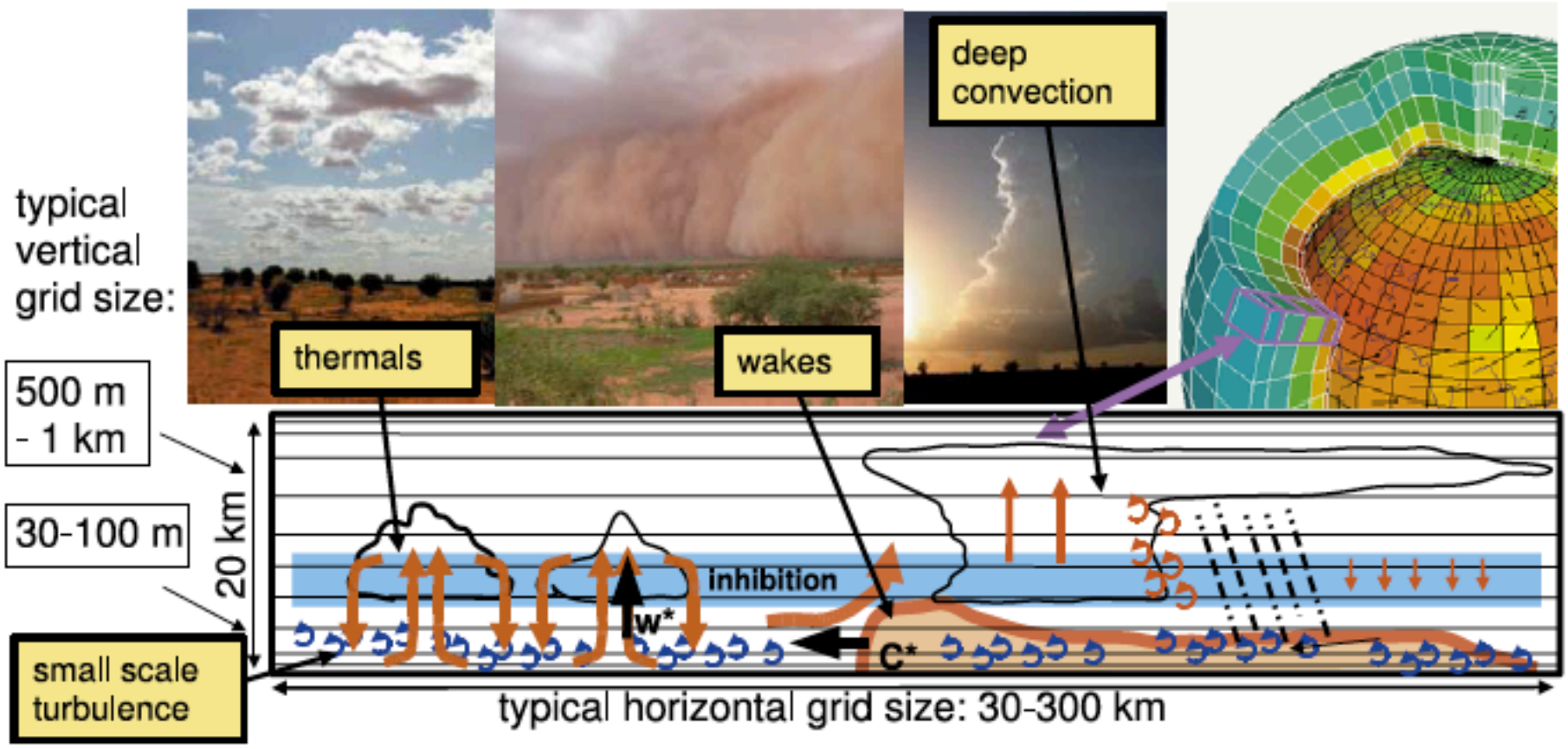
Ann Fridlind, Tony Del Genio, Andy Ackerman—NASA GISS

Aga Smith-Mrowiec, Catherine Rio, Yonghua Chen—Columbia University

Adam Varble, Ed Zipser—University of Utah

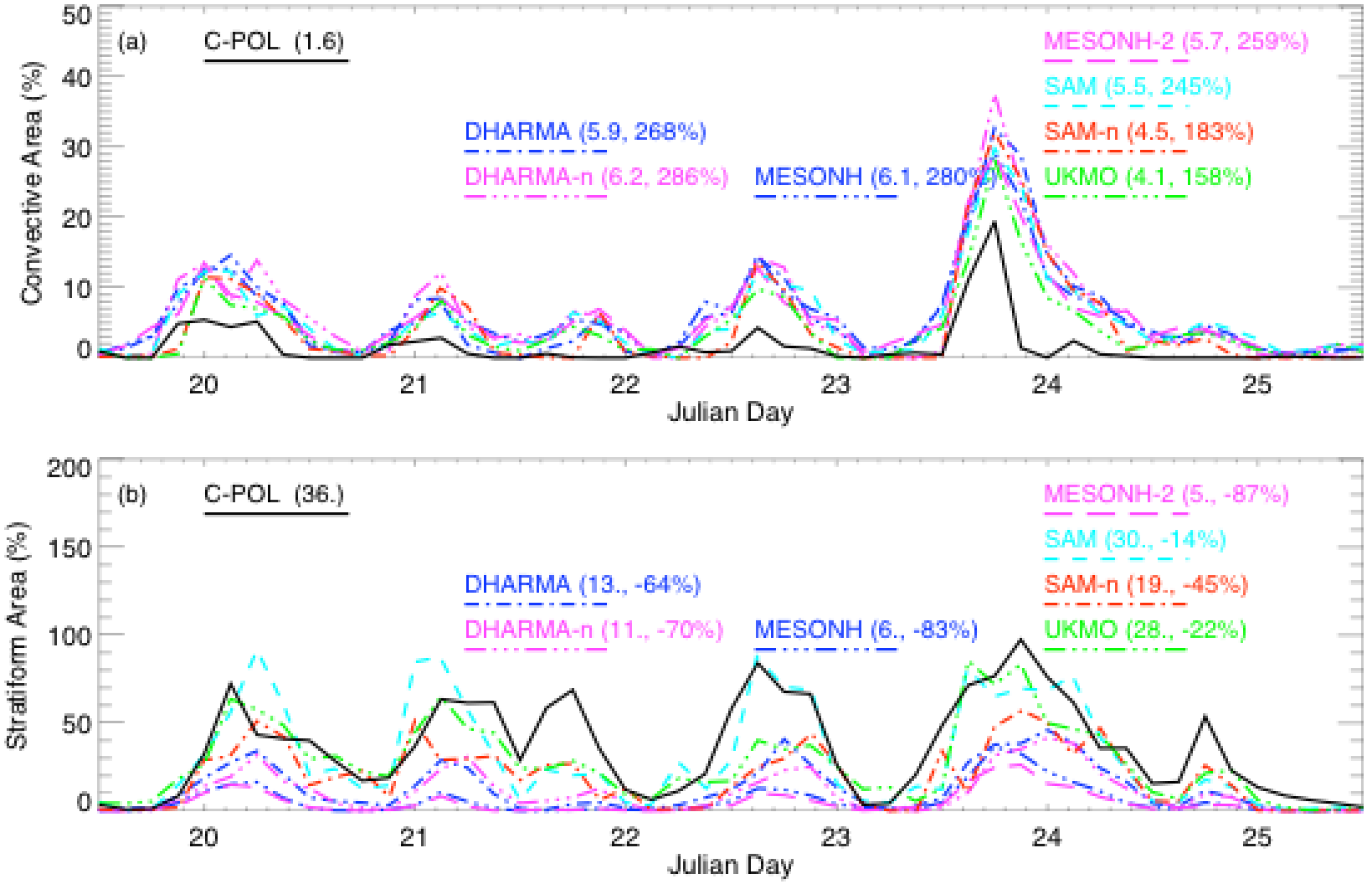
Adrian Hill, Jon Petch—UKMO *Jean-Pierre Chaboureau, Jean-Pierre Pinty—CNRS*

Convective systems in GCMs

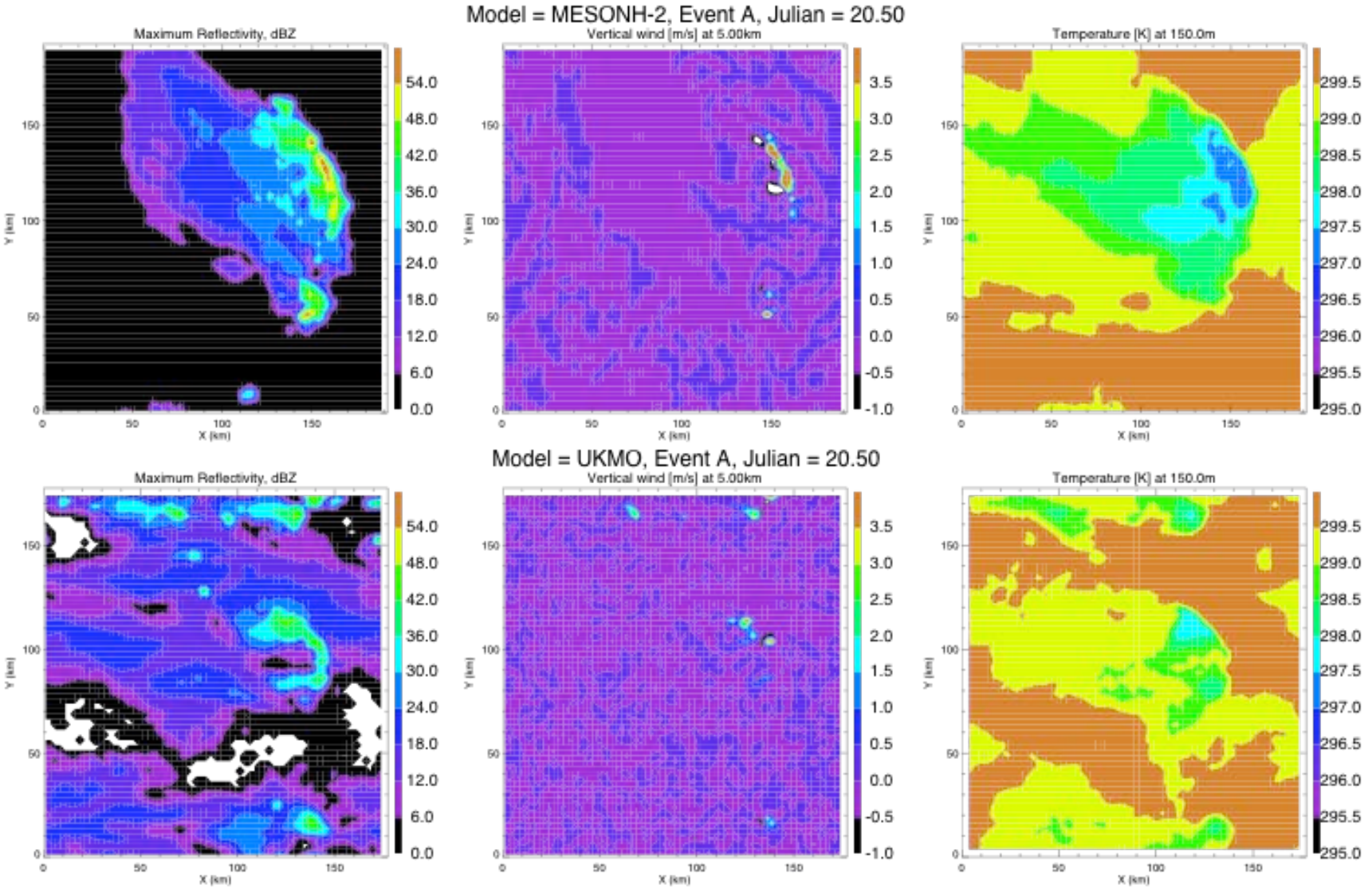


Rio et al, GRL, 2009

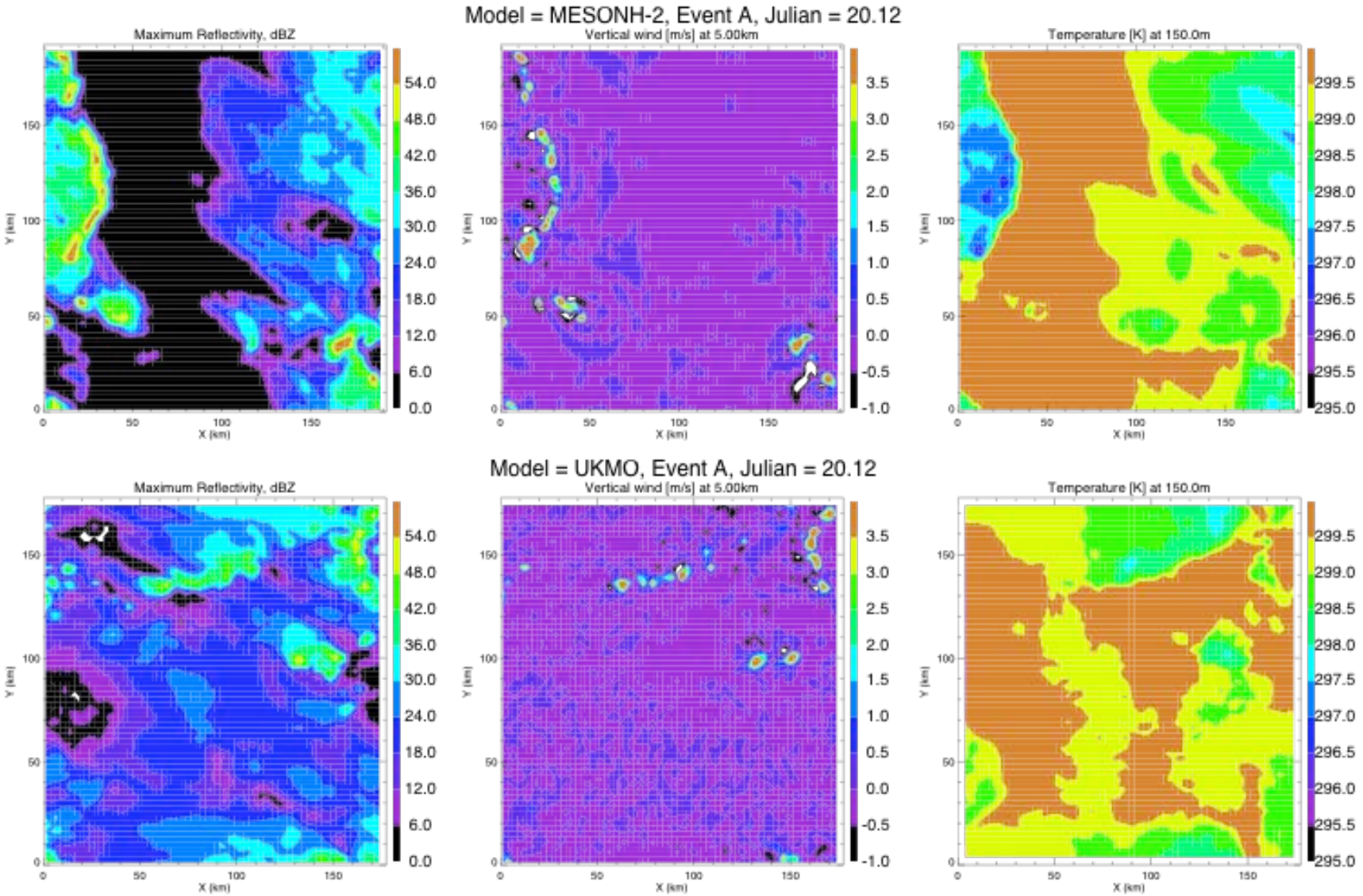
Convective and stratiform areas



Precipitation, winds, and cold pools



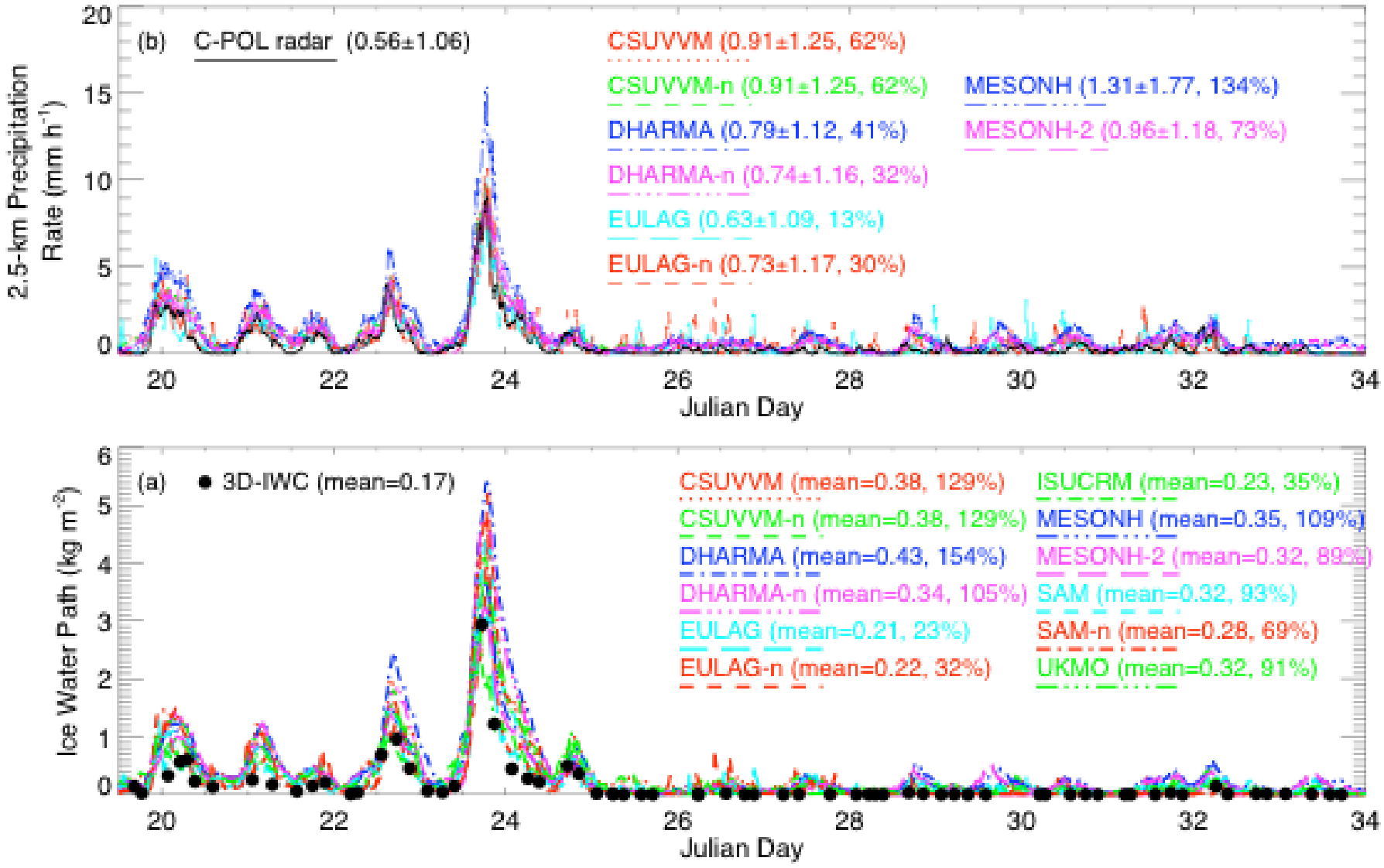
Precipitation, winds, and cold pools



Objectives

- Compare simulated downdraft properties to LMDz and GISS ModelE assumptions
- Identify factors controlling convective/stratiform
  - confirm model variables underlying reflectivity
    - compare model Z-PR-RWC with surface disdrometer
    - map convective and stratiform areas in terms of PRs
    - intercompare model Z-PR-IWC in stratiform areas aloft
    - intercompare PDFs of up/downdrafts, cold pools, stratiform area
  - perform sensitivity tests with DHARMA model
    - single-moment, two-moment, bin microphysics tweaks
    - resolution, domain size, boundary conditions, forcing ...

Uncertainties in forcing derivation



FASTER Framework

- Are multiple CRMs a surrogate ensemble of reality?
- Example of TWP-ICE
  - bigger ensemble, bigger range of reality?
  - stratiform area right, then model right?
  - but convective area wrong
  - conclusion #1: big uncertainties in CRMs
  - conclusion #2: also important uncertainties in forcing
- Added measurements to constrain CRMs
  - targets (e.g., convection structure, aerosol effects) should seek strong CRM-measurement connections
  - availability of measurements (including scanning radar, satellite, in situ data) should influence foci
  - Harnessing added measurements is not FAST