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S-Pol observations and high-resolution simulations of S2D during AMIE/DYNAMO

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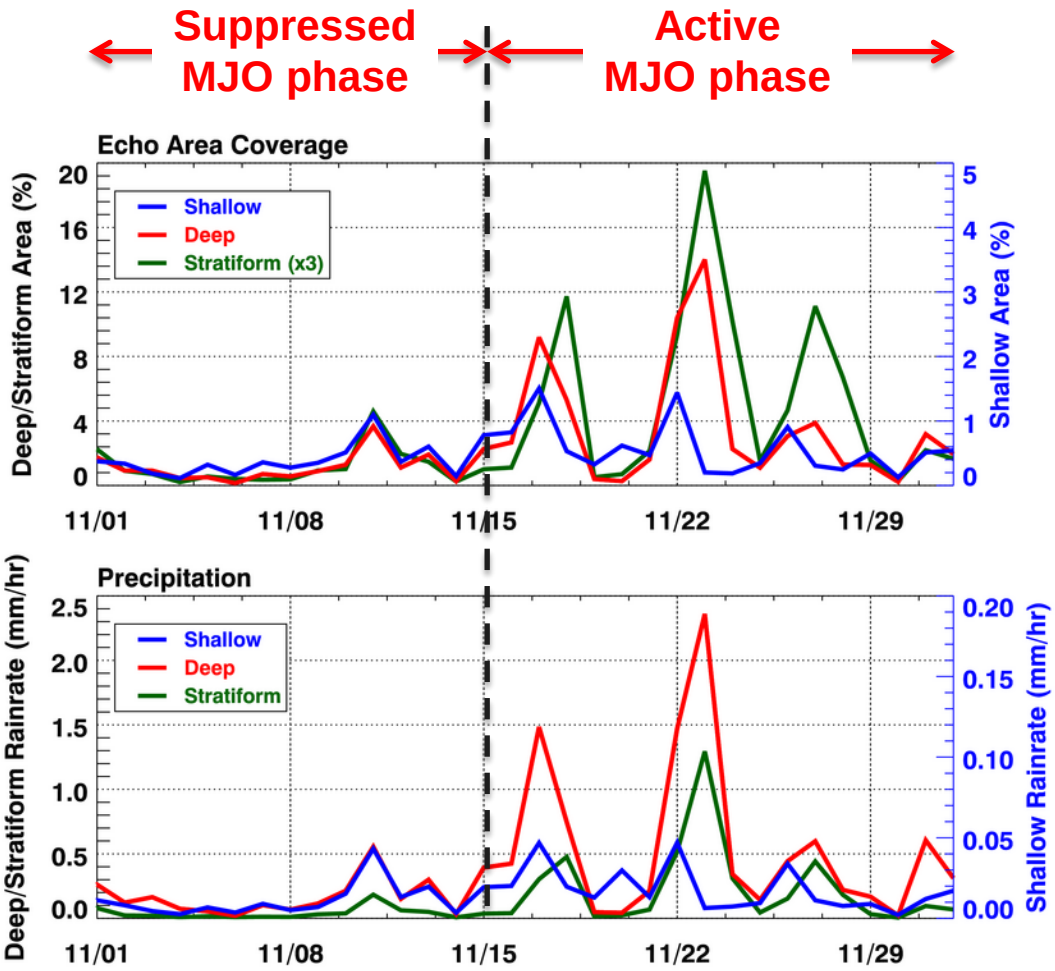
2013 ASR Fall Working Group Meeting – AMIE/MJO/S2D Breakout

S-Pol Observed Transition

- S2D transition occurs at ~1 day (solid) and longer time scale (dash)
- Amount of shallow convection remained relatively unchanged in suppressed/active MJO phase
- Rainfall of shallow convection also does not change with time
- Deep convection successively becomes larger and more intense, followed by enhanced stratiform rain



S-Pol Observed Transition

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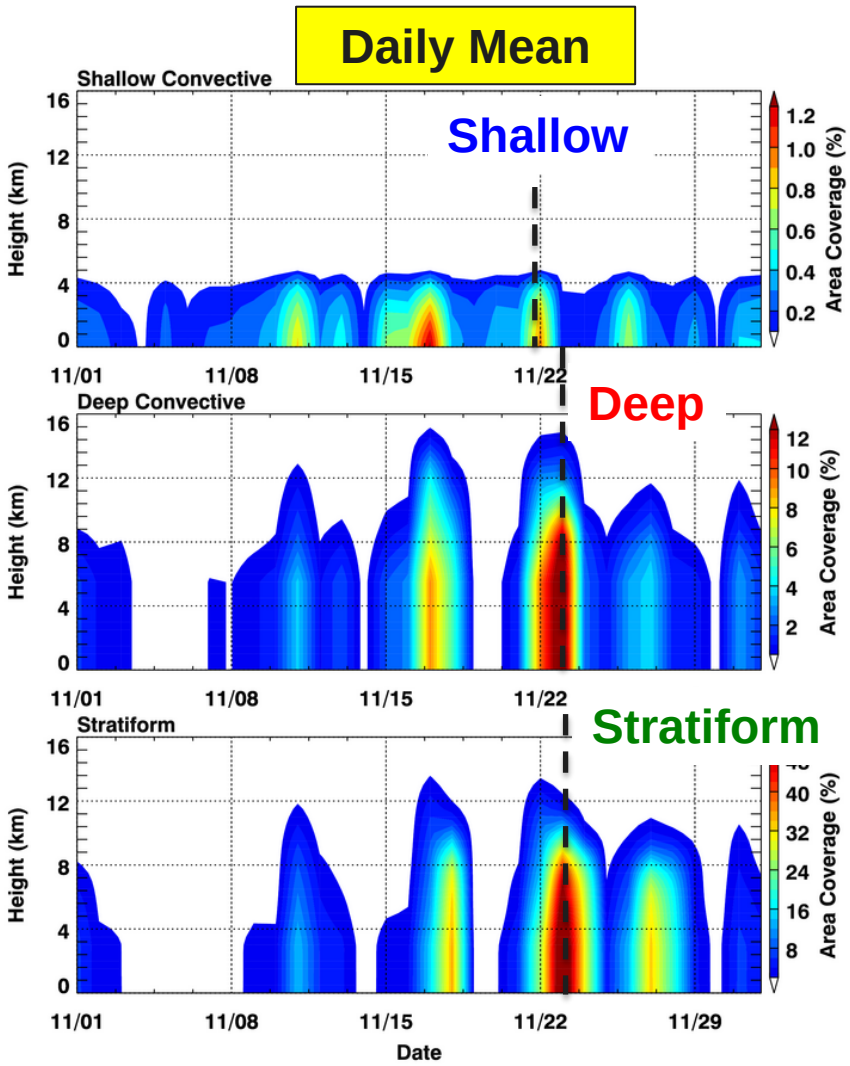
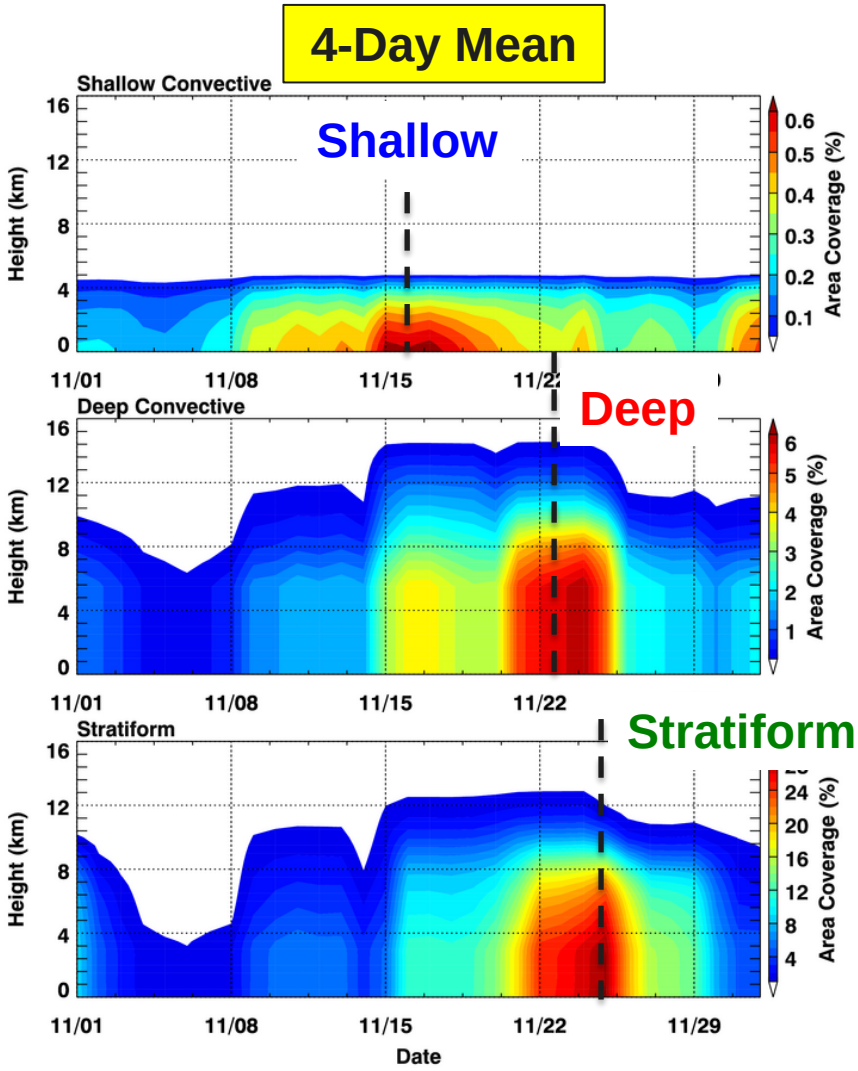
- Daily-mean echo area fraction shows transition occur at mesoscale
- 4-day running mean shows transition at longer time scale





High-res WRF Simulations

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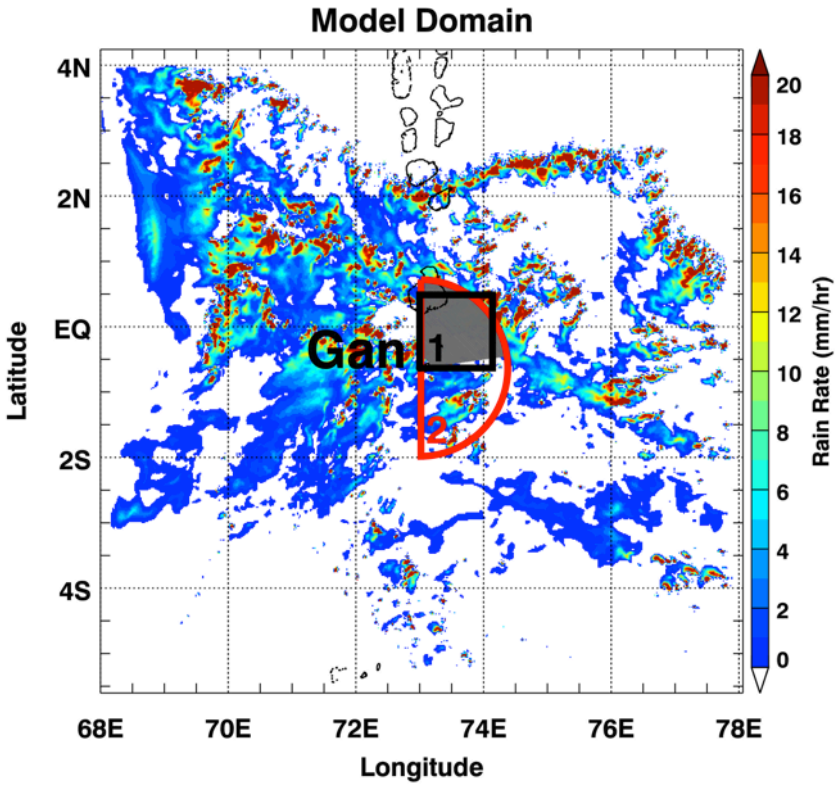
- WRF at 2-km resolution, no cumulus parameterization
- Subset results to same area to compare with S-Pol



	Model Setup
Period	**Nov 1 – 30, 2011**
Lateral/surface forcing	ERA-I 6-hourly analysis
Land surface	NOAH
LW Radiation	RRTM
SW Radiation	Dudhia (1989)
PBL	UW scheme
Microphysics (2-moment bulk schemes)	**Goddard** **Thompson** **Milbrandt** **Morrison** **WDM6**

Use WRF 10cm radar simulator to make direct comparison with observations

Convective Cell Size vs. Height bi-PDF

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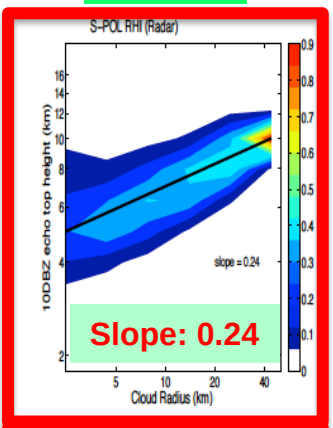
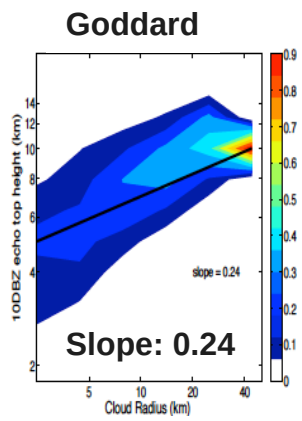
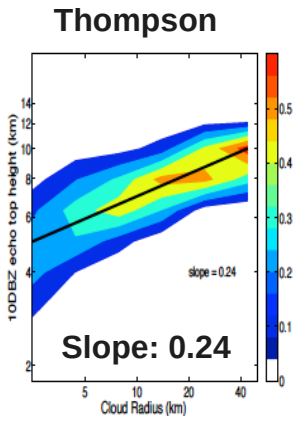
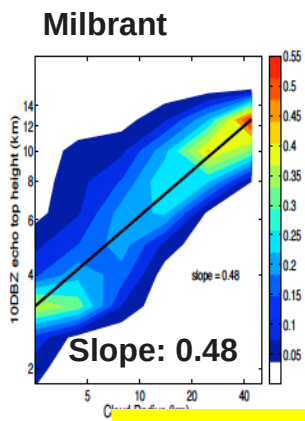
S-Pol

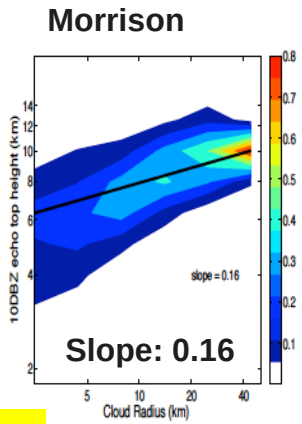
Version 1

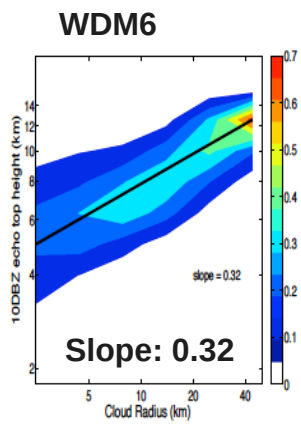




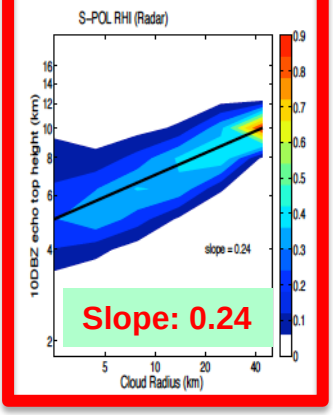


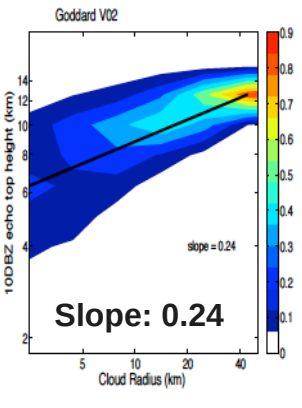


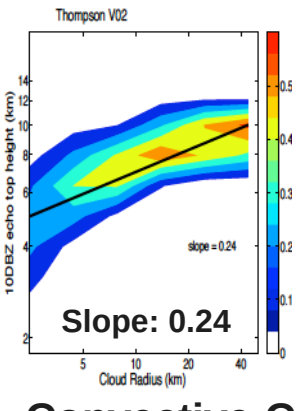


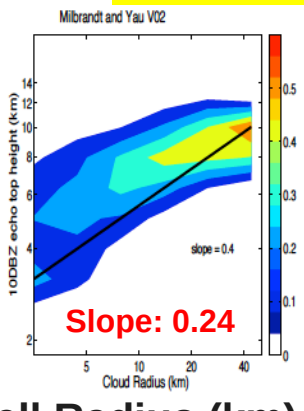


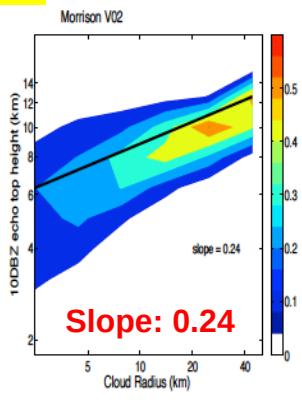
Version 2

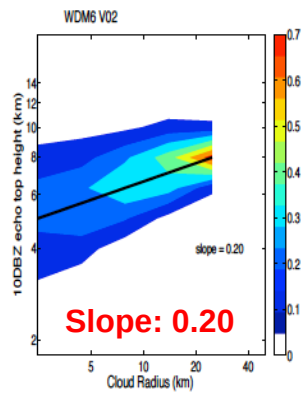












Convective Cell Radius (km)

- Number of convective cells as a function of size and echo-top height
- Slope of convective cell size vs. height: 0.24 (S-Pol)
- Reduce raindrop sizes make some simulations agree better with S-Pol

Evolution of Cloud-top Height

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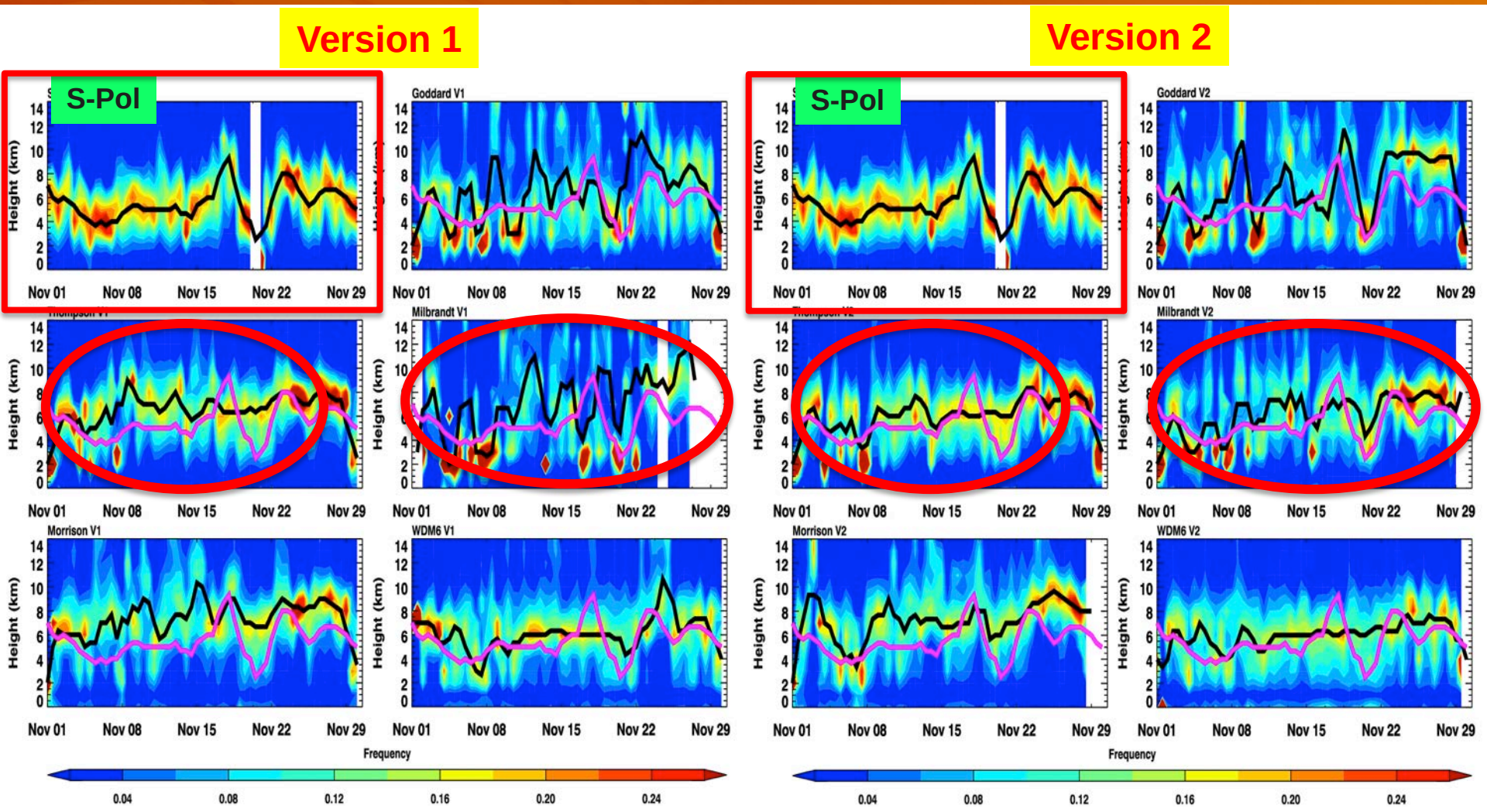

- Various degree of impacts to evolution of cloud populations
- Microphysics have important feedback to convective organization

Organization of Convection

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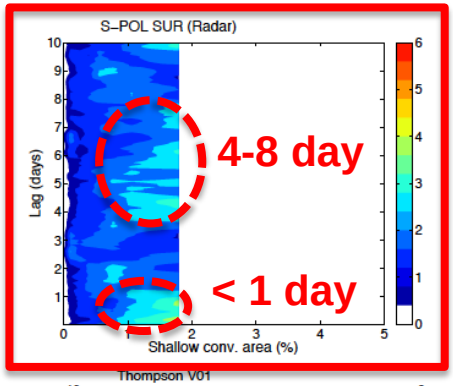

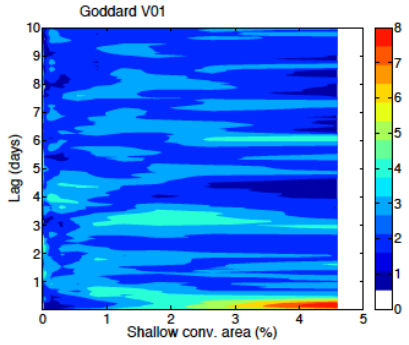

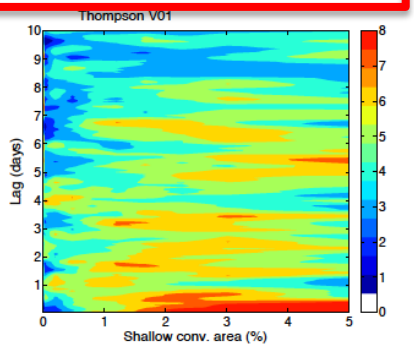

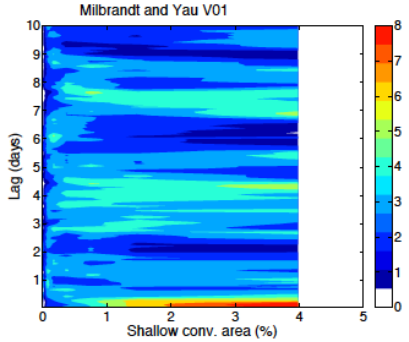

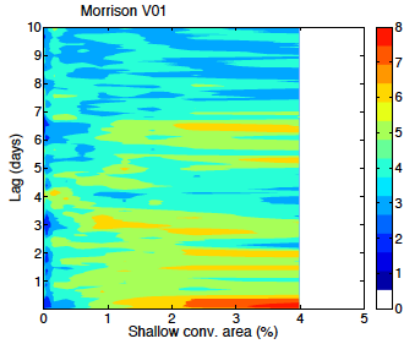

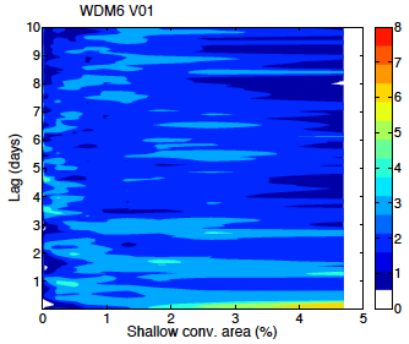

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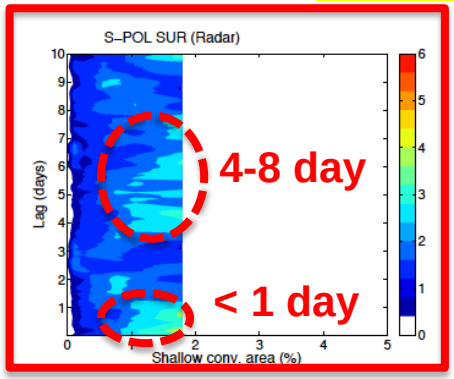

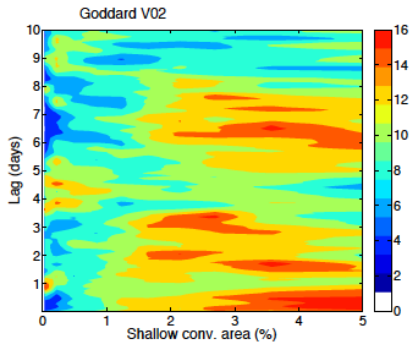

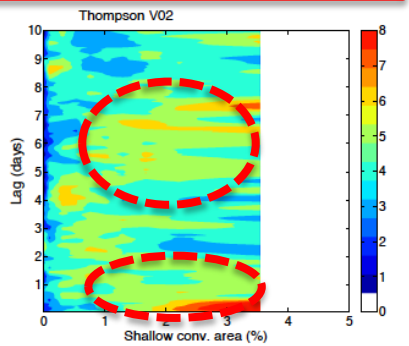

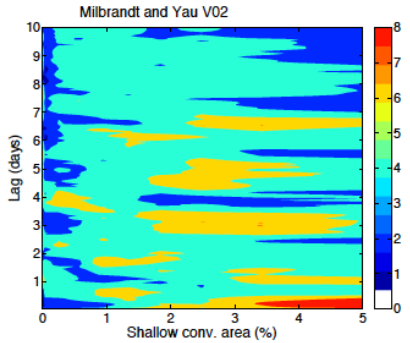

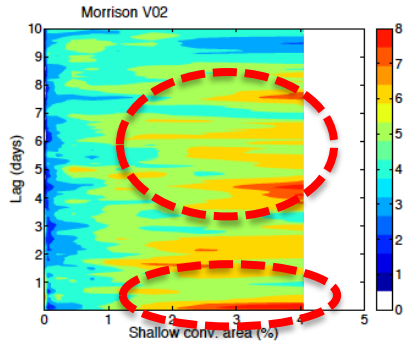

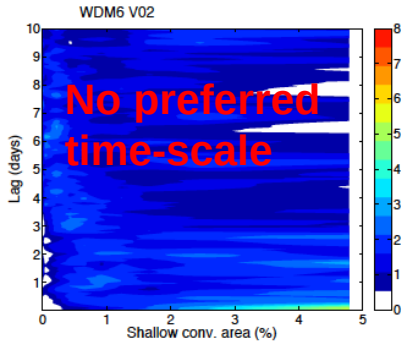

- Deep convective area as a function of shallow convective area & lag
- Microphysics impacts S2D transition in varying degrees

Summary

- High-res WRF simulation reasonably reproduces observed convective cloud population for November MJO episode
- Some microphysics schemes produced better S2D transition than others
- Investigate S2D transition using simulation with modified microphysics scheme on a large domain
- Use combined cloud remote sensing and sounding observations to support the analysis