Impact of Bulk Microphysics Complexity on Squall Line Simulations

Kwinten Van Weverberg[1], Andy Vogelmann[1], Hugh Morrison[2], Jason Milbrandt[3]

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[3] Brookhaven National Laboratory
[2] National Center for Atmospheric Research
[3] Environment Canada

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What level of complexity is needed in GCMs?

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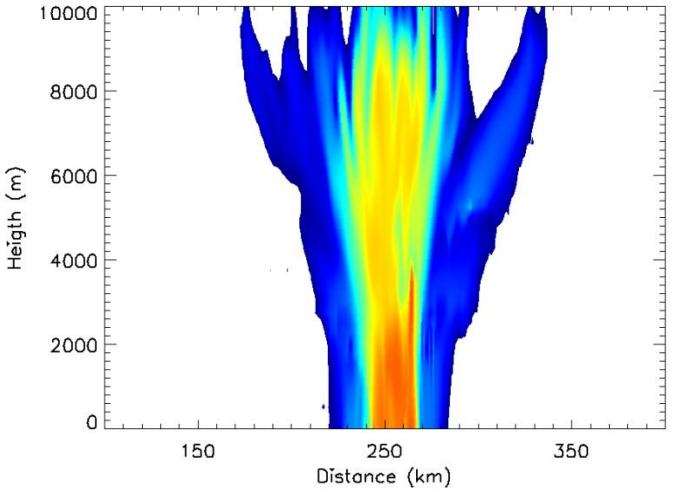
What Level of Complexity is Needed?

Sensitivity simulations of 2D-squall line using WRFV3.2: Morrison vs Milbrandt

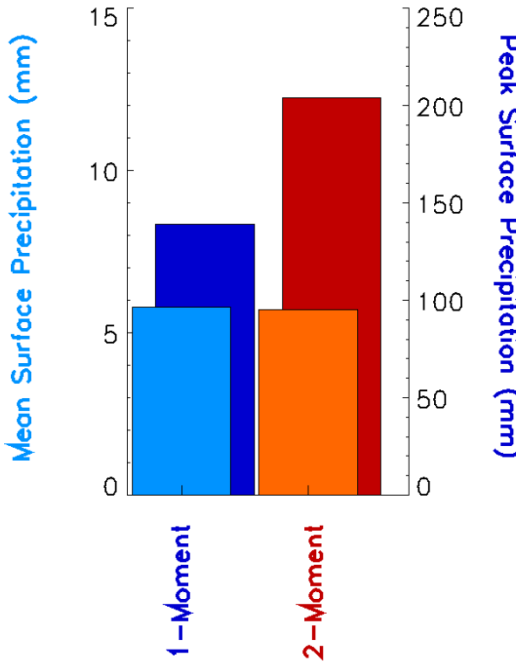
- Number of predicted moments for each hydrometeor
- Number of ice categories – graupel/hail
- Conversion term formulations

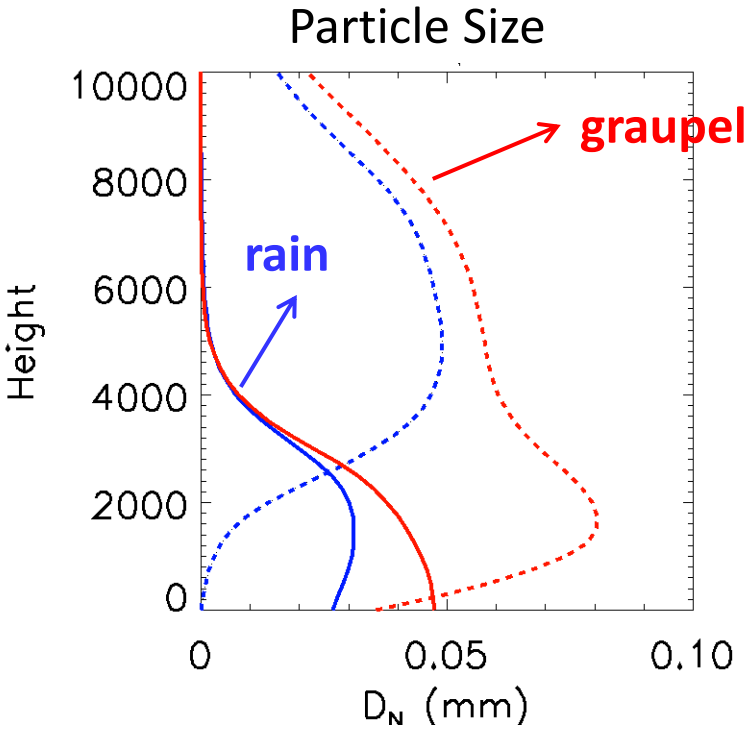


Key Findings

Precipitation extremes sensitive to # predicted moments and to drop breakup

- large drops: faster fallout and less evaporation





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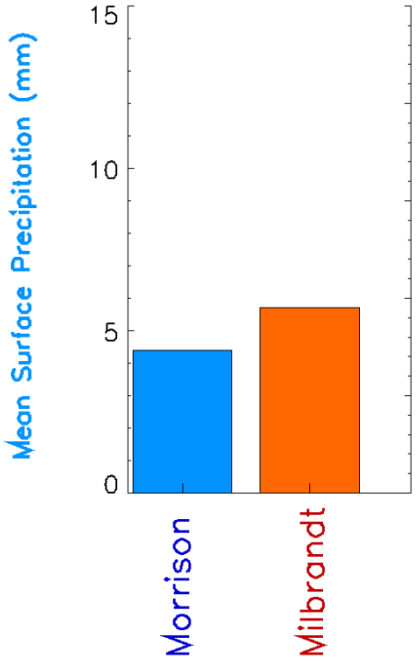
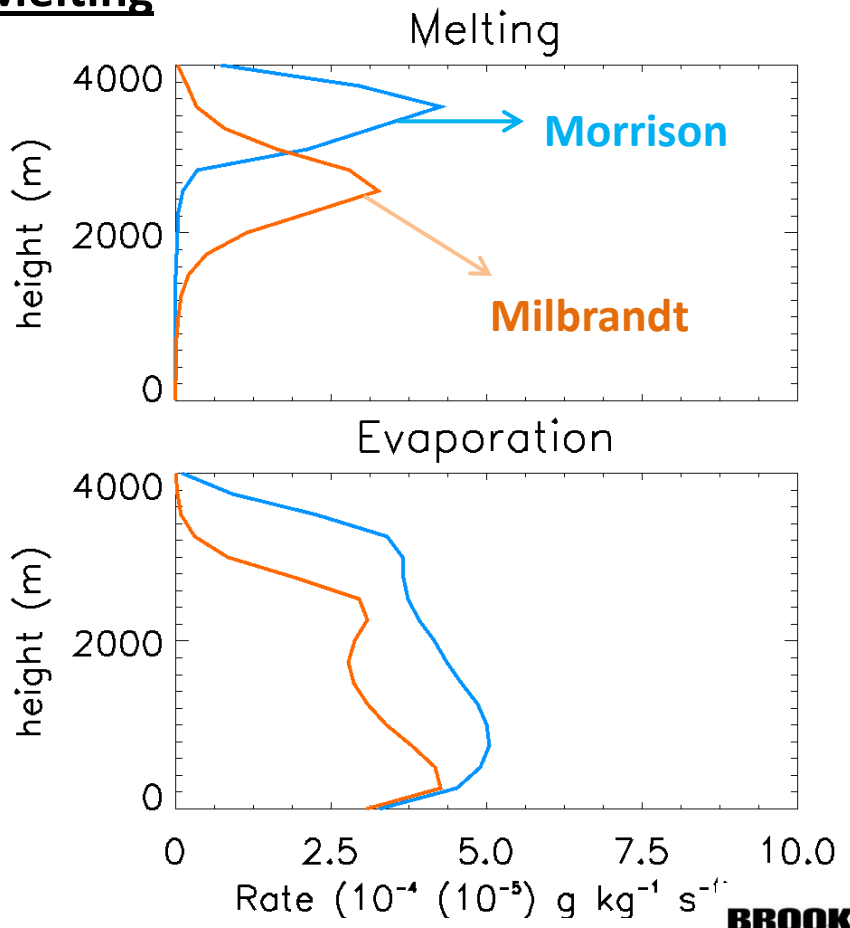
Key Findings

Differences between Morrison and Milbrandt:

- **Domain average precipitation: <u>Melting</u>**





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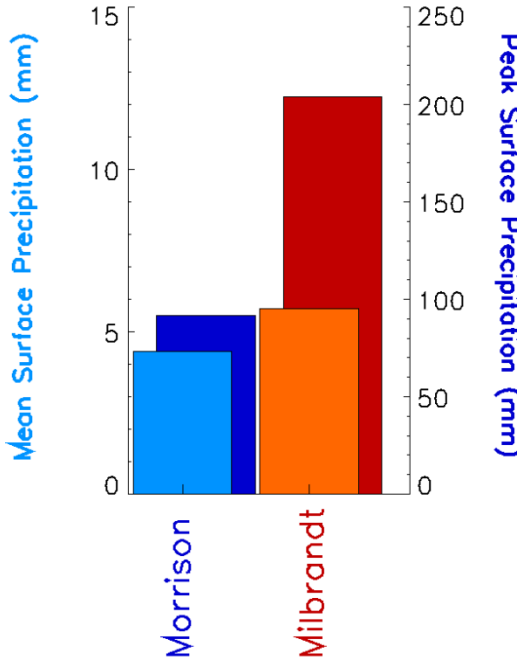
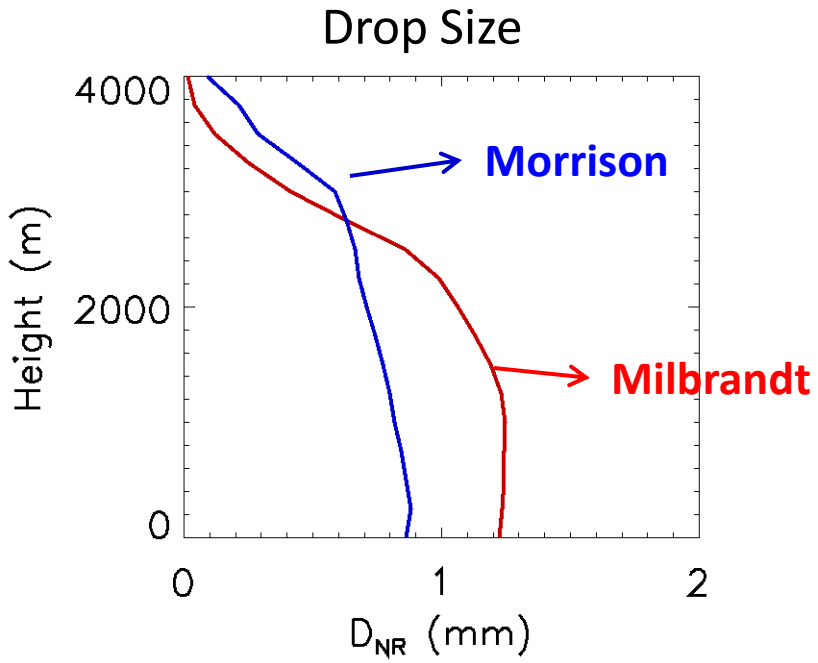
Key Findings

Differences between Morrison and Milbrandt:

- Domain maximum precipitation: <u>Breakup</u>





Conclusions

- **Precipitation extremes sensitive to number of predicted moments and breakup**
  - **Drop sizes and evaporation determine extremes**
- **Increasing number of ice categories makes schemes more sensitive to thresholds**
  - **Continuous riming schemes are probably better approach**
- **Breakup, Melting and Collection explain most of the differences between Milbrandt and Morrison**
  - **Need for observations on drop sizes and vertical profiles of melting precip content**
- ***Up next:***
  - **Bringing in observations (MC^{3}E, NEXRAD, Dual-Pol, Disdrometers)**