Status of the TWP-ICE SCM intercomparison

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Thanks to Kenneth Cheung and Marty Singh

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Outline

- Forcing method
  - Upper level temperature biases? The whys and wherefores….
- Initial single column model results
- Future directions
  - GCSS intercomparison project


Forcing methods
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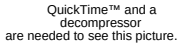
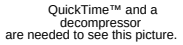
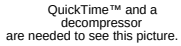
Forcing methods

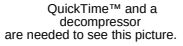
- Randall and Cripe (1999) describe 3 forcing methods for SCM:
  - Prescribe the total forcing - “revealed forcing”. Horizontal and vertical terms (including adiabatic).
  - Horizontal advective forcing. Horizontal term and vertical velocity or omega profiles.
  - Relaxation forcing. Relax T and q to observed profiles.
  - Which one to use…?!
- An additional consideration is how to use variational analysis output to prescribe the terms - use advection of T or s.

Theta biases



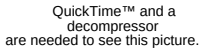




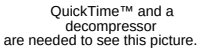


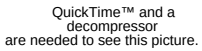
Vertical advection of T profiles

Active (day 20-25)

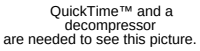


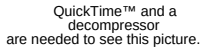
Break (day 38-43)





Focus on 15-22km






Initial single column model results
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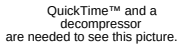
SCM setup

- SCM UM v6.3
- Prescribed horizontal advective tendency of Θ and q, prescribed omega.
- Horizontal winds relaxed on 2 hr timescale
- Fixed SST 29 ^{o}C
- Simulate 1 control (best estimate)
- And 100 ensemble members

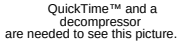
Ensemble rain rates

Passage of MCS

23 Jan 06



24 Jan 06



Ensemble SCM reproduces spread in observed rainfall.

Relative humidity

QuickTime™ and a
decompressor
are needed to see this picture.

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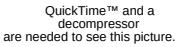
Obs RH

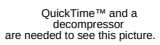
QuickTime™ and a
decompressor
are needed to see this picture.

Ensemble spread RH - Effect of forcing method

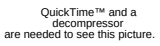
500 mb Relative humidity (liquid water)



Horz. adv. forcing



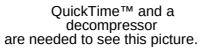
Revealed forcing



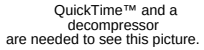
Forcing method can effect ensemble spread - not so much the ensemble mean.

LW Radiation

TOA outgoing LW



Surface downwelling LW



During MCS model always produces excessive high cloud.

The model high cloud is sensitive to the forcing during the suppressed monsoon.

There is insufficient low-level cloud during the suppressed monsoon.

Summary

- The method of forcing an SCM needs to be carefully considered, particularly in regions of deep atmospheric motion, e.g deep convection.
- Ensemble simulations provide and opportunity to investigate sensitivities, not just single best estimate solutions.

TWP-ICE SCM intercomparison

- An ensemble of forcing datasets based on uncertainties in observed rainfall provide an opportunity to:
  - Investigate model sensitivities in a different SCMs.
  - Determine the time evolution of model sensitivities.
  - Highlight issues in different convective regimes.

Further details:

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