MMF Plans*
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describes plans of PNNL, UW groups

* Tentative, subject to revision

PNNL – Steve Ghan and colleagues

- Focus on the direct and indirect effect of aerosol on climate
- Explicit Clouds – Parameterized Pollutants
  - Compute cloud properties with CRM in MMF
  - Use grid cell mean properties from CRM to drive pollutant processing by clouds and radiation effects at large grid cell

PNNL – Steve Ghan and colleagues

- Explicit Clouds – Parameterized Pollutants
  - Vertical transport from mean cloud mass flux
  - Aerosol activation and droplet nucleation from mean updraft velocity
  - Aqueous chemistry using mean cloud fraction and in-cloud water content
  - Precipitation scavenging from precip fraction and rate
  - Water uptake of unactivated aerosol based on CRM RH

PNNL – Steve Ghan and colleagues

- Model components
  - SAM
  - Morrison double-moment cloud microphysics
  - Golaz and Larson higher-order turbulence closure
  - Modal double-moment aerosol microphysics
- Run length
  - 16 months – 4 for spin-up and 12 for analysis

UW – Ackerman, Marchand, Liu, Bretherton, Blossey

- Focus on improving MMF cloud simulations
- Low clouds
  - Increased resolution
  - Adaptive vertical grid
  - Turbulence?
- Convective clouds
  - SAM with Morrison microphysics (SAM-M?)

UW – Ackerman, Marchand, Liu, Bretherton, Blossey

- Can we use MMF to answer questions about cloud feedbacks and climate sensitivity?
- Low clouds
  - Will better resolution / physics enable MMF to produce higher low-cloud fraction and lower low-cloud optical depths?
- Convective clouds
  - Will improved microphysics reduce convective cloud amount and optical depth?

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- Low clouds – increased resolution
  - In conjunction with John Helly and Marat K.
  - Allocated time on Purdue supercomputer
  - Starting runs next month
  - CRM at 250 m; duration of 3 months
  - Plans to do CRM at 125 m

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- Low clouds – adaptive grid
  - Marchand adaptive grid model
  - Tested for several GCSS low cloud cases
  - Additional development required for generalized use in MMF (6 to 12 months)
- Low clouds – turbulence
  - PNNL model with Golaz-Larson turbulence closure can be used to test impact on low clouds

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- Convective clouds
  - Developing collaboration with Hugh Morrison
  - Carry out a set of 2D/3D simulations with SAM-M for existing cases –
    - ARM Summer SGP case 9(run/ being analyzed)
    - Other possibilities – KWAJEX, TWP-ICE
- Adopt configuration for MMF and test impact on cloud amount and optical thickness in convective regions

Diagnostics

- Cloud diagnostics available for MMF
- Standard TOA radiation budget information
- CloudSat radar simulator
- MISR and ISCCP simulators
  - Joint histograms of optical depth and cloud-top height