Key findings related to process understanding, robust model capabilities

Breakout 4

Aerosol-clouds, chemistry

- Tome effect, multiple consistent estimates
- Albrecht effect appears smaller than GCMs suggest
- More models have interactive aerosols
- Understanding natural background state

- Confirm Albrecht effect result
- Aerosol Convective invigoration
- Need for more scenarios
- Understanding implications for 20th century record

- Understanding implications for paleo record
- Understand gap between micro physics and GCMs
- Better constraints on emissions

Climate Sensitivity

- High resolution models to constrain cloud feedbacks
- Climate sensitivity tuning
- Interpreting the 20th century record
- Understanding limits of TCRE

- Radiation forcing quantification
- Middle and high clouds
- Quantification of feedbacks and forcings
- Non-constancy of feedbacks and drivers
- Use of ocean heat update obs

- Cirrus clouds
- Use of paleo archives
- Improve aerosol-cloud representation
- Infer feedback values from long term trends

C Cycle

- Reduced uncertainty of Ocean C Cycle
- Emergence of coupled carbon-climate models
- Development of DGVMs
- Coupling of C-N cycle
- Quantifying effects of Land-use forcing, management
- Permafrost response

- Reduce uncertainty of land carbon cycle
- DGVM-demography
- Constrain effects of land use on land cover
- Management effects

- Close methane budget
- DA C cycle with more obs
- Constrain C cycle response to forcings
- Permafrost dynamics
- Role of biodiversity, acclimation

Oceans

- Parameterization of ocean mixing improved
- New theory for eddies
- Eddy resolving models
- Eddy permitting models
- More observations (e.g. Argo floats)
- State estimations
- Differentiate heat/C uptake
- Closing sea-level budget

- More observations
- Use of Deep Argo
- Improved AMOC

Hydrologic Sensitivity

- CAPE (Convective avail potential energy) response to temp
- Role of radiation schemes
- PPT extremes identification
- Effects of resolution on PPT

- Convective aggregation
- Cloud impact on surface radiation
- PPT extremes understanding

- Resolve persistent biases (e.g. S. ocean, summer dryness)
- Understand circulation to hydrological changes
- PPT frequency (e.g. drizzle)
- PPT extremes

Cryosphere, Ice-sheets

- Internal variation on sea-ice
- Recognition of surface sea-ice processes (e.g. melt ponds, snow)
- Recognition of importance of sea-ice variation
- Coupled dynamic ice-sheet models

- Spatial structure of sea-ice
- Sea-ice process understanding (sea-ice MIP, budget closure)
- ISMIP ice-sheet MIP

- Isostasy
- Ice-sheet–oceans interactions (e.g calving, bottom-melt)
- Small scale dynamics (e.g. ridges, leeds)