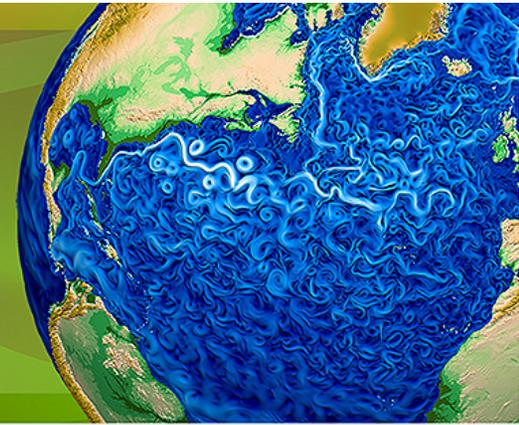




Accelerated Climate Modeling  
for Energy



# ACME since last Modeling Summit

David C. Bader and Ruby Leung

For ACME project members

June 27, 2017

# ACME Atmosphere

- Originated from CAM 5.3 SE (spectral element)
- 72 layers vs 30 in CAM
  - Increased vertical resolution
  - Model top extended from ~30 km to ~60 km
- Two resolutions – ~ 1 degree, ~¼ degree
- Improved aerosol and microphysics
- CLUBB shallow convection

# MPAS Ocean, Sea Ice, Land Ice

- Two standard ocean-sea ice configurations. 100 and 60 level versions
  - EC60to30 “Eddy Closure” with 60 km at mid-latitude and 30 km at the equator and poles.
  - RRS18to6 “Rossby Radius Sclaing” uses 18 km resolution in the tropical oceans (between 20N and 20S) and 6 km resolution at the poles.
- Marine BGC ported from POP
- Two ice-sheet models MPAS FELIX and BISICLES being tested as part of MISMIP and ISOMIP

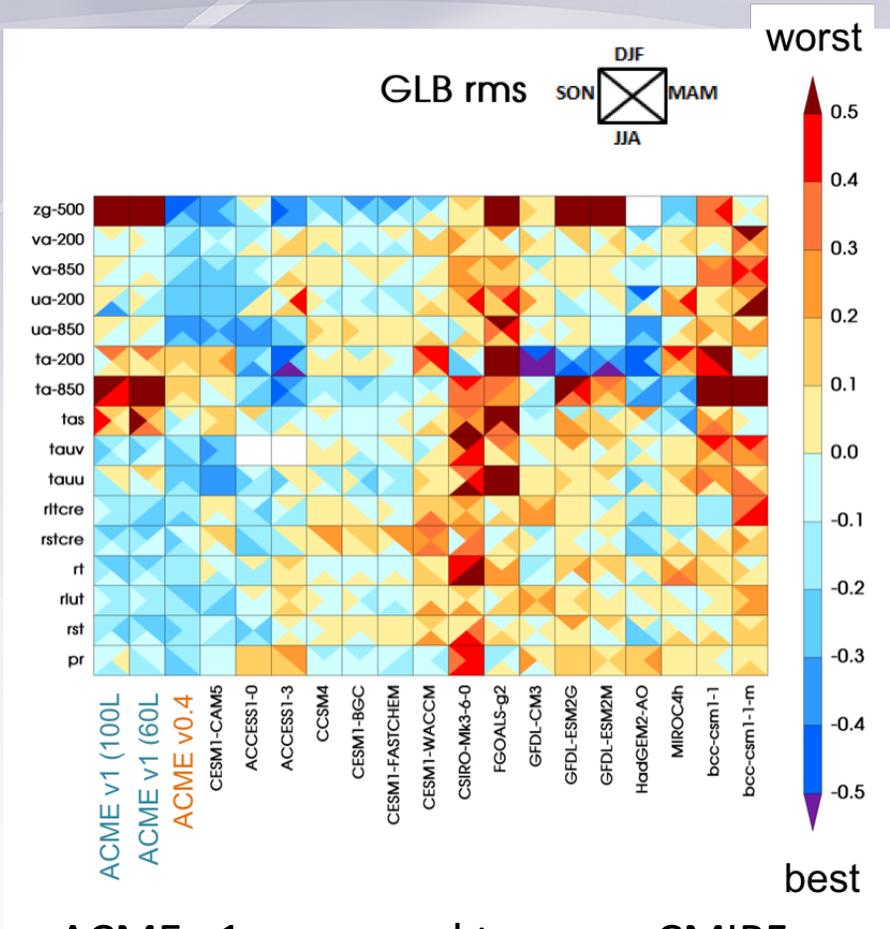
# ACME Land Model (ALM) and ACME-E

- Coupled C-N-P biogeochemistry
- Surface and subsurface hydrology improvements
- MOSART River inundation and run-off model
- Coupled ESM-IA model – iESM released – predecessor to ACME-E
- New developments
  - Managed water systems
  - Crops

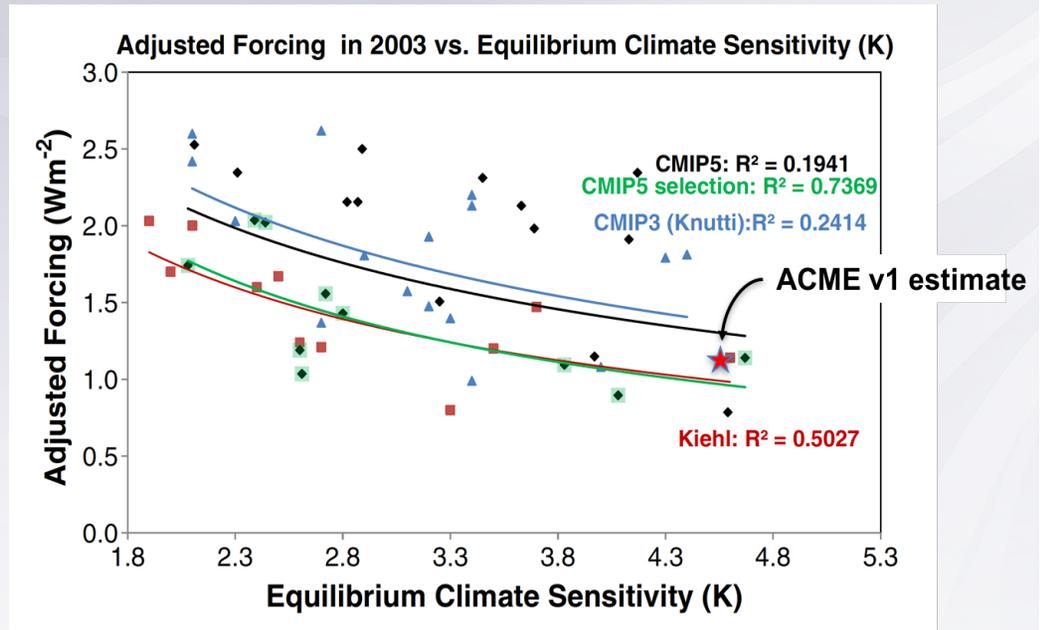
# Fully Coupled ACME v1

- Still testing low resolution version – 7 months and counting
  - Weak ENSO
  - Unacceptable cold bias
  - Likely suspect – numerical problems in ocean mixing parameterizations
- High resolution system
  - Components all complete
  - Undergoing performance evaluation on Mira and Cori
  - Spin-up of ocean/ice on Titan

# Early Results



ACME v1 compared to many CMIP5 models and v0.4.



Equilibrium climate sensitivity vs adjusted forcing for CMIP5 and CMIP3 models (Figure 7; Forster et al, 2013) with the added star indicating our best estimates for prototype ACME v1.

# Near Term Priorities and Deliverables (next 3 months)

- Working v1 ~1-degree resolution model
  - Identify problem causing low variability
  - Stable 1850 control simulation Start DECK runs
- "Production" 0.25/0.1 degree (atm/ocn) resolution configuration with acceptable throughput
- New Strategic Plan
- v1 component papers submitted

# Intermediate Term Priorities (3-9 months)

- Production high resolution experiment underway
- Complete 1850 DECK low resolution Control Run
- Complete AMIP 1970-2010 Simulation
- 19<sup>th</sup>-21<sup>st</sup> Century Historical Run and other DECK simulations underway
- Release v1 model
- Complete v2 experimental plans and priorities for new development