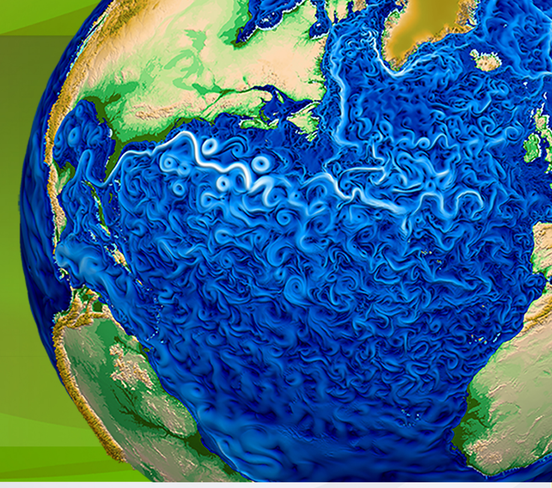
R: Tuning the NE30_L72 ACME V1 Atmosphere Model

Po-Lun Ma, Phil Rasch, Shaocheng Xie, Hailong Wang, Balwinder Singh, Wuyin Lin, Kai Zhang, Hui Wan, Yun Qian, Chris Golaz, Julio Bacmeister, Richard Easter, Steve Ghan, Rich Neale, Cecile Hannay, Yaga Richter, Susannah Burrows, Philip Cameron-Smith, Pete Bogenschutz, Vince Larson, Peter Caldwell, Bryce Harrop

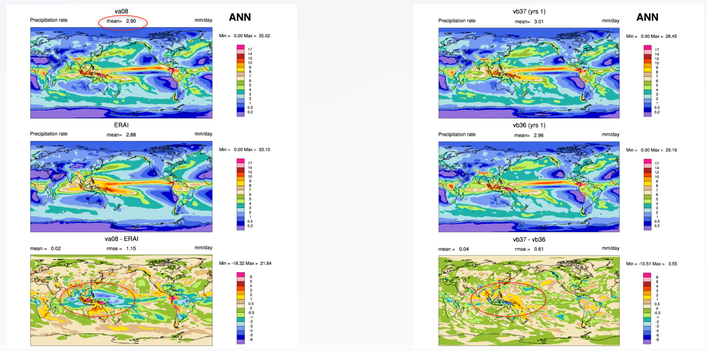


Task Summary

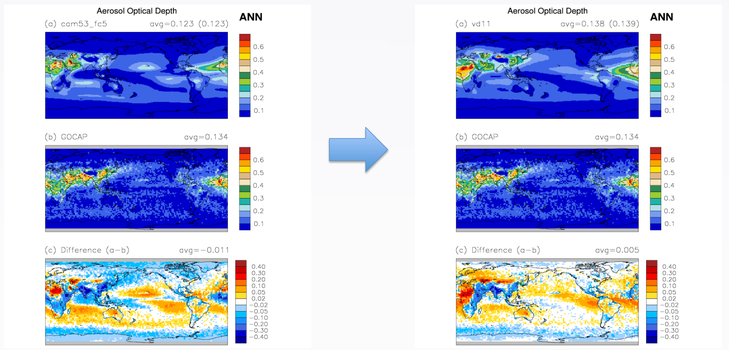
- Over 250 1-yr and multi-year simulations completed in 4 months
- Tunable parameters kept within physically justifiable range
- Cocktail approach: calibrated cloud microphysics, shallow convection, turbulence, deep convection, aerosols, gravity wave drag, and turbulent mountain stress.
- Atmosphere compset delivered at the end of February with near 0 TOA energy balance
- Working with the coupled team, compset updated every month
- Model features are calibrated against observations: CERES-EBAF for shortwave and longwave cloud forcing, GPCP, TRMM, and CMORPH for precipitation, MERRA and ERA-Interim for temperature and sea level pressure, CALIPSO and Satellite-AERONET composite for aerosols, Large-Yeager dataset for surface wind stress, etc.

Results

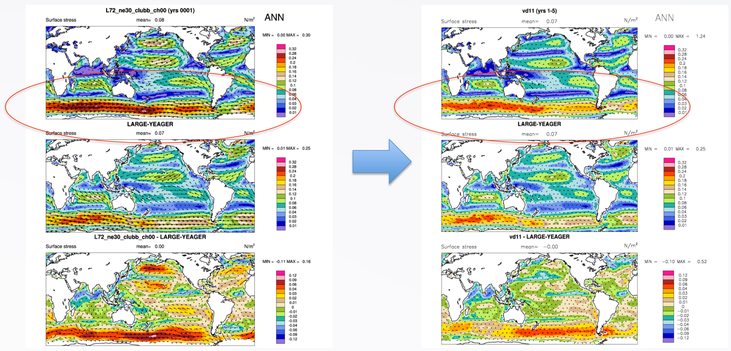
Precipitation



Aerosol Distribution



Surface wind stress



Aerosol Indirect Effects

Improvement in aerosol and cloud parameterizations lead to unrealistic AIE (-3W/m^2):

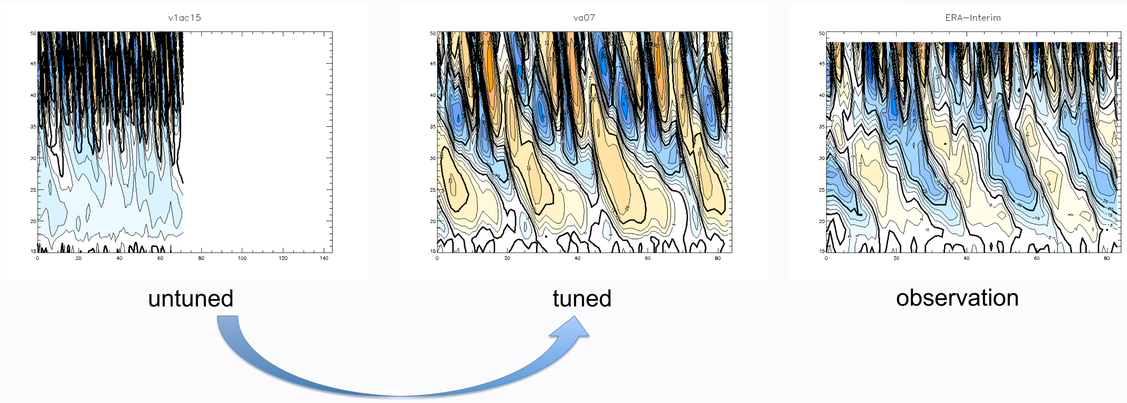
- Anthropogenic aerosol burden in ACME V0 (CAM5) is about 8% of total aerosol burden, compared to 15% in ACME V1.
- Natural aerosol emissions tuned down to increase agreement with satellite observations
- Shallow convective clouds interacted with aerosols in CLUBB

Calibration strategy:

- Stratiform, shallow convection, deep convection, ice nucleation, autoconversion schemes tuned using observational constraints

	AIE (SW)	AIE (LW)	AIE (NET)
CAM5	-1.99	0.30	-1.69
VB31	-4.62	1.69	-2.93
VB40	-3.23	0.91	-2.32
VD11	-1.46	0.39	-1.07

QBO



ACME Accelerated Climate Modeling for Energy

For additional information, contact:

Po-Lun Ma
Scientist

Pacific Northwest National Laboratory
(509) 372-6936
Po-Lun.Ma@pnnl.gov

climatemodeling.science.energy.gov/acme

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