GFDL will run 2 DECKs

CM4.0 and ESM4.0

CM => prescribed CO2 concentrations
ESM => closed carbon cycle driven by emissions

DECKs are a shared lab-wide responsibility

decisions on MIPs, including which DECK to build on, left to scientific groups.
Not decided by lab as a whole

GFDL's CMIP6 generation models: CM4 and ESM4

	CM4.0 ("frozen", starting PI-control)	ESM4.1 (in final development)
Atm. Dyn.	100 km, 33 levels	100 km, 49 levels
Atm. Chem.	aerosol (21 tracers – O3 specified)	aerosol+ozone (103 tracers)
MOM6 Ocean	$1/4^o$, 75 levels	$1/2^o$, 75 levels
Ocean BGC	BLINGv2 (6 tracers - diagnostic)	COBALTv2 (33 tracers - prognostic)
Land	LM4.0	LM4.1 - PPA
Sea Ice	SIS2	SIS2

Comparison of CM4 with CMIP5 models in historical simulations
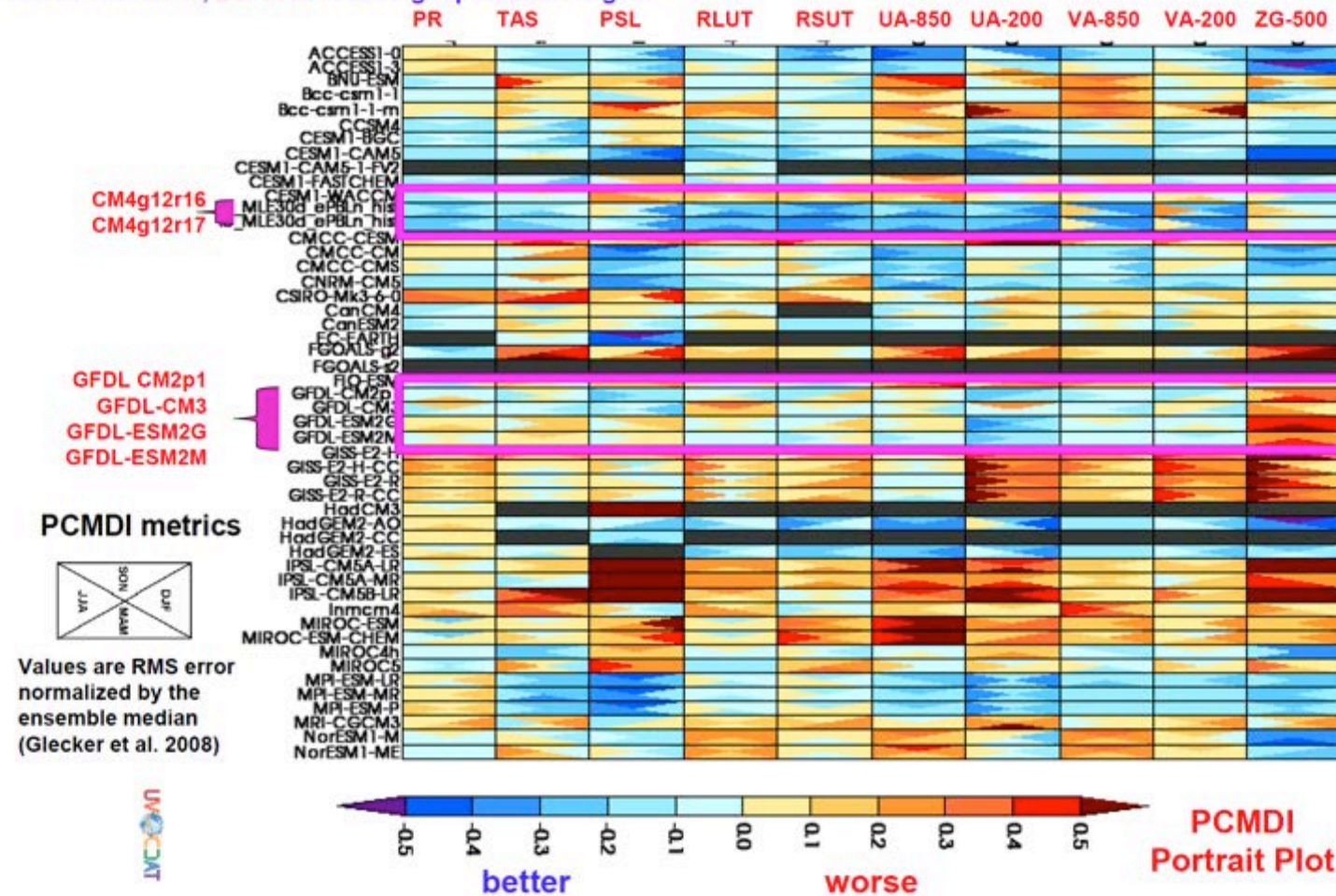
New Help in Model Development

Knowing where one stands relative to other modeling groups
Atm-only (AMIP) mode
AOGCM (CMIP historical) mode

Both using the ESMValTool and PMP

In the past, knew only relative to old in-house models

This is a big advance!

GISS Contributions to CMIP6 DECK + MIPS

Gavin Schmidt and ModelE team
NASA GISS

GISS DECK Configurations

Goddard Institute for Space Studies

GISS-E2.1-G: ModelE/GISS Ocean 2×2.5×L40. (Running) Updated and improved version of GISS-E2-R used in CMIP5

GISS-E3: ModelE Cubed Sphere C90;L102 (End 2017) New atmospheric dynamical core/Cubed-Sphere topology/new microphysics/convection.

GISS-E4: ModelE Cubed Sphere C180;L102 (2018/2019**)** As E3, but w/new GO2 (GISS Ocean 2) model.

GISS DECK Variations

Interactive composition:

phys_vers = 1 Non-interactive (concentrations from fully interactive runs)
phys_vers = 3 Interactive Aerosols/Chemistry (OMA – aerosol mass only)
phys_vers = 4 Interactive Aerosols/Chemistry (MATRIX – aerosol modes)
phys_vers = 5 Interactive Aerosols/Chemistry (TOMAS – aerosol bins)

Ocean model:

-G: GISS-Ocean (1ºx1.25º)
-H: HYCOM (~1º, mercator/tripolar grid)
-G2: GISS-Ocean 2 (~1/8º Cubed-sphere) (E4 only)

Model Top:

L40, model top 0.1hPa/55km (Only E2.1)
L102, model top 0.002hPa/80km (QBO, improved strat/trop exchange)

Forcings:

Variations of historical forcings incl. alternative solar, aerosols, land use

Carbon Cycle:

GISS Issues/Thoughts

**Goddard Institute for
Space Studies**

Generating forcings from emissions has taken longer than planned (slow finalization of emission data, unforeseen problems with 'everything' turned on)

Anticipation of continuation of forcings to 2016.
Some non-CMIP6 priorities (rerunning CMIP5 model with updated forcings)

Concerns about ESGF:
  Status of facility for storing derived data?
  Automatic DOI granularity is wrong (should've been ensemble member)
   Server-side analysis progress?

ESM4.0 components

Atmosphere:
100km (C96) as in AM4.0 but
49 levels with higher top
and full (CM3-like) chemistry

Ocean:
1/2 deg MOM6 with MEKE mesoscale closure

Ocean biogeochemistry:
Comprehensive COBALT

Land:
LM4.1 – new vegetation model ++

Hope to freeze model by Dec. 1

CM4.0 frozen

PI-control to start on ~~Sept 1~~ ~~Oct 1~~ Oct 9
(Zeno's paradox?)

AM4.0 documentation paper submitted

CM4.0 components

AM4.0
100km (C96 cubed sphere) – 33 level

"light" chemistry and aerosols
Aerosols from emissions but ozone specified

New convection ("double plume")

Updated radiation code, increases CO2 RF by 10%

Aerosol forcing reduced by 25% (before 1980) to 40% (present day)
Compared to CM3

Very good performance in AMIP mode compared to CMIP5 AMIPs

Ocean ¼ deg MOM6:
New vertical coordinate, new mixed layer
sub-meso closure but no mesoscale (GM)-like closure

ENSO very good in Pi control
But signficant drift in
deep ocean T, surface Southern Ocean T, ACC strength

May be better model for <100 simulations than for millennial problems

Ocean biogeochemistry:
BLING (simplified and purely diagnostic)

Land:
LM4.0 – modest changes from LM3

- New Interactive atmospheric chemistry from CM3 including improved Nitrogen, SO_4, and BVOC interactions
- COBALT Ocean biogeochemistry module for explicit treatment of zooplankton biodiversity and additional improvements
- Land Perfect Plasticity Approximation for more robust treatment of competition in canopy
- Moving from annual to daily fire
- Including hillslope tiles for subgridscale hydrological heterogeneity
- Soil microbial dynamics
- Interactive Dust
- Probably land coupled carbon-nitrogen interactions
- Currently merging the various code efforts and hoping to freeze ESM4.1 March of 2018 to complete DECK experiments by September 2018…