Decadal Climate Project model development

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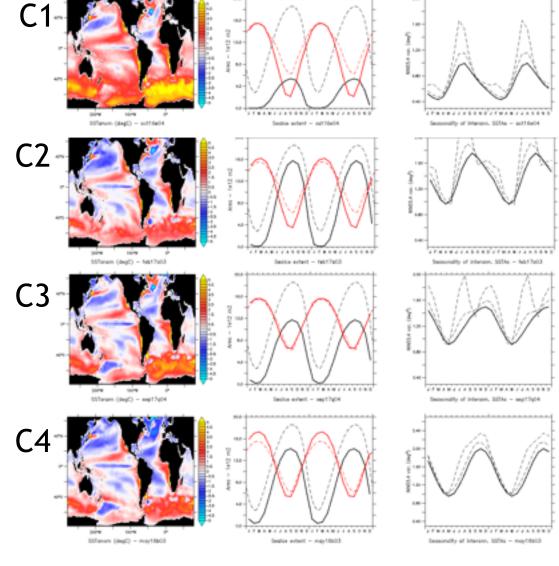
Overview

- Review existing control experiments, and tunings tested over the past 2 years.
- Mention ongoing model developments.
- Introduce Reanalysis experiments currently running: CAFE88, CAFE60.



Control Experiments

- C1 GFDL CM2.1 namelist (with ACCESS ocean grid).
- C2 restore ocean T+S below 2000 m.
- C3 switch to biharmonic friction; higher ice albedos; no deep restoring.
- C4 use biharmonic +laplacian schemes; differential ice albedo; GM_scaling 0.07 -> 0.10.



SSTanom

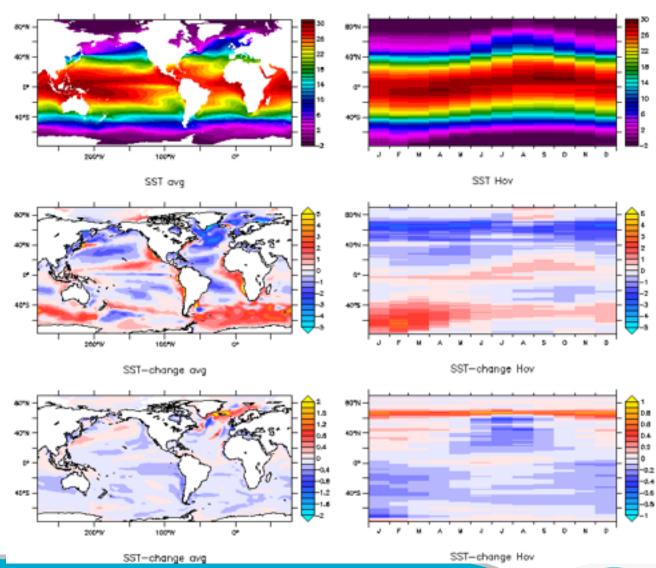
IceArea

Nino3.4 cycle



Wave mixing

- Fox & Kemper 2015, added by Russ.
- Aimed at improving Southern Ocean warm summer bias (middle).
- Some improvement, effects are global (bottom).





Ongoing work

- Plans to evaluate ACCESS-CM1/ESM configuration (UM-CICE-CABLE-MOM).
- Ocean:
 - 0.25-deg resolution model.
- Atmosphere:
 - testing AM2.5 (50-km res.), cubed-sphere grid. Also includes updated land model (LM3).
 - 'Cubic' grid enables better computer performance.
 - AM4 model.



100 members CAFE-88 CAFE-60: 220km atmos; 110km ocean; ETKF 96 members -**CAFE** ERA-Interim: 10 members 80km atmosphere; 4DVar CERA: 125km atmos; 110km ocean; 3DVar 10 members 1 member Reanalyses CSIRO Bluelink : 10km ocean ; EnOI → GODAS: 120km ocean: 3DVar CFSR: 38km atmosphere; 30km ocean; 3DVar 104 years JRA: 55km atmosphere: 4DVar 103 years 102 years Climate Projection (BVP) 10 years Decadal Prediction (IVP & BVP) 1 year 1 month Seasonal Prediction (IVP) 1 week Planetary 1 day Weather Prediction (IVP) Cloud Internal waves clusters 1 hour Thunder Oceanic turbulence 1 min Tormados CAFE-88 CAFE-60 Resolution 1 sec 1km 10km 10²km 10^3 km 104km 105km 1mm 1cm 1dm 10m 100m

• Assimilate data into fully-coupled model (JRA-55 state for atmosphere, sea ice concentration, ocean obs.)

Microscale

Mesoscale

Synoptic

Planetary

- 96-member dynamic ensemble.
- CAFE-88: daily DA cycle, start 1988. To initialise forecasts each month.
- CAFE-60: monthly DA cycle, start 1960. Forecast for each 1-Nov for WMO/ Decadal Climate Prediction Project.

