

ACCESS CMIP7 Model Evaluation Hackathon: Suggested evaluation activities

1. Comparison of concentration-driven and emissions-driven historical simulations

Context: CMIP7 will have a greater focus on emissions-driven simulations with an interactive carbon cycle. Emissions-driven simulations are useful because they incorporate feedbacks between the carbon cycle and climate and because they can be more directly related to carbon mitigation efforts.

ACCESS-ESM1.5 was used to run an emissions-driven historical simulation for CMIP6 (as well as an emissions-driven SSP-585. Global scale analysis shows little difference between the emissions-driven and concentration-driven historical simulation. See figure from Schroeter et al., Global-scale future climate projections from ACCESS model contributions to CMIP6, JSHESS, in press.

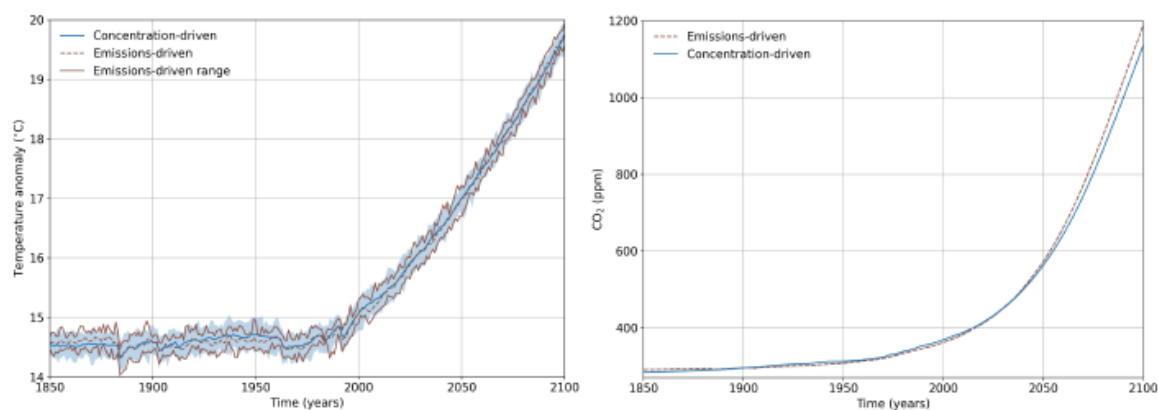


Figure 13. Global mean temperature (a) of the *esm-historical* and *esm-ssp585* emissions-driven simulations (red), compared to the concentration-driven *historical* and *ssp585* scenario (blue). Values are presented as absolute values to evince the absolute difference between the concentration and emissions-driven configurations. In (b), global mean atmospheric surface CO₂ concentration in the *esm-historical* and *esm-ssp585* emissions-driven configuration (red), compared to the concentration-driven *historical* and *ssp585* simulations (blue). Only surface CO₂ concentrations are shown since the well-mixed boundary layer is what is seen by the land and the ocean.

Question: Are there more substantive differences between the simulations at regional scale and/or for particular time periods or for different climate variables?

Datasets:

- /g/data/fs38/publications/CMIP6/CMIP/CSIRO/ACCESS-ESM1-5/historical
- /g/data/fs38/publications/CMIP6/CMIP/CSIRO/ACCESS-ESM1-5/esm-hist
- /g/data/nf33/public/data/ILAMB/ILAMB_RESULT/rechal_result (ILAMB output which includes these two cases)
- The ILAMB output also includes other historical and amip simulations that may be of interest to the land/carbon-cycle breakout group. Note that the ESM1.5-CABLE3 case has a bug in plant respiration and should be ignored.

2. Assessment of alternate model configurations of ACCESS-CM2

Context: While ACCESS-CM2 performance is good overall and reasonable for many ENSO metrics, the ENSO periodicity is biannual. A series of experiments have been performed with

different ocean (GM) and atmosphere parameters (based on the UK Met Office Perturbed Parameter Ensemble). These have had a preliminary assessment for ENSO metrics and other general diagnostics. A few have been selected (with generally better performance) for further evaluation.

Question: What other metrics should be considered in assessing these simulations? Are there aspects of the simulation that have been degraded which would negate any benefits seen in the ENSO performance?

Datasets:

The test runs are control runs with present-day (1985-2014 average) forcing (despite being in a directory called piControl). These are best compared with later years of the ACCESS-CM2 CMIP6 historical run and the ACCESS-CM2 amip run.

- /g/data/fs38/publications/CMIP6/CMIP/CSIRO-ARCCSS/ACCESS-CM2/historical
- /g/data/fs38/publications/CMIP6/CMIP/CSIRO-ARCCSS/ACCESS-CM2/amip
- Present-day control with different ocean (GM) parameters:
/g/data/nf33/public/data/APP4/CMIP6/CMIP/CSIRO-ARCCSS/ACCESS-CM2/piControl/r2i1p16f1
- Present-day control with ocean parameters as above and alternate atmosphere parameters: /g/data/nf33/public/data/APP4/CMIP6/CMIP/CSIRO-ARCCSS/ACCESS-CM2/piControl/r3i1p1f1
- Present-day control with ocean parameters as above and a different set of atmosphere parameters: /g/data/nf33/public/data/APP4/CMIP6/CMIP/CSIRO-ARCCSS/ACCESS-CM2/piControl/r3i1p3f1
- Present-day control with ocean parameters as above and a different set of atmosphere parameters: /g/data/nf33/public/data/APP4/CMIP6/CMIP/CSIRO-ARCCSS/ACCESS-CM2/piControl/r3i1p17f1
- ILAMB output: /g/data/nf33/public/data/ILAMB/ILAMB_RESULT/p66_ar_1