

Interactive comment on “Differences in carbon cycle and temperature projections from emission- and concentration-driven earth system model simulations” by P. Shao et al.

Anonymous Referee #2

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The authors compare results from CO₂-concentration and CO₂-emission driven RCP8.5 simulations published as part of CMIP6. Considered are results from 8 models. Results are compared globally and compartment-wise (atmosphere, land ocean) with respect to differences in carbon uptake, and in surface air temperature. Compared are also differences in diagnostic emissions (called "compatible" emissions by Jones et al. (2013)). Also considered are the seasonal cycles of global atmospheric CO₂ and hemispheric temperatures in comparison to observational data. In addition, the sensitivity $\alpha = dT/dCO_2$ of surface air temperature to CO₂ changes is computed for two periods (1980-2005, 2075-2100) and is for the first period also compared with an observational value for alpha. Finally, the authors propose to use $dT/d\ln(CO_2)$ instead

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of alpha as a better measure of this sensitivity.

All these comparisons are performed without any clear scientific question and accordingly the choice of analyzed variables looks quite arbitrary (many other variables exist in the CMIP5 archive). In principle differences in concentration driven and emission driven experiments could reveal insight into the importance of the re-shuffling of carbon between ocean and land for the global carbon cycle because this re-shuffling is suppressed in the concentration driven experiments. But this issue is not tackled in the paper. Moreover, the discussion of a slightly modified sensitivity index alpha looks like an arbitrary add-on to the paper because no concrete scientific conclusions are drawn from its introduction (the proposed use in the Friedlingstein feedback formalism makes no sense).

My conclusion is that this paper is more a plotting exercise than a scientific investigation.

Interactive comment on Earth Syst. Dynam. Discuss., 5, 991, 2014.