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Geoscientific Model Development Discussions

Interactive comment on "A computationally efficient model for probabilistic local warming projections constrained by history matching and pattern scaling" *by* Philip Goodwin et al.

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General comments

This paper describes a simple methodology for translating global mean surface temperature diagnostic output from a simple climate model (WASP, but in theory any model like MAGICC, FAIR, Hector could theoretically be used) into regional surface temperature changes using a pattern scaling approach. While this is not a necessarily new concept (see fldgen: https://www.geosci-model-dev.net/12/1477/2019/), it is appreciated that a quick and simple tool would be greatly useful for translating the output of simple climate models (e.g. from IAMs) to regional impacts. Additionally, there is a

Printer-friendly version

Discussion paper

nice link from carbon emissions/carbon budgets to future carbon emissions. With this knowledge it could be possible to assess regional impacts as a function of the remaining carbon budget (e.g. to 1.5C).

Specific comments

∼Major

p4 l4-10: I am not sure if three scenarios that all show various rates of continually increasing warming are sufficient to make this conclusion. I would suspect that this does not hold for RCP2.6 where most models stabilise in temperature but regional patterns may continue to evolve. It would be good to show this. It would be helpful to see the 1pctCO2 scenarios for comparison in figure 1, also. (also relevant to p6 l6-10)

p4l22: a point on different non-CO2 forcers in the three scenarios - the RCPs are quite heterogeneous in their aerosol forcing in future scenarios, and 1pctCO2 does not include them. I'm not sure this gives us much information for pattern scaling for custom emissions scenarios. See figure 3 in Liu et al. for temperature responses to - admittedly somewhat extreme - cases of aerosol forcing in Europe and Asia. https://doi.org/10.1175/JCLI-D-17-0439.s1 . Some more discussion about how this model could handle widely varying timeseries of global and regional aerosol forcing would really help strengthen the model (and paper).

∼Minor

p1l36: a couple of years: I'd say it's more like 7 or 8, approximately in line with the corresponding IPCC Assessments.

p2l25: I think it's worth explaining which observational temperature datasets were used because the future projections you obtain from history matching will depend on whether they are observational blended global near-surface air temperautre and sea surface temperature and whether they infill for missing data.

Typographic/stylistic

various places: CO2: the 2 should be a subscript unless talking about named CMIP experiments where this is not the case (e.g. 1pctCO2).

p2l12: IMAGE and MESSAGE

p2l19: do you need to reiterate "efficient"?

p3l11: retracethe space missing

p4l9: not much relevant > not very relevant?

p4l39: observationally-constrained

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