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Climate of the Past Discussions

Interactive comment on "Could the Pliocene constrain the Equilibrium Climate Sensitivity?" *by* J. C. Hargreaves and J. D. Annan

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Here we provide additional comments in reply to anonymous review 1, including detailed responses to the minor points.

Further to the discussion on the regression, we will also include the regression with zero constant term and include this fully in our discussion. As the reviewer predicts, this does of course generate a rather different result, extending to much lower values while still reaching similarly high values to the original result.

Also, please note that changing to modelled SST rather than SAT has clearly improved the agreement between models and data, though without materially affecting the main results. This is due to the combined effects of both some changes in the anomaly values, together with, together with minor changes to the gridding and masking. The

observational estimate now overlaps more substantially with the range of model results. Nevertheless, there does still appear to be a general bias between models and data.

Minor points:

Charley sensitivity is quite widely used in the literature (often in contrast to Earth System sensitivity) and we think it's worth clarifying that this is what we are using exclusively in the paper. We have changed to ECS in multiple places.

24 Ice sheet forcing is not known precisely, and perhaps more importantly, it does not add linearly with other forcings (in GCMs where this can be, and has been tested).

30 The argument is simply that the response will not be precisely linear over a large range of positive and negative forcings (even restricted to CO2) and hence the historical response to high CO2 is the scenario which we may expect to give the best estimate of the future response to high CO2.

33 Agreed, we will expand this section

52 yes probably

98 yes they are attempting to simulate the same climate, with AGCM (prescribed SST) and AOGCM.

109,225 Agreed and we will explicitly mention this

133 Will do

139 30S-30N, now included

217,219,223,227 We will make some minor edits here

256 We use this term to refer to the underlying principle of constancy in natural laws, which underpins the concept of repeatability in experiments

257 Noted.