

Interactive comment on “Evaluating climate model performance with various parameter sets using observations over the last centuries” by M. F. Loutre et al.

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I am sorry to be negative about this paper, but I hope that the authors may find my comments helpful. The problem is that the paper does not discuss a scientific hypothesis or answer any scientific question. Consequently, it presents no new insight and so does not progress scientific knowledge. The paper should, therefore, either be re-written with a clear scientific result and re-submitted here, or else, if the result is not yet mature, the work may be re-written as a detailed experiment design or model evaluation paper and submitted to GMD.

Having said that, the paper has the potential to be very interesting. I particularly like

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the way that the model ensemble has been run for a number of different experiments, to more completely investigate model behaviours.

I have some concerns over the higher sensitivity experiments as they appear to show no sign of starting to equilibrate after 1000 years. I understand that cpu may be limited, but at least the highest sensitivity model should be run for 3000-5000 years to check that it is not unstable.

In order to provide some context for comparison with simulations performed by other climate models (including the fully coupled AOGCMs) it would be helpful to document the equilibrium climate sensitivities, transient climate response (TCR) and ocean heat uptake efficiencies (Gregory and Mitchell GRL 1997) of the ensemble members. These should all be easy to calculate from the existing outputs with no need for additional runs, eg using the method of Gregory et al GRL 2004 over the last 930 years for the equilibrium sensitivity (if TOA radiation balance is unknown, net ocean heat uptake will provide a good estimate). The quoted "CO₂ sensitivity" does not seem to be a useful diagnostic as it is unique to this manuscript and seems to be some blend of transient and equilibrium response depending on the parameter values.

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