

## ***Interactive comment on “Estimates of climatic influence on the carbon cycle” by Ian Enting and Nathan Clisby***

### **Anonymous Referee #1**

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Review of “Estimates of climatic influence on the carbon cycle” by Enting and Clisby

This is a short review due to me not being able to follow the details of the mathematical derivation of the analysis. I follow the general direction, but not the detail of the transforms involved. The equations underpin the whole analysis so this does represent a limit to my ability to perform a thorough review. I will leave it to the editor whether this represents a failing of the reviewer or the paper! I feel that there is clearly a place for detailed mathematical analysis – this is a bedrock of science and we should not be forced to dumb-down important work. But at the same time, some journals are written for a more general science audience who would want to follow the work – ESD is aimed at cross-disciplinary and not all readers have such a strong maths background. Maybe this paper fits better in more specialised journals? Again – a matter for author

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and editor to discuss

Overall I support the main message of the paper that climate-carbon feedbacks are not independent of timescales. I think this is really important to stress and to understand. We have known this for some while (e.g. Gregory et al 2009), but additional evidence and discussion is useful.

However, when trying to follow the derivation I got stuck at equation 4 which appears to me to include both anthropogenic emissions and “emissions due to warming”. I do not understand this choice. I would have expected to just see “S” here as the anthropogenic emission. Or otherwise to include both the warming and CO<sub>2</sub> feedback terms. But to include one of them – the warming term – and not the other appears odd.

Other aspects I would commend:

- the use of multiple datasets of the warming in the paleo record is really nice to see. We know such reconstructions have uncertainties, so to explore implications of this is very good.
- Extension from these periods into the historical is a nice novel analysis
- The conclusion that gamma is not constant for different periods is important – a follow-on conclusion therefore is that one cannot simply translate a measured/inferred gamma from past climates onto future. i.e. the analysis of Frank et al who compared the paleo gamma to model-simulated 21st century is not a valid comparison – rather we need to make sure the models try to simulate the same period as the observations to enable a one-to-one comparison.

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