

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

**Ian Enting and Nathan Clisby**

ian.g.enting@gmail.com

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### **Overall response**

Our response AC3 discusses the importance of the Laplace transform formalism. Apart from being more compact and flexible than the corresponding integro-differential equations in the time domain, we think it is important for 3 reasons:

- \* Relating our formalism to the framework introduced by Friedlingstein et al (2003) and used in the majority of subsequent studies. (in particular relating the  $\beta$  factors to  $\text{CO}_2$  responses,  $R(t)$ )
- \* explaining how our estimates relate to the weighted sums calculated by Bauska et al.

C1

\* clarifying the issues of  $R(t)$  vs  $R_{\text{FB}}$ . Reviewer 2 had thought that this is the only use that we had made of Laplace transforms, but arguably it is less important than relating our formalism to previous studies.

Consequently, we feel that it is appropriate to retain the Laplace transform formalism in the body of the paper.

### **Reviewer 1.:**

The editor has confirmed that ESD is an appropriate journal for presenting work at this level detail. We are gratified by this, since we feel that in the past some key connections (see comments above, and AC3) have been missed because the relevant mathematics has only been published in more specialised contexts (e.g. Enting et al 1994; Enting 2007, 2010).

### **Reviewer 2:**

Our responses to the line-by-line comments from reviewer 2 are given in our comment AC4 which lists our proposed changes. These include additional words to address the issue of the choice of  $\tau$ .

We thank the reviewer for the care and effort that has gone into the review.

### **Additional changes not flagged in AC4**

\* We will add a reference to Enting and Mansbridge (1987) when discussing deconvolution in the context of the Bauska analysis. (Rather than referring to Enting (2007), which we had previously flagged we would do in AC4 for line 238.)

\* Tables 1 and 2 will be restructured so that the date ranges form a single column, as suggested by reviewer 2.

C2

\* Additional wording at beginning of 'Estimation' section in association with following the reviewer's suggestion of moving the equation for  $H(t)$ .

We are gratified that both reviewers acknowledge the importance of our study.

**Reference (referenced in comments but not in paper)**

I. G. Enting (2007). Laplace transform analysis of the carbon cycle. *Environmental Modelling and Software* **22**:1488–1497.

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