

## ***Interactive comment on “Path dependence of climate and carbon cycle response over a broad range of cumulative carbon emissions” by T. Herrington and K. Zickfeld***

**D. Archer (Referee)**

d-archer@uchicago.edu

Received and published: 7 July 2014

This is a nicely written, clearly presented paper describing the limits to the generally very good one-to-one correspondence between the total amount of CO<sub>2</sub> ever emitted by humankind, and the peak temperature and other climate responses. The results presented here seem consistent with previous studies, over a wider range of emission magnitudes and timings. The previous results are well described, and the new results extend them in a useful way.

The carbon cycle responses are very interesting, but of course they are subject to uncertainties which could be pointed out more clearly. Uptake by the ocean may be af-

C295

ected by changes in pH or any of a number of other things, driving ecosystem changes which affect the biological pump. The glacial / interglacial pCO<sub>2</sub> cycle is a demonstration of something like this. Land uptake models are on difficult ground trying to predict the CO<sub>2</sub> fertilization effect, is my understanding, with widely diverging predictions from different models. This could be stated more clearly in the paper. In particular I wonder about frozen carbon in the Arctic; it doesn't seem to be represented in the model. It would be useful to note how much carbon is predicted to emerge from this source, and how that scales with the parts of the carbon cycle you are predicting.

---

Interactive comment on Earth Syst. Dynam. Discuss., 5, 747, 2014.

C296