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Earth System Dynamics
Discussions

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

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Oeschger et al. (1980) defined a dilution factor ($D(\mu)$ in their notation), corresponding to what we denote as $1 + \beta_O(p) + \beta_L(p)$ where $1/\mu$ is the e-folding time of the growth of emissions, corresponding to our variable, p.

Their equation (4) partitions $D(\mu)$ as

$$D(\mu) = 1 + e(\mu)\frac{h_{oc}(\mu)}{H_{oc}} \times \frac{N_{oc}}{\xi N_a} + \epsilon\frac{h_b(\mu)}{H_b} \times \frac{N_b}{N_a}$$

The second and third terms in this equation correspond to β_O and β_L expressed in terms of quantities characteristic of the oceans and biota respectively (see Oeschger et al. for details of notation). The timescale dependence for the ocean is captured

through $h_{oc}(\mu)$ (an equivalent penetration depth for CO2, which they later express as mixed layer depth $+\sqrt{K/\mu}$ using a box-diffusion model) and and an equilibration factor $e(\mu)$. For the biosphere, the dependence $h_b(\mu)$ is parameterised in terms of a one-box model.

On reflection, given that the pioneering aspect of the Oeschger et al. analysis is the μ-dependence of their equivalents to β_O and β_L, (unlike the implicit assumption of fixed β in the work by Friedlingstein) our citation of Oeschger et al. might be better placed after equation (5).

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