

Reply to D. Rapp on Continuous and self-consistent CO₂ and climate records over the past 20 Myrs. By R.S.W. van de Wal and B. de Boer, L. Lourens, P. Köhler and R. Bintanja.

It is clearly that there is a misunderstanding in the interpretation of our figure 5 by D. Rapp and possibly also by the reviewer D. Royer. Figure 5 shows the relation between ΔT_{NH} and $\ln(\text{CO}_2/\text{CO}_{2\text{ref}})$. This relation includes all effects as presented in equation 5 in the manuscript. This implies $\alpha=2.5$ (a factor relating our Northern Hemisphere land temperatures to the global mean), $\beta=5.35$ relating radiative forcing to carbondioxide concentration), γ (the effect of non-CO₂ greenhouse gases and f (the slow feedbacks in the system, albedo changes by land ice, vegetation and dust) and finally the Charney sensitivity S_c which includes the fast feedbacks (water vapour, lapse rate, albedo, snow and sea ice and clouds).

So if we follow the example by D. Rapp of CO₂ is 390 ppm we find with the constants in the manuscript a value of ΔT_{NH} of 15.1 (see also figure 5). This equals to a ΔT_{global} of 6.1, which corresponds without slow feedback to a global temperature change of 1.7 K, $(1-f) \cdot \Delta T_{\text{global}}$. This is the value, which is to be used if the analogue is made to the present-day.

Hence from this study one can conclude that it cannot be shown that the sensitivity is different for the paleoclimate data as presented in this paper as what is commonly derived from climate models.

We will make sure that this issue will be clarified in the revised version.

Note that the lambda in line 310 in eq.5 should be a gamma and that $f=0.71$ as stated below eq. 3.