Reply to Referee 2
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We thank the referee for the consideration given to our article. Both referees are highly critical, yet neither renders an opinion on the fundamental methodological issue we raise: the presumption, in many existing regression analyses of Pleistocene climate data, that the intercept of the regression line must pass through the origin. For the published dataset of Martínez-Botí et al (2015), which we analysed, that assumption would be rejected in a standard *t*-test at the significance level 1.28×10^{-34}. Only when the assumption of a tie-in to the origin is discarded does an important feature of the data emerge: the rate of change in mean annual surface temperature with respect to CO_2 forcing is different during episodes of decreasing CO_2 (which we termed "glaciation") and increasing CO_2 (termed "deglaciation"). The differences are large and the explanatory power of the regressions in these episodes also show large differences. Of course, as mentioned, these regressions capture only effects that play out within 1000 year timescales. Effects of slower processes show up in the noise. Loss of explanatory power during glaciation suggests that slower processes are more important than in the more rapid deglaciation episodes.

We were trained to first apply a simple analysis of data to see the molar features. It helps to catch big mistakes before adding assumptions and detail. We may have missed something in our readings, but nowhere in germane literature have we found the above issues addressed. Accordingly, we believe a brief Technical Note is the appropriate format for raising this finding and associated regression issues. Many referee comments effectively enjoin us to abandon the brief Technical Note format. Unless that format is excluded we forego addressing these comments, except to say that the characterizations in lines 39 to 54 to which the referee takes umbrage are not our inventions but taken verbatim from the cited articles.

Neither referee has indicated where the following pertinent facts are identified in the literature, to wit:
(1) statistical evidence against forcing the intercept to zero,
(2) the differences in regression coefficients in de/glaciation episodes, and
(3) differences in explanatory power in de/glaciation episodes.

We further believe that the paleoclimate community would be well served by enlisting a referee who can render an opinion on the central methodological issues relating to regression analysis.

For good order, we mention that Snyder (2019) gives detailed analysis of various regression models, and partitions the data according to ΔT, 450kaBP and temperature within 3.5C of the present. In Snyder's study, independent variables include forcings from CO_2, land ice, dust and vegetation -- reconstructed in various ways under various subjective assumptions. After spending considerable time reviewing those analyses, in our Technical Note to CP we decided, for reasons given in our reply to referee 1, to stick with the simple analysis, with CO_2 forcing as the sole independent variable. For convenience we reproduce here the considerations we articulated in our Technical Note:

“Much of the literature emphasizes Land Ice forcing, and the fact that this must be removed for predicting the effects of doubling CO_2 when the land ice is vastly reduced. We looked at this and eventually decided not to use these forcing terms as predicting the future was not our goal. We take advantage of this opportunity to share the following:

In Martínez-Botí et al (2015), three versions of Land Ice forcing are considered: $\Delta F_{CO2LIVDW11}$, $\Delta F_{CO2LIR09E12}$ and $\Delta F_{CO2LIR14}$ which include CO_2 forcing (see Martínez-Botí et al 2015 for detailed definitions). When regressing ΔT on these Land Ice forcing terms, the climate sensitivity parameter is lower than regressing on ΔF_{CO2}. At the same time, these forcings explain more of the variance in ΔT. The lower values of S are explained by the wider range of values of the land ice forcing terms. The strongest effect occurs with $\Delta F_{CO2LIVDW11}$. The linear regression coefficient of ΔT on ΔF is COV(ΔT, ΔF)/VAR(ΔF). For $\Delta F = \Delta_{FCO2}$ these values are $0.85/0.42 = 2.04$. For $\Delta F = \Delta F_{CO2LIVDW11}$ they are $2.18/1.99 = 1.096$. Quadrupling the variance of the forcing term overwhelms the doubling of the covariance term, roughly speaking.

If we remove the ΔF_{CO2} and regress ΔT on $\Delta F_{CO2LIVDW11} - \Delta F_{CO2}$, something curious happens. $\Delta F_{CO2LIVDW11} - \Delta F_{CO2}$ yields a better predictor of ΔT ($R^2=0.94$) than $\Delta F_{CO2LIVDW11}$ ($R^2=0.89$). This suggests that $\Delta F_{CO2LIVDW11}$ may incorporate information on ΔT to the extent that $\Delta F_{CO2LIVDW11} - \Delta F_{CO2}$ becomes a proxy for ΔT.”