



EGUsphere, author comment AC2
<https://doi.org/10.5194/egusphere-2022-574-AC2>, 2022
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Reply on RC2

Jordan R. W. Martin et al.

Author comment on "Predicting trends in atmospheric CO₂ across the Mid-Pleistocene Transition using existing climate archives" by Jordan R. W. Martin et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-574-AC2>, 2022

Comment: Line 16

Response: Accepted and revised

Comment: Line 17

Response: Accepted and revised. *kyr* – thousand years, *kya* thousand years ago, *Myr* – million years, *Mya* – million years ago

Comment: Line 25

Response: Revised in abstract: "...Further, discrete measurements and proxy data of atmospheric CO₂ indicate more stable interglacial concentrations during interglacial periods when compared to the glacial periods across the MPT. This supports the theories that changes in factors governing the stability of ice sheets over time (namely the removal of sub-glacial regolith, or phase locking of the Northern and Southern Hemisphere ice sheets at the precession orbital frequency) has resulted in the change from 41 kyr to 100 kyr ice age periodicity..."

Comment: Line 58-59

Response: Revised to: "The rationale in using the LR04 stack as an input parameter to predict CO₂ is based on the relationship of ocean temperature (of which $\delta^{18}\text{O}$ is a proxy measure) with its ability to absorb CO₂ from the atmosphere. The solubility of CO₂ in the ocean decreases with increasing temperature meaning when the ocean temperature is warmer there is a lower concentration of CO₂ in the atmosphere."

Comment: Line 66

Response: This record, while not providing any insight to the trends across the MPT (1250 – 800 kya), supports our general conclusion of a predicted upward departure of

CO2 values from our LR04 based predictions. The record presented by Dyez *et al.*, displays significantly higher IG CO2 values than our predicted models, whereas glacial CO2 is more in agreement. We will include this record on Fig02 in our discussion.

Comment: Line 68

Response: Accepted and revised

Comment: Line 85

Response: Revised to r2. The test is between our predicted record of CO2 and the observed composite ice core record. As the model we used was a generalised least square model, it accounted for autocorrelation/lag between the predictor (d18O) and CO2 using an AR correlation factor (see methods).

Comment: Line 89

Response: We will further discuss the limitations of blue ice CO2 reconstructions and d11B reconstructions of CO2 in our discussion.