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Interactive comment on "Alkenone isotopes show evidence of active carbon concentrating mechanisms in coccolithophores as aqueous carbon dioxide concentrations fall below 7 µmol L^{-1}" *by* Marcus P. S. Badger

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This manuscript is well-written and I expect that it will be a valuable addition to the ongoing discussion on CCMs in phytoplankton and coccolithophores in particular. There is something that I do not understand though. Based on Figure 2 I deduce that all of the sites used - with the exception of this Manop C site - have the same present-day CO2 partial pressure anomaly. In addition, all of the sites are within 0-30 N/S. This then makes me conclude that the calculation of [CO2]aq using the ice-core pCO2 estimates should primarily depend on SST and salinity estimates back in time right? I personally

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cannot see how SST and salinity back in time would be so much different for these very similar sites. I find this difficult to believe and it would be helpful if you could show the maps of the SST and salinity values used to calculate [CO2]aq. Also, I find it a bit of an easy statement to make that low CO2 should trigger the CCMs in coccos if recent papers have convincingly shown that light level and nutrient availability are main triggers of CCMs (e.g. Wilkes et al., 2019). Last, I find it a bit of an overstatement to say that as CO2 equilibrium should be better maintained at high atmospheric CO2 into the Cenozoic, and as CCMs should likely not operate at high pCO2; we can thus use the alkenone-pCO2 proxy confidentially throughout the whole Cenozoic. Could you discuss the uncertainty in this extrapolation? After all, pCO2 through glacial-interglacial times never exceeds 280ppm. Furthermore, what about coccolith evolution through time? I hope these comments are helpful.

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