The authors of this study present Mg\Ca and clumped isotope bottom water temperature records for the Late Pliocene from Site 849 (3346m) in the Pacific, and U1308 (3426m) in the Atlantic. They find that the Atlantic site was warmer (>4C as compared to ~1C warmer in the modern Ocean) and saltier than the Pacific site during this time. The authors attribute this to a different ocean circulation regime under which there is a more limited water mass exchange between the deep Atlantic and Pacific basins. Based on the amplitude of the cooling observed at both sites during MIS M2 they suggest that the benthic delta18O changes associated with this cold stage were mostly driven by changes in the deep ocean temperature rather than ice volume.

Overall, I found the new records exciting and very insightful and the manuscript rigorous and well structured. As a modeler I am not in the position to provide a critical assessment of the analysis methods but can offer an assessment of the dynamical interpretation. While the authors are careful to be vague as to mechanism in the abstract and conclusions, I am not completely convinced of the tentative explanation for the larger difference in water mass properties between the two basins stated in the discussion section (Ln 427-429). Given the circumpolar nature of the Southern Ocean and that already ~80% of modern deep water is upwelled in the Southern Ocean it is not clear how this would be enhanced in the Pliocene and lead to a reduction in the inter basin exchange of deep water. It would be good if the authors could point to a study with ocean simulations that reproduce the proposed type of circulation regime change. On the other hand, Pliocene simulations with north Pacific deep water formation result in fresher North Pacific deep waters relative to preindustrial (Burls et al., 2017, Fig. 5) and reduced warming relative to the Atlantic (Burls et al., 2017, Fig. 4). So it seems both scenarios should be considered in the discussion.

We will note that the influence of North Pacific Deep Water on Site 849 offers another possible explanation for the large temperature gradient observed between the Pacific and Atlantic basins. Given the reviewer's comment on the likeliness of increased upwelling of the warmer NADW in the Southern Ocean, we suggest omitting this speculative part of the section. We suggest revising this paragraph as follows: "Hypothetically, a possible explanation for the observed temperature gradient, if water mass mixing was identical to today, could be that the Southern Ocean end member cooled enough to compensate for the warm Atlantic waters to produce a cold Pacific end result. Given the globally warm surface conditions of the mid-Piacenzian, this scenario is, however, rather unlikely. Another possibility is that the deep central Pacific was bathed by water masses sourced from the North Pacific, rather than from the Southern Ocean. While formation of NPDW has been suggested for the Pliocene (Burls et al., 2017; Shankle et al., 2021; Ford et al., 2022), the modelled spatial extent of NPDW during the mPWP does not support a large influence of this water mass on the abyssal central Pacific (Ford et al., 2022). Instead, we consider it most likely that limited oceanic exchange occurred between the Pacific and Atlantic basins at this time. This suggests a fundamentally different mode of ocean circulation or mixing compared to the present."

The backing out of salinity estimates is a nice part of the manuscript but as one of the other reviewers mentions some more details are needed explaining how the ice sheet contribution was handled. This should not affect the basin gradient though. The limitations/robustness of assuming modern relationships should be discussed e.g. see Fig. S7 in Gaskell et al., (2022).

We recognize the inherent uncertainties in calculating salinity from d18O for the Pliocene given the likely changes in d18O-salinity relationships over time. To avoid putting too much emphasis on absolute values, we suggest omitting these calculations, and simply stating that there is likely to be a large salinity gradient between the two basins given the reconstructed difference in d18Osw.

Minor comments:

Ln 405-406:“Slightly less saline” perhaps add modern values to Table 2 so that the reader can assess just how much fresher for the Pacific.

See above, we will remove Table 2.

Fig 2d: The incorrect axis label is provided; it should be insolation and presumably units of W/m^2.

We will fix the axis label on Fig. 2d.

Fig 2e: Why isn’t the 5pt running mean shown as in the other panels?

We will add the 5pt running mean to Fig. 2e.

Fig 5c: Modern d13C values are missing and would be helpful for reference.

We will add modern $\delta^{13}C$ values to Fig. 5c.