AUTHOR RESPONSE

Referee 1 – Adam Woodhouse

I very much enjoyed reading this paper and believe it is a fantastic contribution to Biogeosciences. I have left very minor comments which need addressing/acknowledging, but other than that, I look forward to the manuscript being published.

We thank the reviewer for their positive assessment of the manuscript and appreciate their constructive feedback. We will address all minor comments as requested.

RC1. Redefine ECVs in the introduction.

AC: Thank you for this suggestion. We will redefine ECVs in the introduction in the revised manuscript.

RC2. "Would Polar Amplification be more appropriate as this study has global implications?"

AC: We appreciate this point. While our sampling was conducted in the Arctic and initially framed in the context of Arctic Amplification, the broader implications indeed relate to Polar Amplification. We will clarify this in the revised manuscript.

RC3. Do you have temperature data for *T. quinqueloba* to compare with *N. pachyderma* and *N. incompta*?

AC: Thank you for raising this. *T. quinqueloba* occurs across a wide temperature range (1–29.5 °C), depending on genotype. We will add this information and the relevant references (Bé & Tolderlund, 1971; Darling et al., 2000; Seears et al., 2012) in the revised manuscript.

RC4. Define MQ water.

AC: We will add a definition of MQ water in the revised manuscript in section 2.4.

RC5. There are 7 types of *N. pachyderma* in Morard et al. (2024) - are all the specimens in this study the same type? This should be stated.

AC: We did not genotype the specimens in this study. However, Darling et al. (2004 and 2007) found only one genotype of *N. pachyderma* (e.g., Type I) in the subpolar North Atlantic/Arctic Ocean. Bird et al. (2025) confirmed that there is only one genotype of *N. pachyderma* in the subpolar North Atlantic/Arctic Ocean. We will state that our specimens were likely of this genotype while noting that we did not perform genotyping.

RC6. *T. quinqueloba* also has many genotypes.

AC: Two Arctic-associated genotypes of *T. quinqueloba* (Type IIa and Type IIb) have been identified (Darling et al., 2000). We will note this in our revised manuscript in section 4.1.

RC7. "This demonstrates that larger planktonic foraminifera exhibit higher metabolic rates, even when respiration is normalised to account for temperature effects using both species-specific and uniform Q_{10} values (Table 4)." The referee noted "Love this result! Great implications across the entire field"

AC: We thank the referee for their positive feedback on this result. We are pleased that the implications of the size–metabolism relationship were clear.

R8. Figure 8 panel (b): This is quite difficult to see, could the crosses be made larger and have the images been colour-blind friendly-checked?

AC: We will increase the symbol size and adjust the colour palette to ensure colour-blind accessibility in the revised figure.

RC9. "Consequently, our findings alleviate concerns about physiological confounding due to respiration. However, this may not be the case for N. incompta and *T. quinqueloba*. The elevated Q_{10} values for these two species may call for the development of species-specific calibration equations that consider the influence of respiration for accurate proxy application." The referee noted that "Genetic types may have different results too."

AC: We agree that genotype may influence proxy reliability in different species. In the Arctic and North Atlantic, only one genotype (Type I) is known for both *N. pachyderma* and *N. incompta*, whereas two genotypes (Type IIa and Type IIb) are reported for *T. quinqueloba*. We will add a clarifying sentence in the revised manuscript in section 4.3.