

Responses to Reviewer

We sincerely thank the reviewer for their constructive comments and thoughtful suggestions, as well as the editor for their time and dedicated efforts throughout the review process. Their input has been invaluable in helping us improve the quality and clarity of the manuscript.

The authors have effectively addressed my concerns and suggestions, and the manuscript has been significantly improved. I particularly appreciate their thorough review of how energy transport influences Arctic amplification, which is important and highly relevant for linking this work to existing studies. As a result, the motivation for this work is now clearly articulated.

I have two minor suggestions for further improvement:

1. Line 24: More than half of the paragraph explains why warming in the Antarctic is slower than in the Arctic. While this is an interesting point, it doesn't seem directly relevant to the main topic of this paper. Since this is the opening paragraph, I suggest the authors reconsider this paragraph.

Response:

We have shortened this sentence as suggested. Since the Antarctic energy budget is also analyzed in this study, we agree that a concise version is more appropriate. Please refer to Line 23 for the revised sentence:

"On the other hand, the Antarctic warming is weaker compared to the Arctic warming due to higher average elevation of the Antarctic continent, lower albedo, feedback efficiency differences, and the Southern Ocean's heat absorption capacity (Marshall 2003; Salzmann et al., 2017; Smith et al., 2019; Hahn et al., 2021)."

2. Line 108: It would be helpful to add one or two sentences to explain why the first eight EOF modes were selected. Specifically, how much variance is explained by each mode? This will help readers focus on the predominated modes and their impact on AA.

Response:

We have added a sentence clarifying this point: "The first eight EOF modes explain approximately 55% of the total variance in global SST anomalies, thereby representing the predominant variability patterns." Please see Line 106.