

The change in Arctic sea ice area is a hot topic. Authors elucidated the changes in sea ice area (SIA) in boreal winter and amplified variance of decadal fluctuations in the wintertime SIA increment ( $\Delta$ SIA). The manuscript is well-written and has good novelty. Some concerns should be addressed before acceptance of the manuscript I suggest minor revisions. Some grammar errors need to be revised. My detailed comments are organized as follows:

1. Sea ice concentration budget holds significant potential for elucidating the aforementioned competitive processes, as it enables the quantitative decomposition of sea ice concentration changes into distinct physical components—including sea ice drift (encompassing transport and convergence dynamics), thermal melting/freezing, and mechanical redistribution. Given this analytical capability, the authors are encouraged to clarify why the sea ice concentration budget was not employed in the present study.
2. What is the role of atmospheric thermodynamic forcing—such as the radiative effects of water vapor and clouds—in the proposed competition mechanism? These factors are known to exert significant influences on sea ice thermodynamic processes.
3. Section 2.2b: Would alternative decomposition methods (e.g., Ensemble Empirical Mode Decomposition, EEMD) produce similar results to the one currently used? Validating the findings against EEMD would help confirm the robustness of the analysis.
4. Figure 2i ‘increament’->’increment’.
5. Figure 3: Have you conducted sensitivity tests on the moving window parameters? The robustness of the results presented in this figure relies heavily on the stability of the moving window settings.
6. Certain figures require additional beautification to improve their presentation quality, including Figures 4, 5, and 7.
7. Authors should emphasize further the implication of this study.