

Comment on “An Assessment of Antarctic Sea-ice Thickness in CMIP6 Simulations with Comparison to the Satellite-based Observations and Reanalyses” by Shreya Trivedi et al.

This study evaluates Antarctic sea-ice thickness (SIT) and volume (SIV) from 39 CMIP6 models from 2002 to 2014, utilizing three sea-ice products, including satellite observations and two reanalysis datasets. It analyzes spatio-temporal variations in SIT and examines the seasonal co-variability between sea-ice area (SIA) and SIT, noting a negative relationship in summer and a positive winter one. Overall, the paper is well structured and relevant, though minor revisions are recommended for clarity and insight before publication in *The Cryosphere*.

General Comments:

1. The manuscript outlines the sea ice products in the data and methods section. However, the details regarding each product's parameters used in this study are inadequately described, and the process of calculating the SIV and SIA simultaneously. It is essential to provide a clearer explanation of the conversion procedure and the parameters involved in obtaining the target variables. Ensure that all key variables (SIT, SIV, and SIA) are clearly defined in the calculation process in the manuscript.
2. The analysis shows that CMIP6 models better match satellite observations at thickness maxima (February) and reanalysis at minima. I recommend that the authors discuss potential causes, for example, whether the models' parameterizations, snow-ice interactions, or ice growth processes could be driving the observed discrepancies.
3. The description and analysis of Figure 2 are confusing. The manuscript mentioned that “we observe positive trends in SIT/SIV during the cooler seasons, which are absent in SIA.” However, the trend in the description of Figure 2 is not clear regarding which data's trend is being referenced. Meanwhile, it seems that there are also positive trends in SIA during the cooler seasons, as indicated in the last figure in the fourth line.

Minor Comments:

Some figures do not have specific sub-diagram serial numbers, which makes it impossible to properly match the description with the diagram when describing the diagram (e.g., Figure 2). It is recommended to add an ordinal number to each subgraph as well as additional annotations such as legend. Meanwhile, the quality of some figures needs to be optimized. For example, the black squares in Figure 3 are not clearly shown.