

# Review of ‘A comparison of the atmospheric response to the Weddell Sea Polynya in AGCMs of varying resolutions’

## The Cryosphere

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The objective of this paper is to assess the impact of the Weddell Sea Polynya (WSP) on the atmosphere via the ocean-air transfer of heat during the opening in the 70s. The method used by the authors is based on modelling using 3 atmospheric models with prescribed sea ice and SSTs. The scientific question is interesting however the methodology is not valid and I invite the authors to rethink how they can improve their strategy to investigate this question.

Major comments:

- The authors could have used satellite data for sea ice instead of ERA5 in order to get an accurate coverage of sea ice during the polynya event.
- The authors interpret the anomalies in heat, temperature and precipitation as being due to the polynya. However, it has been shown that during the polynya events (2017 and 70s) there is an excess of heat and precipitation coming from the atmospheric rivers **toward** to ocean. How the authors can be sure that the values they obtained for the different parameters are solely due to ocean-to-air transfer of heat and not to the existing atmospheric conditions (atmospheric rivers and cyclones) which lasted for several days? This is critical and needs to be addressed by the authors perhaps by conducting sensitivity studies using the models and comparing one set of simulations **with** sea ice opening and one **without** sea ice opening but both with the same atmospheric conditions i.e. those occurring during the polynya events.
- During the 2017 event there are in-situ measurement from the SOCCOM network that can be used at least to check how the models are performing.