The Cryosphere Discussions

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Comment on tc-2020-375

Anonymous Referee #2

Referee comment on "Arctic sea ice anomalies during the MOSAiC winter 2019/20" by Klaus Dethloff et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2020-375-RC2, 2021

Review on “Arctic sea ice anomalies during the MOSAiC winter 2019/20” by Dethloff et al.

The study presents the characteristics of Arctic atmospheric circulation anomalies in winter 2019/20 and their effects on sea ice advection, thermodynamic and dynamic processes, as well as the variation of sea ice thickness in some regions. Combined with the ice thickness data obtained from satellite radar altimeter and the output of fully coupled regional climate model, this study attempts to separate the influence of sea ice thermodynamics and dynamics on sea ice thickening, and analyze the mechanism of atmospheric circulation anomalies affecting the process of thermodynamics and dynamics. It is an interesting work for the study on the process of Arctic sea ice on a seasonal scale and the mechanism of rapid change in Arctic sea ice. It's worth publishing in the TC. However, at present, there is still rooms for further improvement both in content and expression, thus, I recommend that the manuscript to be considered for publication after major revision.

Here are the comments:

General comments:

1) This work attempts to establish a close relationship with the related work of MOSAiC campaign, so as to support the subsequent analysis of mosaic observation data. This is a good point, however, the relationship between the analysis content in this paper and the work of MOSAiC is not so close. You only use the data from MOSAiC are the drift track of ice station and the summarized results of ice thickness observed from the supply vessel. Only way is to reduce the color of MOSAiC through the paper, e.g., change the title and rewrite the introduction. The other way, you can highlight anomalies of some MOSAiC observed parameters compared to the climatology, for example, the drifting trajectory vs. the historic buoys also operated along the Transpolar Drift Stream (e.g., Lei R, Heil P, Wang J, Zhang Z, Li Q, Li N. 2016. Characterization of sea-ice kinematic in the Arctic outflow region using buoy data. Polar. Res. 35: 22658. doi:10.3402/polar.v35.22658.), and the basic meteorological parameters (air temperature, wind, relative humidity) along the MOSAiC trajectory in 2019/20 vs. that obtained from the climatology…

2) The Arctic dipole is the most important pattern for the atmospheric circulation to

influence the sea ice motion of the Transpolar Drift Stream (e.g., Vihma T, Tisler P, Uotila P. 2012. Atmospheric forcing on the drift of Arctic sea ice in 1989-2009. *Geophys. Res. Lett.* **39**: 10.1029/2011gl050118.; Lei R, Gui D, Hutchings J K, Wang J, Pang X. 2019. Backward and forward drift trajectories of sea ice in the northwestern Arctic Ocean in response to changing atmospheric circulation. *Int. J. Climatol.* **39**: 4372-4391.), but not the AO. Therefore, to analyze the influence of atmospheric circulation on sea ice processes through the Transpolar Drift Stream, it is necessary to fully discuss the influence of Arctic dipole, associated with AO.

Specially comments:

1) Along-track ship-based ice thickness measurementsï¼□it would be better to give some more details of results;

2) Sea ice growth: If this is the result of combined effects of sea ice thermodynamics and dynamics, it would be better use the "sea ice thickening", for item obtained from pure thermodynamic process, it is sea ice growth;

3) Line 310, "the SIT distribution a region" change to "the SIT distribution in a region";

4ï¼□Line330 "the climate mean 2010-2019" change to "the climate mean of 2010-2019";

5) Line 389 "ocean and sea ice time scales" I don't understand the time scales here;

6) Line 430 "losing heat the atmosphere" change to "losing heat to the atmosphere".