Review response on

“Recent observations of superimposed ice and snow ice on sea ice in the northwestern Weddell Sea” by Stefanie Arndt et al.

Anonymous Referee #2

Received and published: 12 July 2021

As with Referee 1, I was also a previous reviewer of an earlier ms on this topic.

The paper is a good representation of the observations on superimposed and snow ice formation in the Western Weddell Sea. With the benefit of Reviewer 1's posted detailed comments, I have only a brief comments to add.

We thank the reviewer for the overall positive feedback and that he/she acknowledged the progress of the manuscript.

On the argument that the conditions for melting of the snowpack in the Weddell Sea that would lead to a triggering of ice albedo feedback and widespread melting (the 'arctification" of the Western Weddell Sea), they may want to add an additional sentence or two. The diurnal freeze-thaw cycle that exists in the Antarctic because of its lower latitude can shift the energy balance from positive shortwave to negative longwave especially during late Jan and Feb as the daylight hours shorten away from the solstice. Along with the deeper snow cover in the Weddell Sea, the triggering of ice-albedo feedback may be delayed by this diurnal radiation effect.

We agree with the reviewer that the latitudinal dependence of the radiation should be mentioned in the conclusion. However, a deeper analysis of this effect is beyond the scope of the manuscript. We therefore added the following paragraph to the conclusion section:

When discussing the potential future “arctification” of Antarctic sea ice one also has to take into account the fundamentally different solar radiation conditions experienced by Arctic and Antarctic sea ice in summer due to their different latitudinal occurrence, with Arctic sea ice mostly residing at latitudes above 80° and Antarctic sea ice below 80° (e.g. Haas, 2003). This implies that Antarctic sea ice is subject to stronger diurnal cycles where nighttime longwave radiation cooling favors superimposed ice formation (Arndt and Haas, 2019) and may reduce the effectiveness of the ice-albedo feedback in leading to melt pond formation.