Summary

This manuscript employs the MERIS melt pond retrieval algorithm on OLCI data. As MERIS and OLCI have almost same spectral response function, this transferability looks possible. However, there is still room for improvement in the research content of this paper. I recommend that the paper can be considered for publication after major revision.

Specific comments

I suggest dividing the results and discussion sections for better organization. Discussions are currently scattered throughout the paper.

I think there are spectral differences between MERIS and OLCI. The sensitive analysis should be done on the same targets (i.e., sea ice, melt pond, lead, and ocean) between MERIS and OLCI. Although MERIS and OLCI don't have same temporal period, similar targets can be used. This analysis will show a good example applying the algorithm for old satellite to a successor satellite.

P4, L118: Multiple satellite have been used for their purpose, but it is hard to follow. It would be good to add a table summarizing satellites used in this paper. Furthermore, a flowchart of this paper would enhance clarity.

P5, L146: In terms of cloud screening, cloud shadows are appeared on the sea ice surface depending on angles. Please describe the cloud shadow removal process if authors did.

Figure3 c: Please explain why sentinel-3 OLCI MPF produces 1 comparing to different sentinel-2 MSI MPF.

P8, L225: Please justify why the authors select these two cases. I think there are good cases in the 50 scenes. In the 50 scenes, some cases (i.e., leads and small open water) highly affect melt pond fraction showing diverse spectral behavior. Please add more diverse cases.

Figure5 c: Please explain why sentinel-3 OLCI MPF produces 1 comparing to different sentinel-2 MSI MPF.

P13, L330: I don't get it how this conclusion was reached.

P13, L357: Open water influence the retrieval of melt pond fraction. The leads and small open water surrounded by sea ice are also influence the retrieval of melt pond fraction. It would be good to mention this.

P14: While there is no map in the figure 9, the part 4 describes geographical information.

P17, 434-435: If sea ice type shift have progressed, it would be good to add melt onset data for this description.

Figure 11: Please demonstrate more about figure 11 in the paper.

4.2: The trend of Arctic sea ice concentration and thickness is steeper than long-term melt pond trend due to sea ice type shift above described?

Figure 12: It is difficult to see the many weekly trends. It would be good to show monthly trend instead of weekly with error bars.

Technical corrections

P9, L239: Figure 2a to Figure 3a?

P9, L242: level means level ice?

Figure7: IC means SIC?

What stands for OWF?

P13, L352: Please add this reference Rostosky et al., (2023) below.

P14, L367: data 2012-2016 not available should be mentioned.

Figure9: Please add some information about the thickness of blue and red color.