

Interactive comment on “Investigation of spatiotemporal variability of melt pond fraction and its relationship with sea ice extent during 2000–2017 using a new data” by Yifan Ding et al.

Anonymous Referee #1

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The manuscript “Investigation of spatiotemporal variability of melt pond fraction and its relationship with sea ice extent during 2000-2017 using a new data” by Ding et al. submitted to The Cryosphere is on an important subject relevant for the journal. It is well written and the methods used seem to be adequate. However, it has a serious methodological flaw which needs at least a major revision or better more work and a re-submission.

The authors train a neural network with MODIS data and in-situ melt pond observations to retrieve the melt pond fraction (MPF). This is similar to the approach of Rösel et al. (2012) but with a major difference. Rösel et al. (2012) use the mixing equation to solve

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for three unknown surface types: open water, melt ponds, and snow and ice. This means Rösel et al. estimate the melt pond fraction with respect to the ice surface. The sea ice concentration results as an independent quantity from the MODIS retrieval. In my understanding, the authors of the present manuscript do not retrieve the ice concentration as an independent parameter which means that the coverage of melt ponds is not correctly estimated in areas with ice concentration below 100%. This is obvious in gradients of the MPF in the marginal ice zone where a coverage of >50% is estimated (e.g. Fig. 11 and 12) . This is a clear artefact and does not resemble the real melt pond coverage. The new MPF seems to be highly influenced by the ice concentration and is not an independent measure, see Kern et al. (2016) for further details.

Kern, S., Rösel, A., Pedersen, L. T., Ivanova, N., Saldo, R., and Tonboe, R. T.: The impact of melt ponds on summertime microwave brightness temperatures and sea-ice concentrations, *The Cryosphere*, 10, 2217–2239, <https://doi.org/10.5194/tc-10-2217-2016>, 2016.

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