

The paper 'Review of Radar Altimetry Techniques over the Arctic Ocean: Recent Progress and Future Opportunities for Sea Level and Sea Ice Research' by Quartly et al. aim to provide an overview and review of various radar altimetry techniques over the Arctic Ocean for sea ice freeboard/thickness and sea surface height retrievals. The paper reviews altimetry techniques in a very broad context and includes a comprehensive review of altimetric data sets, basic-to-advanced concepts of radar altimetry, retracking algorithms, and geophysical correction methods for unambiguous parameter retrievals.

Since I am an altimetry expert on sea ice freeboard/thickness retrievals, I would want to concentrate my focus on reviewing the sea ice side of this paper. Overall, I find this manuscript not suitable for publication at this point of time, as the authors fail to provide a comprehensive treatment snow depth and its associated thermal and geophysical properties as a major source of uncertainty in sea ice freeboard/thickness retrievals. The authors should understand the impact of critical snow geophysical properties such as snow temperature, snow salinity, snow grain microstructure, in addition to snow thickness and density (which the authors have already pointed out as error sources in this manuscript). This is to be emphasized in more detail as snow covers on sea ice is still considered to be the greatest source of uncertainty, with currently used snow thickness and density assumptions considered to be unassumingly vague. A critical assessment of how snow covers and its geophysical properties impact sea ice thickness freeboard/thickness should be accounted for in this manuscript and requires substantial focus in this manuscript. I would recommend you reviewing latest literature on how snow thickness (Tonboe et al., 2006; Tonboe et al., 2010; Ricker et al., 2014, 2015, 2017), snow density (Alexandrov et al., 2010, Tonboe et al., 2006), snow temperature (Willatt et al., 2011), snow compression (Tilling et al., 2015; Kern et al., 2015), snow salinity (Nandan et al., 2017; Nandan et al., 2016) impact freeboard retrievals from radar altimetry.

I also agree with the comments from the other two reviewers and would like to see a more detailed revision addressing the points above and also from the other reviewers. Hence, I do not recommend publication in its present stage, and would recommend to resubmit this manuscript in a revised form. I will be happy to provide specific comments to the revised manuscript, once the general comments are addressed.