

# ***Interactive comment on* “Dynamic Ocean Topography of the Greenland Sea: A comparison between satellite altimetry and ocean modeling” by Felix L. Müller et al.**

## **Anonymous Referee #3**

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The paper focuses on studying dynamic ocean topography of the Greenland Sea. For this task the authors consider two alternative techniques based on satellite altimetry measurements of the sea surface height and ocean models. The peculiarities of applying satellite altimetry for the study region covered by the sea ice are considered and addressed by using an unsupervised waveform classification approach and the ALES+ retracking algorithm for SSH estimation. Overall, it has been demonstrated that combination of radar altimetry and the Finite Element Sea-ice Ocean Model techniques can lead to better understanding of the Greenland Sea dynamic topography. It is a well written paper worth publishing in the journal. However, I have got some comments that I would recommend the authors to addressing before publishing this manuscript.

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### Major comments:

Section 2.3.1 Sea-Ice/Water Discrimination starting p.5. The authors use annual altimetry data to compare with ocean model data. For Arctic regions the altimetry measurements can be affected by a seasonal sea-ice. The unsupervised classification technique is applied to discriminate altimeter waveforms from the open water, including leads, polynyas and Open Ocean (line 4, page 6). In late spring and summer time the sea-ice is covered by melt ponds – pools of melt water formed on the sea-ice (see, for example, NASA’s 2014 MABEL campaign). It is not clear if the melt ponds can be discriminated by the proposed classification techniques and if the corresponding measurements were removed from further processing. Can the classification of altimeter waveforms be reliable in summer time? Please clarify and explain the possibility and extent to which melt ponds can affect the measurements of dynamic ocean topography of the Greenland Sea.

### Minor comments:

Line 5 on page 5 – replace “information are used” with “information is used”

Line 1 on page 6 – a Ref to K-medoids algorithm is missing

Line 9 on page 7 – please specify the kernel size of a moving average filter

Line 5, page 8 – What method was used for interpolation of FESOM model data in time and space?

Line 10 on page 9 – replace “physical explained” with “physically explained”

Line 21, page 9 – can the reference be given for the applied harmonic fitting technique?

Line 1, page 10 “. . . differences in the annual amplitudes” – can these phase differences be caused by model sampling issues?

Line 12, page 16 replace “significant noisier” with “significantly noisier”. Please clarify why the altimeter DOT estimates are less reliable in sea-ice areas.

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Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2018-184>, 2018.

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