The Cryosphere

Discussions

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Interactive comment on "A key factor initiating surface ablation of Arctic sea ice: Earlier and increasing liquid precipitation" *by* Tingfeng Dou et al.

Anonymous Referee #2

Received and published: 12 January 2019

Title: A key factor initiating surface ablation of Arctic sea ice: Earlier and increasing liquid precipitation Author(s): Tingfeng Dou et al. MS No.: tc-2018-239

General Comments The authors use a model and time series observations from undeformed landfast first-year sea ice to investigate the impact of rain on snow events on sea ice ablation. The authors also use historical rainfall data from a coastal station adjacent to the sea ice cover and find that spring rainfall is occurring earlier, especially since the mid-1990s. The paper addresses a relevant and current topic, seasonal sea ice ablation as it pertains to increased or earlier rainfall contributing to rapid snow ablation due to ripening and decreased albedo.

The authors do a commendable job of incorporating measurements and modelling to explain the impact of rain on snow metamorphism and ablation, as evidence by the agreement between simulations and observations. However as it is presented the results aren't particularly novel, and aside from the rainfall climatology for region of interest, the paper's conclusions about rain on snow are mainly a re-affirmation of the introductory statements (i.e. that these events should likely impact melt pond formation and sea ice ablation). As it is, the snow cover effects are addressed, but impacts on melt pond formation and sea ice ablation are not. Given the location of the study site, the authors should be able to incorporate data on melt pond and sea ice evolution (e.g. pond formation, sea ice thickness, timing of sea ice break-up, etc.) in order to provide valuable insights.

Specific Comments Page = P, Line = L

The title of the paper is perhaps too broad given that the focus is on rain on snow events occurring on an undeformed landfast first year sea ice site.

P2, L7: "... in recent decades."

P3, L1: delete "over sea ice"

P3, L9: Rather than headings for air termperature, wind etc. the appropriate variables should be described under the heading "Micrometeorological Observations". In this section describe air temperature and humidity together with the instrumentation since they were measured and logged together.

P3, L10: state the years of the study in the introductory sentence about the MB site. Section 2.2: Since the model is being presented in detail, include all of the appropriate units (only some are given).

P5, L109: can be shortened to "... snow water equivalent in m, ..."

P5, L113: There is a change to present tense here; be consistent.

P5, L115-118: The temperature profile data should be described in the data section.

Section 3-5 should be "Results" with numbered sub-headings as appropriate.

P6, L29: ". . . rain event of the year . . ."

P7, L1: The rainfall amounts should be also described in the text.

P7, L7: ". . . in surface albedo will result in . . ."

P7, L11-15: Here there are methods that should be described in the methods section.

P8, L8-10: Sentence "A constant SWE and reduced . . . " should be re-written for clarity.

P9, L1-6: Here there are methods that should be described in the methods section.

P10, L16-23: Clarify that this study was for undeformed landfast first year sea ice.

Table 2 is not formatted properly. Heading text could be shortened and footnotes and captions used to explain energy balance components.