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Interactive comment on "Ice Acidification: A review of the effects of ocean acidification on sea ice microbial communities" *by* Andrew McMinn

Anonymous Referee #2

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General comment Ocean acidification (OA) is a hot topic that received increasing attention during the last 10 years or so. Several experimental studies have been conducted to assess the sensitivity of phytoplankton and other marine organisms to the predicted changes in pH/CO2 concentrations. Bacteria and microalgae living in the sea ice will also be exposed to changes in pH. Few studies so far attended to determine the sensitivity of these microorganisms to changes in pH/CO2. This paper review their main findings. The paper reads well and provides a good overview of our state of knowledge. Although bacteria are also considered here, the focus is clearly on sea ice algae. The paper offers a good balance between the factual review of the findings from the different papers and more personal viewpoints. Surprisingly for such a specific and relatively recent topic, the number of published papers is large enough to justify a review. The main conclusion is that ice-related organisms are generally quite resistant

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to OA although the potential co-effect of additional stressors such as iron limitation is uncertain.

I would recommand to:

1. Provide an estimate of the relative importance of bottom, brines, and top ice assemblages to the annual primary productivity. In the present version of the paper, algae living in these different ice 'habitats' seem to be equally important in terms of PP which is not the case.

2. Present the information on bacteria and algae in different sections.

Specific comments

P1, 10: . . .than marine phytoplankton. . .Note that coastal and even more estuarine phytoplankton are also subjected to large variations in pH taking place at different time scales.

P1, 23: . . .on bacterial growth. . .

P2, 20-21: Is this seasonality found all over the SO or only in the marginal ice zone? The 2-3 examples provided in the paragraph are all from the near coastal waters.

P2, 32: . . .CO2 concentration in. . ..?

P3, 14-19: This paragraph disrupts the flow of the paper.

P3, 14: . . .form later in the season and melt sooner. . .Yes but the extent of sea ice tends to decrease over most the Antarctica waters.

P3, 30: . . .The biological communities can be. . .Here the author should refer to the previous studies describing these different assemblages (ex. Cota et al. 1991, Horner et al. 1992, and the more recent one by Bluhm et al. 2017). In Antarctica ice, infiltration assemblage are important at time. They are not mentioned in the review.

P4, 9: ...communities (add Bluhm et al. 2017 in the list). . .

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P4, 28: . . .diatoms, which also show increased. . .I am not sure ‘also’ fits well here since there are several mentions before (and after. . .) of no or negative effects of high CO2 on phytoplankton growth. This could be confusing.

P5, 4: . . .which affects average. . .

P5, 32: Delete ‘at all’.

P6, 1: . . .the important. . .delete ‘important’ or explain why this species is important.

P6, 2: . . .Unlike most previous experiments, growth was not stimulated. . .Why ‘unlike’? You previously mentioned other studies showing no effect of high CO2 on phytoplankton growth.

P6, 9-12: This paragraph will better fit at the end in a ‘summary’ section.

P6, 30: . . .demanding function for species with CCMs. . .

P7, 3: . . .how these processes. . .Which processes? Please be more specific.

P7, 10: . . .Likewise. . .The author should explain why bacterial growth increase with increasing CO2 concentrations.

P7, 14: . . .Sea ice ecosystems. . .The idea developed in this paragraph is interesting but is not well introduced. The paper needs a proper conclusion section starting with a short summary of the main findings, followed by the limitations identified (ex. age of the culture), and ending perhaps with the importance of considering the full life cycle of the species.

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