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Interactive comment on “X-ray computed microtomography of sea ice – comment on “A review of air–ice chemical and physical interactions (AICI): liquids, quasi-liquids, and solids in snow”, by Bartels-Rausch et al. (2014)” by R. W. Obbard

Anonymous Referee #1

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This comment addresses a statement in Bartels-Rausch et al., (2014) regarding the discernment of liquid inclusions in sea ice using X-ray computed microtomography. The author correctly points out that brine in freezing equilibrium would be predominantly liquid at the study temperature (-10 C), and that the total volume of precipitated salt would be small. The main point of the comment is spot on, however, I am concerned that the supporting evidence is not appropriate. The author cites precipitates

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and temperatures of initial precipitation from McCarthy et al. (2007), yet that work deals exclusively with single-salt binary systems, not the multi-salt system of seawater. I would suggest the author confer with Marion et al. [1999] for a more appropriate description of the species and their temperatures for this system. In particular, the work of Marion et al., casts light on the lowest temperature at which liquid likely exists in sea ice (-36.2 C; not -60C as stated on p. 13169, line 11) and the absence of $\text{MgSO}_4 - 11\text{H}_2\text{O}$ in the seawater system, and the much lower temperature of initial precipitation of KCl than the -10.7 C cited (p 13169, line 15). I appreciate that the precipitation pathway presented by Marion et al. is an alternative, but that paper also presents the previously existing paradigm for the multi-salt seawater system, which also indicates no $\text{MgSO}_4 - 11\text{H}_2\text{O}$ precipitation, and the much lower temperature of KCl formation.

Minor points: P 13169, line 5 “and the literature”? or “in the literature”? P 13169, line 11: “and salt saturated and when solubility limits.” should be “. . .the brine becomes more concentrated and salts saturate when solubility limits are reached” Line 18: most of the other “cations” contribute only a tiny fraction of overall salinity. . . . Why “cations”? I think should be “most of the other precipitates contribute only . . .” p. 13170, line 8: who is “we”? Obbard et al., 2009? This is confusing.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 13167, 2015.

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