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Atmospheric Chemistry and Physics Discussions

Interactive comment on "How does deposition of gas phase species affect pH at frozen salty interfaces?" *by* S. N. Wren and D. J. Donaldson

Anonymous Referee #1

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In this paper, the authors characterize the pH of frozen interfaces representative of environmentally relevant salty solutions such as sea water and its evolution upon acidic gases deposition. As the authors very clearly argue in their introduction, this is a very needed measurement in order to understand how salty ices interfere on atmospheric chemistry. The experiments are well described, and the results well documented and interpreted, and I would therefore recommend the paper to be accepted once the authors account for the minor comments below.

P19281 line 5Âă: the sentence ends without a period

p19281 line 24Âă: 50 monolayersÂă: how thick is that in nmÂă?

P19282 line 7Âă: missing -

p19282 line 12Âă: what about surface coverage by harmine and the influence of such a coverage on the ability of gas phase HCl to access the ice surface through the Harmine layerÂă? Is such a process plausibleÂă? Similarly, how might the surface coverage of the ice with harmine influence surface acidic propertiesÂă?

P 19282 line 17Âă: is there a specific reason for using a liquid core waveguide rather than a regular optical fiberÂă?

P 19282 Line 20Âă: the authors write that the temperature is controlled to 263K, by the presence of a cooled surface at the bottom of the chamber. Yet, the chamber is teflon, a not so good thermal conductor. Doesn't a temperature gradient appear in the chamber under such conditions, which would set an actual temperature at the air ice interface somewhat higher than 263K, and depending on the air temperatureÂă?

P19283 line 21Âă: a value for the film thickness would be appreciated here, although it can be retrieved from values on volume and surface given in page 19288

p19284 line 21-22Âă: it is not clear to me what 5-10% uptake meansÂă: is it 5-10% of the total amount of HCl that flowed byÂă?

p 19285 line 20-24Âă: ÂńÂăharmine spectral features are not influenced by ...Âż Yet, Fig 1a shows some change. This needs clarification.

P 19290 line 20-23Âă; the authors seem to imply here an opposition between the expectation that reaction R1 is faster on acidic ice surfaces and the observation that bromine is produced by heterogeneous ozonation of frozen sea water or salt water independantly of surface acidity. Are not reaction R1 and ozonation independant reactions?

p 19291 line 3-7Âă: I do not clearly see how the observed buffering at the frozen sea water surface ÂńÂăsupportsÂăÂż Dieckmann et al field studies or Morin et al calculations. The first ones point towards the presence of Ikaite in sea ice, as teh result of its precipitation from the remaining brine during the freezing process. The second one deals with predicting the chemical composition and buffering capacity of the remaining aqueous phase upon seawater freezing. In both cases, the process under study is the freezing of the liquid brineÂăand it doesn't appear clear to me how to relate those findings directly with acidity or buffreing capacity at the frozen surface of seawater.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 19277, 2012.