

Interactive  
Comment

# ***Interactive comment on “Technical Note: On the use of the mushy-layer Rayleigh number for the interpretation of sea-ice-core data” by M. Vancoppenolle et al.***

## **Anonymous Referee #1**

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General description: This is a short notice paper which discusses the possible effects of the uncertainties in physical parameter on the mushy-layer Rayleigh number. As the uncertainties, the formulation of permeability of sea ice, brine losses during core extraction, and lack of sampling frequency were mainly taken into account. The formulation of permeability was checked by comparing Freitag et al.(1999) and Eicken et al.(2004). The amount of brine losses during core extraction were assumed to depend on brine volume fraction. Regarding the error caused by lack of sampling frequency, the observational results obtained in the Ross Sea were examined. As a result, it was found that significant error can be caused in thin growing ice and spring ice when sea ice temperature is relatively high. Since the mushy-layer Rayleigh number is closely re-

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lated to the activity of brine convection, it is important to estimate it correctly. Therefore this paper contains some intrinsic matters although it is a rather simple investigation, and I think it is worth publication as a technical note. Personally it seems to be intriguing that Rayleigh number shows diurnal changes after early spring ( $T > -5\text{C}$ ), which means brine convection may have such variation as well. However, at the same time I feel that for publication the authors should discuss more quantitatively how much the activity of brine convection is affected by the possible error caused by physical parameters and how it affects the profiles of salinity, brine volume fraction, and so on. It is important because at the early stage it may determine the subsequent evolution of salinity profile within sea ice and in spring it may determine the timing of major desalination. I recommend the authors to examine this quantitatively, if possible.

Specific comments: \* (P7L196) “an underestimation of the bulk salinity ranging up to 20 g/kg compared to non-destructive measurements” I am wondering if 20 g/kg might be too much because in most cases bulk salinity of sea ice is less than 12 g/kg. \* (Fig.4) The line of NW-dS is hard to see.

That is all. Yours truly

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Interactive comment on The Cryosphere Discuss., 7, 3209, 2013.

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