

The Cryosphere Discuss., referee comment RC1
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Comment on tc-2021-209

Anonymous Referee #1

Referee comment on "Physical and mechanical properties of winter first-year ice in the Antarctic marginal ice zone along the Good Hope Line" by Sebastian Skatulla et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2021-209-RC1>, 2021

The manuscript provides a good analyses on the physical and mechanical properties of winter first-year ice. And four pancake ice floes were collected using ship's crane, different from pervious studies using ice cores. So the results are interesting to me, and I have some comments as below.

- L33, what is the full name of SO?
- L34, in my opinion, sea ice morphology is the exterior properties such as ridge, size, shape of sea ice, while the grain size, crystallographic texture and fabrics are interior properties.
- L98, -10°C is a bit higher, though the cores were placed in a horizontal position, brine drainage may be strength than at a cold temperature.
- L122, more detailed information on the ice salinity measurements are needed. Were cores cut immediately after they were extracted or how long between the salinity measurements and core drilling? It affects the estimation of ice salinity measurement accuracy.
- Necessary error analysis on the ice salinity, density, modulus and compressive strength are absent.
- Give a brief introduction on the stiffness of the compression machine.
- L219, what is the probable reason for the high density at the top layer.
- 4, Give the method how to determine the crystal size. Was plate spacing measured? How was μ determined?
- L256, a grammatical mistake, 'there no' should be 'there is no'.
- L271, are there references? It seems that the strength of granular ice is more than that of columnar ice.
- 13, also give the quantitative dependency of modulus on brine volume. Why the relationship between young's modulus and brine volume for pancake ice is significant but not for pack ice in longitudinal direction.
- L317, it is questionable to assume negligible air volume fraction. As ice density are measured, therefore sea ice porosity can be determined by ice temperature, salinity, and density according to following references. And then compare it with Kovacs (1997).

Leppäranta, M., & Manninen, T. (1988). Brine and gas content of sea ice with attention to low salinities and high temperatures. Finnish Institute of Marine Research Internal Report, Helsinki.

Cox, G. F. N., & Weeks, W. F. (1983). Equations for determining the gas and brine volumes in sea ice samples. *Journal of Glaciology*, 29(102), 306–316.

- L338, Two “and” in the sentence.
- Authors should emphasize the aim of this investigation on sea ice mechanical properties. Is it for engineering or geophysics. For engineering, effective modulus is more widely-used than elastic modulus; while for geophysics, it is necessary to state the application of elastic and shear modulus in the nature process or sea ice models.