Comment on tc-2021-242
Anonymous Referee #1

Referee comment on "Ice-shelf ocean boundary layer dynamics from large-eddy simulations" by Carolyn Branecky Begeman et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2021-242-RC1, 2021

Abstract:
Line 2: “Yet these small scale processes, which regulate heat transfer between....”

Should be heat and salt transfer.

Introduction:

Line 27: “....an overturning circulation known as “ice pump” “

Could talk about the refreezing process.

Line 31: “ IOBLs present unique conditions in the global ocean, involving a stabilizing flux from phase change” The stabilizing flux mostly comes from the freshening of the boundary layer not from ‘phase-change’.

Line 36: “ Numerical studies addressing intermediate scale”

Please define ‘Intermediate scale’. Also to my knowledge Mondal et al., 2019 was a DNS study that resolved the Kolmogorov scale.

should clearly mention the author used a Lewis number =1.

It would be interesting to see how friction length changes over slope, assuming eddy viscousity is estimated as a product of friction velocity and mixing length.
Methods:

General Comment: I would love a schematic of the model set up.

Overview of the LES model: It would help the readers if you clearly mention whether you have used a linear or non-linear equation of state.

Simulation set-up:

Line 150: What about the time step?

Line 167: I don’t think 1 degree is a relatively high slope for Antarctic ice-shelves.

Result:

A plot with temporal evolution of melt rate, obukhov lengthscales could help the reader.

Discussion:

Line 397: 'The relationship between melt rate and distant thermal driving': the sentence is hard to read.