The study investigates the spatial variability and characteristic length scales of snow properties on Antarctic sea ice during late summer. This is important because snow significantly affects sea ice thermodynamics, mass balance, and remote sensing. However, knowledge about its variability is limited beyond local scales. Researchers combined manual snow pit observations with more than 900 high-resolution SnowMicroPen (SMP) profiles collected during three expeditions in the Weddell Sea from 2018 to 2021. Using a supervised one-dimensional convolutional neural network (1D-CNN), they classified snow microstructural layers and types from SMP data. The paper focuses on characterizing snow properties for FYI and MYI to improve representation of snow on Antarctic sea ice. I only have specific comments.

Specific comments:

Line 8: which regimes?

Line 13: 50% of the variability of what? Snow density…

Line 60: I would mention SSA here if you are going use it.

Line 73: microstructural

Line 107: What is the mean temperature? does that mean that the snow is wet? Can you describe what the effect is on the snowpack if temps are above zero.

Line 163: maybe a word on coefficients? King et al. (2020) provided coefficient for density on sea ice but no ssa...

Line 189: Is this how it was done in Kaltenborn et al. (2023)?

Line 202: Maybe mention these parameters are also used to derive density and SSA.

Line 210: Switch the order to match "Rare or weak". New snow is not rare...

Line 295: everything is still frozen? Clarify the snow state with respect to melting.

Table 3: SSA values are key for remote sensing. I think it should be emphasized more in the conclusion or abstract.

Line 324: Probably because of more developed facet on MYI or melted Facet which will have a small SSA.

Line 344: 35% of MF… is this even with accounting for the basal layer that couldn't be measured by the SMP on MYI?

Line 372: "indicating that bulk density is the most spatially homogeneous property." That is good for remote sensing retrieval.

Line 430: King et al. (2020) measured data in winter.... this study in the summer. How do you think this affect the comparison.

Line 431: Do you also see the same thing for SSA?

Line 486: What if you want to retrieve bulk properties like SWE?

Line 507: Different parametrizations also exist…

Line 550: Yes but is there an impact of a bulk representation for remote sensing retrieval? This wasn't shown here.