The authors would like to thank Z.R. Courville for recognizing the value of our study and providing valuable comments and feedback on our manuscript. We carefully revised the manuscript and engaged in correspondence for all of your comments. Our responses are provided in blue. The sentences in red are the revised text.

Reviewer #2: Z.R. Courville

Overall, this is a very interesting and impressive set of high resolution firn physical property measurements from relatively closely spaced (i.e., within 60 km of one another) low accumulation rate sites in Eastern Antarctica. The paper presents a suite of complementary measurements of high vertical resolution density, anisotropy and SSA. Some of the more interesting conclusions of the paper include that there may exist a positive feedback between temperature gradient metamorphism and anisotropy, which makes sense intuitively and is supported by the results, and that post-depositional changes in SSA are not overcome by initial SSA variations formed by surface depositional conditions. The paper also presents evidence that at least for this low accumulation site that there is a lack of significant density in the top 4m of the firn column and that firn at the summit of the dome is less than the surrounding area, and points to the role of wind and, related to wind, topography, in the determination of initially high density layers which impact firn densification rates in addition to snow accumulation and temperature (as are typically used to determine firn density with depth profiles empirically). Furthermore, the paper does an excellent job of describing the environmental factors driving the density and microstructure variations in the firn in the context of previous studies in order to interpret the results, and discuss the interrelation of the snow microstructural parameters (i.e., pore and grain size and anisotropy) and environmental conditions to explain density variations.

Science and methodology questions:

Table 1: How well does the NDF18 10 meter temperature reflect the 10 m temperatures at NDF13 and NDFN? Same question for the Dome Fuji temperature being used for the DFS10 site (and likely more differences between the actual values for these two sites)?
We agree with your point that 10 m temperatures at the NDF13, NDFN, and DFS can be different from neighboring sites. We will remove them from the table 1.

Line 165: How were the cores transported? Specifically, what temperatures were the cores shipped and stored at and what measures were taken to ensure minimal grain size changes?
We will add the following sentences: "*The cores were transported within a temperature range of −30°C to −15°C during the transport from the field to a ship (for ~20 days, of which ~5 days above −20°C) and at −28°C during the ship transport (for ~80 days), then stored at −30°C.*" around L140 (in the original text).

We did not apply specific measures to minimize the grain growth during transportation. Instead, we will consider the effect of grain growth as follows. "*The SSA decrease due to metamorphism during sample transportation is expected to be less than 15% if the SSA of snow is less than 15 m^2 kg^{-1}, according to the* *empirical SSA reduction rate (Taillandier et al., 2007). Although metamorphism during transportation may cause a systematic error, it does not affect our discussions on relative variability in SSA (e.g., differences among sites and variations within each core).*" in L244.

Figure 8: not sure if this figure is needed? It is confusing to interpret, and seems to be conveying much of the same info that is in Figure 7.

Figure 7 shows the evolution of relationship between density, Δε, and SSA in the ILDF and IHDF using a statistical indicator. In the ρ-SSA scatter plots in Fig. 8, we can directly observe the evolution of the three variables and their relationship on scatter plots, helping us understand that ILDF and IHDF evolve with different initial conditions and different evolution processes. Thus, we believe that Fig. 8 is valuable for presentation in the paper. Nevertheless, we agree that interpreting this graph might be confusing in the flow of the main text, thus we will move Fig. 8 to Appendix.

Minor/technical issues:

Line 30: "For example, accurate density profile of near-surface firn is essential to derive the surface mass balance from the change in surface height" should be "For example, an accurate density profile of near-surface firn is essential to derive the surface mass balance from the change in surface height.." (just missing the article "an")

We will correct it.

Figure 1: This is a really great figure that really helps to clarify the context of wind and accumulation.

Thank you for recognizing the effectiveness of the graph.

Table 1, caption for "a" should be "The number after the letter designation…" or "The number in the alphanumeric designation.."

We will correct it. →"*The number after the letter designation…*"

Line 185 (Figure 2 caption): should be, or more precisely, is more commonly written "perpendicular to the page"

We will correct it.

Line 538: "suggesting that the spatial difference in the microstructural anisotropy developed by TGM are maintained in the deeper firn." Should be, "suggesting that the spatial differences in the microstructural anisotropy developed by TGM are maintained in the deeper firn."

We will correct it. →"*differences*"

Line 541: "The sensitivity of Δε to accumulation rate is higher at lower accumulation rates (Fig. 11a), may implying the existence of positive feedback between TGM and microstructural anisotropy." Should be "The sensitivity of Δε to accumulation rate is higher at lower accumulation rates (Fig. 11a), may imply the existence of positive feedback between TGM and microstructural anisotropy."

We will modify it to "*The sensitivity of Δε to accumulation rate is higher at lower accumulation rates (Fig. 11a), implying the existence of positive feedback between TGM and microstructural anisotropy.*"

Line 542: "The firn with more vertically elongated structure (created by TGM) become more permeable, thereby facilitating vertical vapor transport and potentially leading to stronger TGM (e.g., Albert, 2002)." Should be, "The firn with more vertically elongated structure (created by TGM) becomes more permeable, thereby facilitating vertical vapor transport and potentially leading to stronger TGM (e.g., Albert, 2002)."
We will correct it. →"*becomes*"

Line 724: fieldworks should be fieldwork
We will correct it.