We appreciate the very positive comment by David Shean, which shows the value of open review with public discussion opportunities. Regarding the comments made:

1. *There are a few additional relevant papers in the literature involving GNSS-Reflectometry for SMB of Antarctic ice shelves and ice streams:*

   Shean et al. (2017) GPS-derived estimates of surface mass balance and ocean-induced basal melt for Pine Island Glacier ice shelf, Antarctica, https://tc.copernicus.org/articles/11/2655/2017/tc-11-2655-2017.html

   Seigfried et al (2017), Snow accumulation variability on a West Antarctic ice stream observed with GPS reflectometry, 2007–2017: *https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2017GL074039*

   These papers offer some context, identify limitations, and provide further justification for the refractometry. I recommend you give them a read, and consider citing.

   Thank you for these suggestions, we added them to the literature overview.

2. *I have not had a chance to do a detailed review, but I believe your experimental setup provides the (potentially unique) opportunity to characterize potential bias in snow measurements extracted from GNSS-Reflectometry alone. While I agree that GNSS-RR is a better option (assuming field support and equipment resources are available), there is also value in opportunistic reflectometry-only approaches leveraging existing archives of GNSS data collected by receivers deployed for other purposes (like ice motion). In other words, if you didn't have the refractometry, is there still value in the reflectometry results from your reference antenna alone?*

   The intention of our study was to extend a GNSS-IR setup with GNSS refractometry to study its potential for additional SWE and density estimation. However, before this study, the experimental site was only equipped with a reference antenna for GNSS-IR and tropospheric zenith path delay studies. There is definetily a value for the GNSS-IR results only and if you are interested in these data, they are publicly available and referenced in the paper. Additionally, ice movement, effective surface elevation and maybe ionospheric scintillation could be observed only by the reference antenna.

3. *I may have missed it, but it would be valuable to report the depth of the tower (or "sensor mast") in the firn at the start of the experiment. One important question is the depth of "bonding" between the tower and the firn, and whether the receivers rigidly mounted to the tower are experiencing relative downward motion due to compaction within upper or deeper layers of the firn column. Twit Conway has anecdotes about GNSS antenna poles near South Pole station penetrating several 10s of cm through plywood sheets due to differential firn compaction rates.*

   Thank you, this point was picked up in comment 2. of RC2, see our response there. Although such differential deformation might indeed be a problem for cold firn, the environmental conditions at Neumayer Station cause several melting events during summer to produce considerable ice layering. The tower will thus be anchored in the firn by such refrozen melt layers.

4. *I believe your upward-looking "rover" antennas are rigidly attached to the same tower as the reference antenna, with an assumption that the rovers remain fixed relative to the original "firn surface" from the start of the experiment. If the tower (and all receivers) are moving downward at the same rate as the original firn surface, all is well, but if not (due to the tower bonding in deeper layers), then your "rover" antennas will be pulled below the layer corresponding to the original firn surface, and your derived measurements will also include upper layers of firn instead of just new snow accumulation. Hopefully that makes sense. If you can demonstrate that this is not an issue, that would be a nice addition!*

   This question was also picked up by both reviewers. Yes, the antennas are fixed with respect to each other and the tower and all measurements are thus relative.