Response to Anonymous Referee #1:

We thank this anonymous reviewer for their constructive comments. Edits based on your input (and that of the second reviewer) have substantially improved this manuscript.

Here are our responses (in red) to your specific comments (in black):

I think the paper makes a significant contribution to our knowledge of assessment of altimetry data using groundbased GPS data. I believe the paper should be published after minor revision.

Minor comments:
Page 2, line 14, concerning satellite-derived time series. Add references to other than Zwally, 2005.
This was an oversight. We have added Velicogna et al., 2014, Shepherd et al., 2012, and Zwally et al., 2011; we feel that these references cover various satellite methods for both Greenland and Antarctica.

Page 3, line 11 and 18 (and throughout the paper). 11,000 m and 6,000 m, change to 11 km and 6 km. I Assume the track is not exactly 11,000 m ?
We had originally used 'm' throughout for consistency, but the reviewer makes an excellent point. We have changed most references to 1000 – 10,000 m to km. This also includes the caption and scale bar of Figure 1.

Page 3 line 18: After the text "...long and dense in situ observation of icesheet elevation change". Perhaps add reference to other papers combining GPS and ICESat, ATM e.g. Larsen, S. H., et al, J. Geophys. Res. Earth Surf., 121, 241–256, doi:10.1002/2015JF003507.
Our text here was intended to highlight the very unique nature of this in situ dataset, which is a 10-year, monthly, ground-based traverse, that continues to this day (and is expected to continue through the ICESat-2 mission, into the 2020's); thus, this should prove to be a roughly 15-year dataset. We are reluctant to diminish this point with a comparison to a 5-year in situ record, at 4 sites (not a survey line). But to address this point, we have added text that reinforces the uniqueness of the dataset.

Page 3, line 24. Is Trimble R7 receiver and Zephyr antenna used for all years?
Yes, the same equipment was used all 4 years. We have added a line that explicitly states this: ("*... ; we note that the kinematic surveys have always been conducted using this equipment.*"). Further, we added a similar statement about the base station: ("*For the duration of the survey time series, the base station has been a dual-frequency Trimble NetRS receiver recording at 1 Hz with a Trimble Zephyr Geodetic antenna...*").

Page 3, line 26. If possible add a photo of the antenna mounted on a static metal post on the sled.
This is an excellent suggestion. We have added a new Figure 2, which not only provides a photo of the setup, but also gives approximate numbers for the corrections from the GPS phase center back to the snow surface.

Page 6, line 18-31. I find this section confusing. You have listed names of several software packages used to process GPS data, however, no useful information about how the GPS data is processed is provided. How do you correct for troposphere delay, ionosphere? Which model is used? what cut-off elevation angle do you use? how do you deal with multipath etc…? It is also important that same GPS clock/orbit products are used by the different software packages, otherwise you may add an extra bias to your GPS solutions.
We have added a lengthy paragraph with the details of each of the processing methods: ("*Independent of post-processing method, all of the ground-based GPS solutions are based on final precise orbit and clock information from the Crustal Dynamics Data Information System, or CDDIS, at GSFC. Processing using TRACK corrected for errors associated with the ionosphere by incorporating an IGS data product. To mitigate the effect of multipath distortion, all processing methods used a cut-off angle (7.5°, 10°, and 12° for Inertial Explorer, TRACK and GITAR, respectively). Inertial Explorer and TRACK used a Saastamoinen model to correct for tropospheric delay, while GITAR used a gridded reanalysis data product from the National Centers for Environmental Prediction (NCEP). And all processing methods corrected for solid Earth tides based on an Earth Rotation and Reference System Services, or IERS, model.*")

Discussion: Potential future work. In addition to surface elevations, you could compare elevation change rates. Here, you could take advantage of the continuously operating GPS base station at Summit Station. The reflected GPS signals from the summit station, can be used to measure GPS reflected height of the surface (see Larson et al, 2015, Journal of Glaciology, Vol. 61, No. 225, 2015 doi: 10.3189/2015JoG14J130).
The idea of investigating change rates is great, and it is exciting that these data are available for such a study. However, at this time this is outside of the scope of this paper, where we wanted to stay focused on aircraft/satellite applications.