The technical corrections are listed here and marked in red also in the Manuscript

Line 13:

In studying the mass balance of polar ice sheets, the fluctuation of the firn density near the surface is a major uncertainty.

Is changed into:

In studying the mass balance of polar ice sheets, fluctuations of firn density near the surface is a major uncertainty.

Line 57:

The strongest echoes in a radar echogram, for example, show the position of abrupt permittivity changes that usually correspond to the position of refrozen melt layers (Jezek and others, 1994; Zabel and others, 1995).

Into :

The strongest echoes in a radar echogram, for example, show the positions of abrupt permittivity changes that usually correspond to the positions of refrozen melt layers (Jezek and others, 1994; Zabel and others, 1995).

Line 64

Change" In our previous works [Yardim etal 20222], we have used UWBRAD to sense the subsurface temperature profile, in which case the reflections caused by firn density fluctuations are nuisance effects. "

Into:

"In our previous work, we have used Ultra-Wide Band software defined RADiometer (UWBRAD) to sense the subsurface temperature profile, in which case the reflections caused by firn density fluctuations are nuisance effects[Yardim etal 20222]."

Line 69:

In this paper, we use co-located Snow Radar echoes (acquired in Greenland during the Operation Ice Bridge Campaign 2017, [CReSIS. 2021]) and 0.5-2 GHz brightness temperature data (the latter collected by the Ultra-Wide Band Software Defined Radiometer (UWBRAD) in 2017) to quantitatively evaluate firn density fluctuations in the Greenland ice sheet.

Changed into:

In this paper, we use co-located Snow Radar echoes (acquired in Greenland during the Operation Ice Bridge Campaign 2017, [CReSIS. 2021]) and 0.5-2 GHz brightness temperature data (the latter collected by the (UWBRAD) in 2017) to quantitatively evaluate firn density fluctuations in the Greenland ice sheet.

Line 125 :

We use the Community Firn Model v1.1.6 (CFM; Stevens et al., 2020,2021) to simulate the firn column density profile at several locations across the ice sheet

Changed into

We use the Community Firn Model v1.1.6 (CFM; Stevens et al., 2020) to simulate the firn column density profiles at several locations across the ice sheet

Line 126:

CFM simulations are set up as detailed in Medley et al. (In Review) where the model is forced by a modified version of the MERRA-2 global atmospheric reanalysis (Gelaro et al., 2017) at 5-day temporal resolution

Changed into :

CFM simulations are set up as detailed in Medley et al. (2022) where the model is forced by a modified version of the MERRA-2 global atmospheric reanalysis (Gelaro et al., 2017) at 5-day temporal resolution

Also in the reference list,

Medley, B., Neumann, T. A., Zwally, H. J., Smith, B. E., & Stevens, C.M.. Forty-year simulations of firn processes over the Greenland and Antarctic ice sheets. The Cryosphere Discussions, 1-35, in Review.

Changed into

Medley, B., Neumann, T. A., Zwally, H. J., Smith, B. E., and Stevens, C. M.: Simulations of firn processes over the Greenland and Antarctic ice sheets: 1980–2021, The Cryosphere, 16, 3971–4011, https://doi.org/10.5194/tc-16-3971-2022, 2022.

Line 136:

The first profile was collected at T41 (71.08N,37.92W) along the EGIG line by Morris [Morris and Wingham 2011] in 2004 using a neutron probe (Figure 1, left).

Changed into

The first profile was collected at T41 (71.08N,37.92W) along the EGIG line by Morris [Morris and Wingham 2011] in 2004 using a neutron probe.

Line 137：

Data were collected up to 13 meters below the surface at a vertical resolution of 1 cm, and clearly show significant fluctuations in density in the upper firn

Changed into

Data was collected up to 13 meters below the surface at a vertical resolution of 1 cm, and clearly show significant fluctuations in density in the upper firn

Line 139

The second profile and third profiles (Figure 2) are from a 2009 borehole measurement at the NEEM site [Ian Baker. 2012. NEEM Firn Core 2009S2 Density and Permeability] with a vertical resolution of ~90 cm and from a 2012 measurement at the NEGIS [Vallelonga et al., 2014] site having ~1 m increments

Changed into

The second profile and third profiles are from a 2009 borehole measurement at the NEEM site [Ian Baker. 2012. NEEM Firn Core 2009S2 Density and Permeability] with a vertical resolution of ~90 cm and from a 2012 measurement at the NEGIS [Vallelonga et al., 2014] site having ~1 m increments

Line 149:

The real and imaginary parts of the microwave permittivity of the firn are related to the firn density using the models in [Matzler, Tiuri].

Changed into:

The real and imaginary parts of the microwave permittivity of the firn are related to the firn density using the models in [Matzler 1996, Tiuri etal 1984].

Missing references are added:

Dattler, M. E., Lenaerts, J. T., & Medley, B. (2019). Significant Spatial Variability in Radar-Derived West Antarctic Accumulation Linked to Surface Winds and Topography. Geophysical Research Letters, 46(22), 13126-13134.

Kuipers Munneke, P., Ligtenberg, S. R. M., Noël, B. P. Y., Howat, I. M., Box, J. E., Mosley-Thompson, E., ... & Van Den Broeke, M. R. (2015). Elevation change of the Greenland Ice Sheet due to surface mass balance and firn processes, 1960–2014. The Cryosphere, 9(6), 2009-2025.

Matzler, C. "Microwave permittivity of dry snow," IEEE Trans. Geosci. Remote Sens., vol. 34, no. 2, pp. 573–581, Mar. 1996.

M. Tiuri, A. Sihvola, E. Nyfors, and M. Hallikaiken, "The complex dielectric constant of snow at microwave frequencies," IEEE J. Ocean. Eng., vol. 9, no. 5, pp. 377–382, Dec. 1984.

Line 195:

In Figure 3, the profiles from T41 high resolution measurements and CFM simulation is plotted. The standard deviation of density and its correlation length based on 1m profile is provide in Table 2.

Changed into

In Figure 3, the profiles from T41 high resolution measurements and CFM simulation is plotted. The standard deviation of density and its correlation length based on every 1m segment is provide in Table 2.

Line 232:

. An average of radar echoes over a 1 km distance surrounding each site was therefore performed. CFM profile simulations also account only for large-scale climate properties in simulating firn profiles, so that a spatial average of radar measurements is also reasonable, and UWBRAD measurements also correspond to a footprint of 1 km diameter.

Changed into:

CFM profile simulations also account only for large-scale climate properties in simulating firn profiles, so that a spatial average of radar measurements is also reasonable. Besides, UWBRAD measurements also correspond to a footprint of 1 km diameter. These facts validates the averaging over 1km data.

Line 253:

Figure 1 Averaged Snow Radar echo (upper plot) compared to X-ray high resolution tomography density data (lower data) near cross-over site one

Changed into

Figure 2 Averaged Snow Radar echo (upper plot) compared to X-ray high resolution tomography density data (lower data) near cross-over location one

Line 264:

Table 3: Peaks in Snow Radar echoes

Changed into:

Table 4: Peaks in Snow Radar echoes

Line 293

Table 5 Column 2 row 1 "Not modelled "

Changed into

"Not modelled in CFM"

Line 327

The CFM results show $std(\rho)$ values of 0.036g/cm^3 with $l_z = 10.5cm$ for Pt1 and $0.033g/cm$^3 with vertical correlation length close to 7cm for the other sites.

Changed into

The CFM results show $std(\rho)$ values of 0.036g/cm^3 with $l_z = 10.5cm$ for Location 1 and $0.033g/cm$^3 with vertical correlation length close to 7cm for the other sites.

Table 6 and 7.

The first rows of these 2 tables are changed into “Location 1, Location 2, Location 3 Location 4 ”

Line 325 to Line 330

Long scale density fluctuation parameters inferred from the CFM……….

The “sites” and “Pts” are changed into “Locations”