

Interactive comment on “Changes in the firn structure of the Greenland Ice Sheet caused by recent warming” by S. de la Peña et al.

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S. de la Peña et al (2015) is an important examination of the volume of meltwater that is refreezing in the percolation zone on the western side of the GIS. The paper identifies significant spatial and temporal variations using a combination of field observations and radar observations. The observations are used for a first approximation calculation of the volume of meltwater refrozen. The few comments below are aimed at gaining a more detailed understanding of the findings of this compelling paper.

548-19: In regions above the zone of superimposed ice, at what depth within the snow-pack were the ice layers forming, since the depth was fairly similar in radar results (0.81 m) the following spring, this implies a similar depth of refreezing at least versus the end of melt season surface.

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548-21: Can you better quantify the zone over which the continuous 2012 or 2010 ice layer is observed in terms of swath width, length and area?

548-23: Did T5 show anything of value in terms of ice?

549-6: What about comparable snow radar available from 2013 to see the 2012 melt layer?

549-10: Figure 4 suggests that the continuous refrozen layer from the 2010 melt season loses continuity between 1600 m and 1800 m. How continuous is it in this zone? Is the diminishing ice layer due to the failure of the meltwater to refreeze in this zone due to the warmer firn?

552-11: Can you explain the calculation of the volume of refrozen ice more completely particularly in terms of assumptions or adjustments. For example for the earlier periods was the percolation zone used the same elevation zone, or was it allowed to extend to lower elevations due to the suggested lower elevation of the percolation zone in the past? It appears you do extend the calculation all the way to the ELA which may address this. You note earlier that in a previous study “Firn ice content was greater than 50% by volume below 1600 m elevation, decreasing steadily with height” This implies that the firn ice content maximum was at a lower elevation prior to 1999, is this change taken into account?

Table 1: Can data for the J-line in 2013 be added here?

Figure 3a: You have room to add the elevations of the three firn cores.

Figure 3b: There is room to add one more cylinder. T13 would be interesting to compare in terms of ice lens distribution to T12.

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