

Interactive comment on “Greenland annual accumulation along the EGIG line, 1959–2004, from ASIRAS airborne radar and detailed neutron-probe density measurements” by T. B. Overly et al.

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1 Author Response to L. Koenig

1. Comment: “...The first is that the timing on the annual accumulation measurement data is not given. For instances a typical annual dating on an ice core would be Jan 1 to Dec 31 yet the annual dating for the NP and radar will be density peak to density peak which as defined in the paper is in the summer time. The authors also need to clarify how they are defining annual and any differences

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that then arise between the measurements due to timing.”

2. Author's Response: We mention the radar accumulation year on pg. 6799 line 18 “1959 accumulation year (Autumn 1958 to Autumn 1959)”, but agree that the timing of the annual accumulation measurements needs further clarification / description.
3. Author's Changes in Manuscript: We add descriptions of annual accumulation timing for ASIRAS, NP density, Anklin shallow cores, MM5, RACMO2.3, and MAR (RACMO and MAR Regional Climate Models added for comparison based on Anonymous Referee #1 comments). We add a discussion on the differences that arise due to annual accumulation definitions.

2 Author Response to L. Koenig

1. Comment: “Second, all of the field measurements and radar-derived accumulation should be given uncertainties or errors to put them in perspective with the accumulation changes that are being detected on a decadal scale. Specifically, error estimate on density and radar-derived accumulation should be given as well as any errors that were reported with the ice core dating for ice core derived accumulation.”
2. Author's Response: We report standard uncertainty for Table 1, Table 2, Fig. 3, Fig. 4, and Fig. 5. Our text throughout Section 4 Results failed to report the standard uncertainties seen in the tables and figures. We correct this oversight and include a description of density and ice core uncertainty.
3. Author's Changes in Manuscript: The revised manuscript contains sixteen text additions of specific accumulation uncertainty. We add descriptions of density, ice core, and model uncertainty.

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3 Author Response to L. Koenig

1. Comment: "Third, more information is needed and justification provided on how the paper is comparing point, line and area measurements. It is unclear at points in the paper if, for instance, the radar-derived accumulation is being averaged to the Polar MM5 grid or just compared at point locations, and clarification is needed as it provides a better understanding of how the small scale spatial variability in accumulation is scaling between measurements"
2. Author's Response: We agree and seek to address the spatial comparison briefly in this response and thoroughly in the revised manuscript. In Section 5.3 (pg 6809, Lines 8–18), we discuss the MM5 and ASIRAS-NP comparison. This section requires detailed clarification, which we provide in the revised manuscript. We do not make any area comparisons. We reduce the models to point locations. The high spatial resolution of our ASIRAS-NP radar measurements (one accumulation measurement every 3m) and the coarse spatial resolution of the modeled accumulation rates (2km grid spacing for MM5, 11km for RACMO, 23km for MAR) result in one ASIRAS-NP point falling within only one grid-cell point. We revise Fig. 4 (displayed below as "Fig. 1" in this interactive response) to show the exact grid points from the Regional Climate Models (MM5, RACMO, MAR, with RACMO and MAR added for comparison based on Anonymous Referee #1 comments).
3. Author's Changes in Manuscript: We clarify existing accumulation comparisons and add a description of the spatial comparisons. We remove the implication that MM5 is spatially continuous by updating Fig. 4 to reflect the point locations (rather than the previous line) of compared accumulations.

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4 Author Response to L. Koenig

1. Comment: "My other concern is that the paper needs additional references, including Medley et al 2013, and others listed in the markup and is confusing to read in places. Additional read through for clarification is needed and are well within the list of coauthors abilities. I have included a detailed mark-up of the .pdf in the supplemental to this comment. The mark-up includes additional references and highlights where I found material confusing or vague."
2. Author's Response: We agree and include references to Medley et al (2013) and Simonsen (2013). We thank the reviewer for their detailed reading and supplemental comments.
3. Author's Changes in Manuscript: The revised manuscript contains twenty-five clarifications, twenty edits, one grammatical correction, and seven reference updates related to the annotated supplement.

Interactive comment on The Cryosphere Discuss., 9, 6791, 2015.

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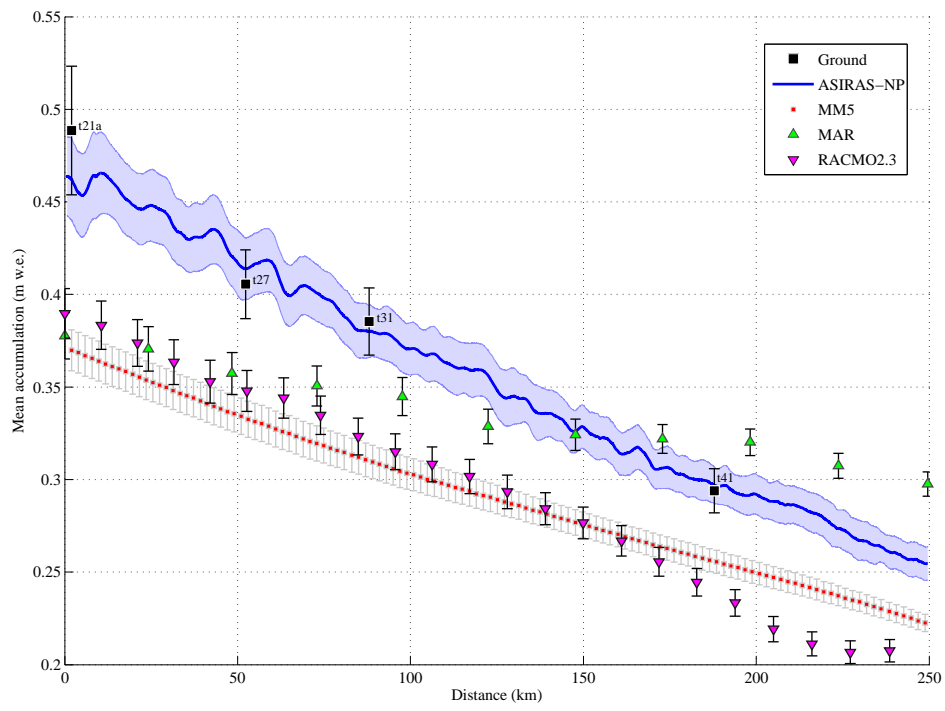


Fig. 1.

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