Dear Dr. Wernli,

We graciously thank you for feedback on our manuscript. We have incorporated the recommended changes and believe they have greatly improved the manuscript. Please refer to the line numbers given below to see changes in the revised, unmarked version of the manuscript.

Reviewer comments are shown in **bold**.
Author comments are in plain text.

Sincerely,
A Waling and Coauthors

Dear Annelise

We are almost there ... just a few minor points for you to consider before the paper is finally accepted (the 2nd one is important!):

- L49: I don't understand the logic of this newly introduced sentence: "Though ... more efficient, unstructured grids provide higher ... efficiency ...". This does not make sense to me and I don't understand what "efficient" means in the first part of the sentence vs. the 2nd part. Please correct this sentence or omit it.

Thank you for this note, we agree that this sentence was unclear and have removed it.

- Fig. 5: the first sentence of the caption is hard to read / understand. I think "eventually" is not needed. To me it would read much better as "Origin of summer ARs that intersect the GrIS in JJA." Also the next sentence is most likely not proper English (or at least very complicated). Just write something like "The size and color of the dots indicate ..." --> please check all figure captions and improve readability where possible!!

We have revised many of the figure captions for readability, please see below.

Figure 1: We added Latitude-Longitude (LL), Quasi-Uniform (QU), and Variable-Resolution (VR) labels to each of the three columns for clarity.

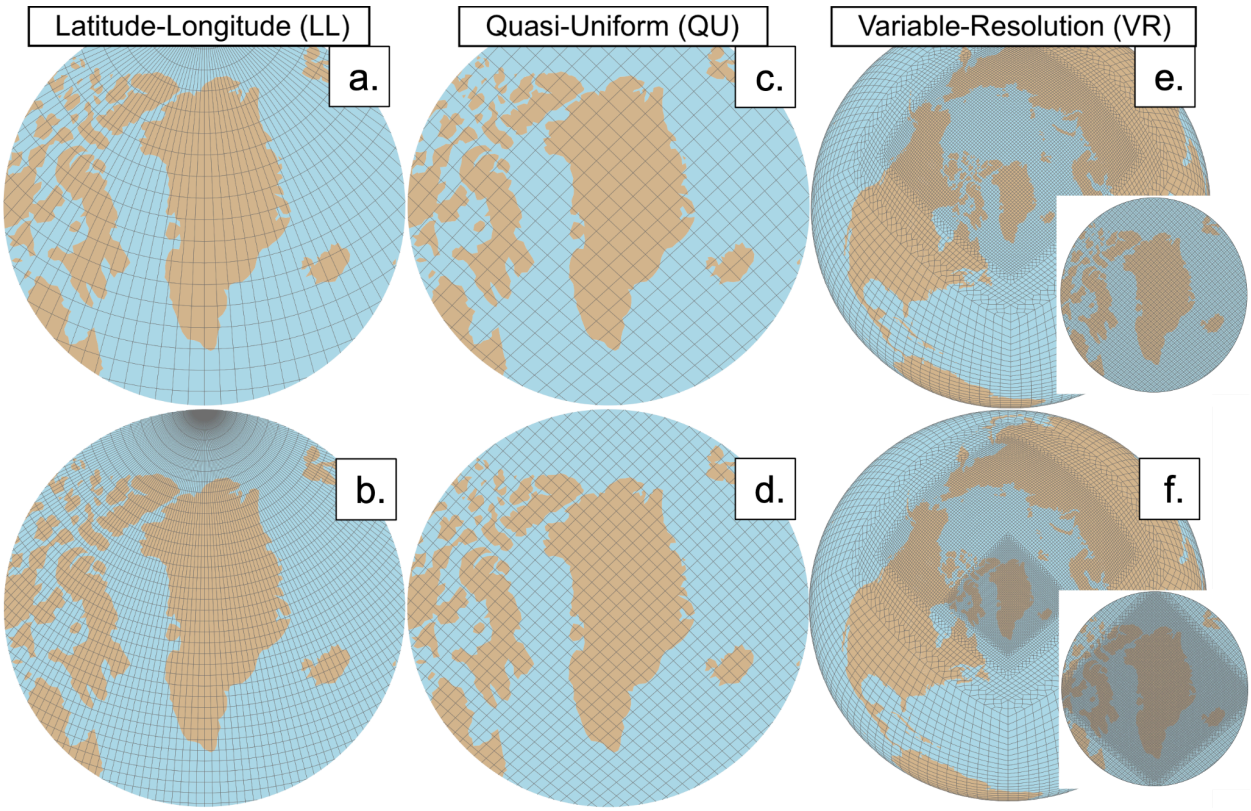

Figure 2: Native topography of each CESM2.2 grid configuration and reanalysis dataset used in this study. A-b show latitude-longitude (LL) (a- LL_2°, b- LL_1°) grids, c-d quasi-uniform (QU) (c- QU_1.5°, d- QU_1°), and e-f variable-resolution (VR) (e- 0.25°, *f- VR_0.125*°), g shows ERA5, and h shows MERRA2.

Figure 3: Average number of ARs in the Northern Hemisphere among the ensemble (left axis, blue). Average percentage of ARs intersecting GrIS among ensemble (right axis, green) normalized by total ARs was calculated using data available in Table 2.

Figure 4: Number of ARs intersecting the Greenland ice sheet by season. Winter was defined as December through February, spring as March through May, summer as June through August, and fall as September through November. Seasonal distributions include 20 years of data (1979-1998) using values from each of the four remapped ensemble members (N=80). Orange line in the center of each box signifies median value and box lower/upper boundaries describe the 25% and 75% quartiles, respectively. The whiskers extend from the box to the 1st and 99th percentiles. Outliers outside these percentiles indicated as open circles.

Figure 5: Origin of summer ARs that intersect the GrIS in JJA. The size and color of the dots indicate the number of ARs originating at a given location and the ensemble member represented, respectively.

Figure 6: Spatial distribution of ARs over the GrIS using grid configurations remapped to LL_2° and QU_1.5°.

Figure 7: (a) Number of ARs that eventually intersect GrIS as a function of time, normalized as days relative to the time of maximum overlap with GrIS and (b) number of ARs overlapping GrIS. (c) Area (m^2) of ARs that eventually intersect GrIS and (d) area (m^2) of ARs that overlap the GrIS.

Figure 8: Annual mean precipitation rates (mm/day) for grids and reanalyses used in this study, plotted on their native grids.

Figure 9: Average precipitation rate (mm/day) over the GrIS during landfalling ARs in an example from the VR_0.125° remapped to LL_2°using ESMF (n = 520 ARs). Time t indicates the time of maximum overlap for the AR over the GrIS.

Figure 10: Cumulative precipitation metrics centered around time of maximum AR overlap with GrIS, including (a) mean area-average precipitation rate, (b) 95th percentile precipitation rate, (c) mean area-integrated cumulative precipitation, and (d) 95th percentile cumulative precipitation over the GrIS. Time t indicates the time of maximum overlap for ARs over the GrIS. Precipitation is derived from six-hourly average samples for ERA5 (PRECT), six-hourly average for MERRA2 (PRECTOT), and six-hourly instantaneous for all model simulations (PRECC+PRECL).

Figure 11: 95th percentile ARs and precipitation rates produced by LL, QU, and VR configurations at four different dates. ARs are outlined in blue. Black contours are sea level pressure anomalies with 5 hPa intervals. Dates are not specified as model runs are free-evolving and do not reflect historical conditions.

Figure 12: 95th percentile ARs and precipitation rates produced by MERRA2 and ERA5 reanalyses at four different dates. ARs are outlined in blue. Black contours are sea level pressure anomalies with 5 hPa intervals. Dates are not specified for the model AR example figure (Figure 11) and therefore are also not given for this comparison reanalysis figure.

Figure 13: (a) Mean precipitation rates, (b) 95th percentile precipitation rates, (c) mean area-integrated precipitation, and (d) 95th percentile area-integrated precipitation over the GrIS compared to radial great circle distance of GrIS grid points to AR. Radial great circle distance (km) describes the distance of each grid point on the GrIS to an AR. Precipitation is derived from six-hourly instantaneous output in the model runs, whereas the reanalyses use six-hourly

averaged precipitation. The dotted purple line in (b) is the VR_0.25° run but using using two-point averaging to estimate the impact of using averaged variables in the reanalyses.

- Fig. 11 caption: please check whether "datetime" is proper English.

We have removed datetime and replaced it with dates, please see below.

Figure 11: 95th percentile ARs and precipitation rates produced by LL, QU, and VR configurations at four different dates. ARs are outlined in blue. Black contours are sea level pressure anomalies with 5 hPa intervals. Dates are not specified as model runs are free-evolving and do not reflect historical conditions.

With best regards,
Heini