Known issues in ATL14 and ATL15, release 001

1. **Ice-front advance and retreat.** The ATL14/15 products are intended to provide surface-height estimates for the ice sheet, and not to include the surface-height changes that happen with ice-shelf fronts advance and retreat (i.e. between the height in the ice-sheet surface and the water as the ice front moves. The extent of the ice sheet is specified by masks that may not always have been correct, and in many places the ice front has advanced or retreated since the masks were generated. Known examples of ice-front errors are in the Larsen C and Amery ice shelves (figure 1), where large bergs have calved since the mask was generated. We expect to correct front-position errors in subsequent versions of the products.

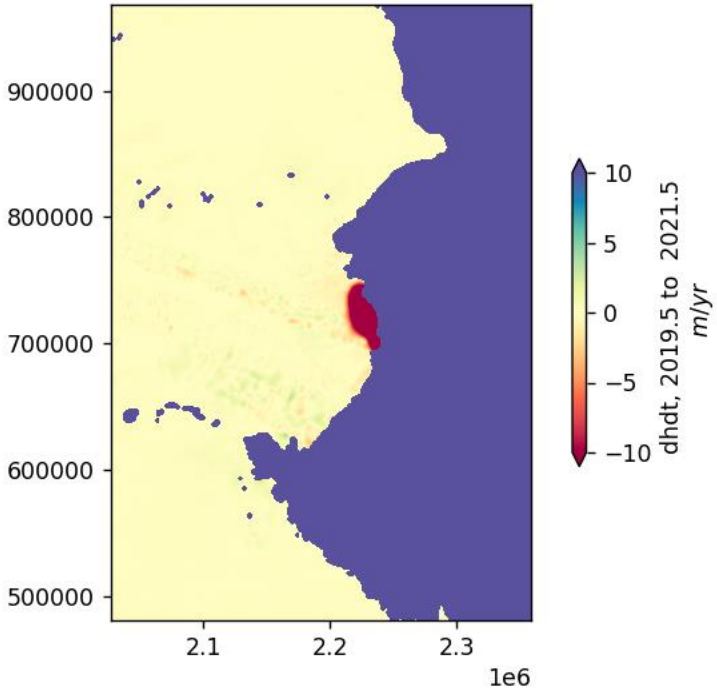

Figure 1. Height change rate (2019.5 to 2021.5) at the front of Amery Ice Shelf, East Antarctica. The large negative change reflects an iceberg calving event in late September, 2019.

2. **Missing tiles.** The algorithm did not correctly write to its output files for a few coastal tiles in Antarctica. It is likely that these had minimal impact on the final product because the mosaicking algorithm should have filled in data from neighboring tiles.

3. **Track striping.** ICESat-2's 91-day repeat tracks sometimes sample different accumulation and ablation events differently, and each track may be affected differently by errors in the tide model. This results in large apparent differences in height-change rates between adjacent tracks that are visible as track-parallel stripes in the short-term height-change fields. These stripes are especially prominent when the tracks run parallel to the tile boundaries, because adjacent tiles may sample the tracks somewhat differently (figure 2).

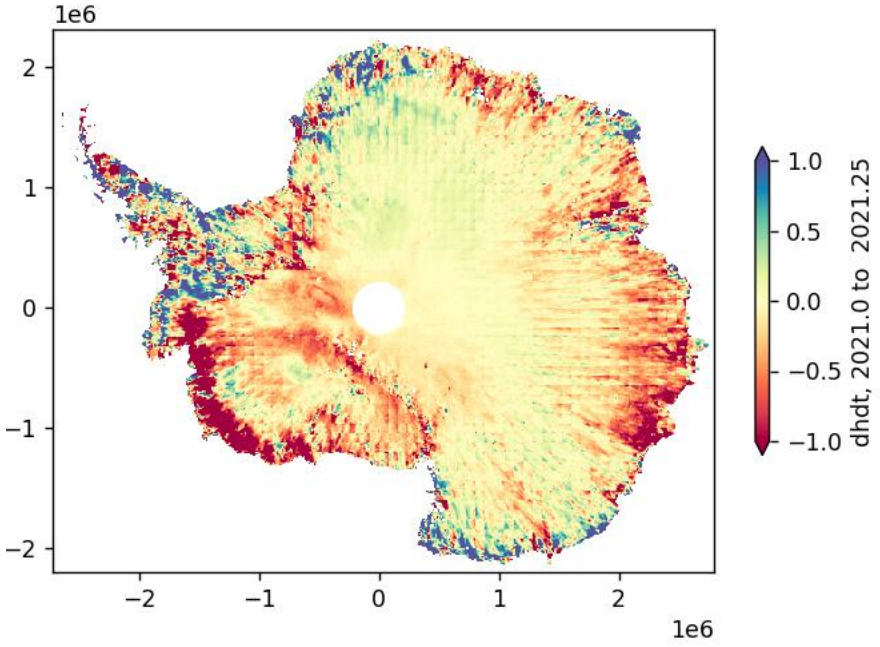

Figure 2. Estimated height-change rate for the first quarter of 2021

4. **Sharp changes in constraint parameters.** The parameter that controls the smoothness of the reference-surface height, σ_{xx0}, is calculated separately for each 80x80-km tile. The weak constraint values needed to achieve good misfits near the coasts of Antarctica and Greenland lead to sharp changes in the constraint at the edge of these tiles; this is most evident in the maps of ATL14 surface-height uncertainty, which have large values in a blocky region close to the Greenland and Antarctic coasts. Future versions of the product will specify smoothly-varying constraint-field values to reduce this effect.

5. Near-Grounding Zone Tides and Grounding Line Retreat: The ATL14/15 products are corrected for the effects of ocean tide fluctuations using tidal constituent outputs from regional tide models. Within grounding zones, ice flexure occurs as the ice transitions from a fully grounded state to a floating state in hydrostatic balance with the ocean. The ATL14/15 products do not include the effects of ice flexure or other non-hydrostatic effects (i.e. due to bridging stresses). ATL14/15 surface-height changes that happen within or near grounding zone regions may be affected by tidal aliasing effects due to the incorrect application of ocean tides. In addition, the inland extent of the ice shelves are specified by masks that may not always have been correct, and in many places they may have retreated or varied (i.e. due to being weakly grounded) since the masks were generated.