

ATL11 release 004 known issues. April 9, 2021

Poorly constrained reference surfaces:

The primary problem observed with ATL11 data is that when the surface topography is complex, and when the number of repeat measurements for an along-track point is small, the reference-surface fitting solution can produce unreliable results, resulting in unrealistic corrected-height values. The `/ptx/ref_surf/fit_quality` flag is provided to help users identify points affected by this problem. This variable has one element for each reference point, and nonzero values (1, 2, or 3) indicate a problem. The subset of data with `/ptx/ref_surf/fit_quality==0` will contain significantly fewer, and smaller, outlying values.

Inherited problems from lower-level products:

The ATL06 dataset contains a few tracks that have significant errors not accounted for in the standard error model. These include signal-finding blunders, and systematic errors associated with activities that point the spacecraft away from the reference ground tracks. These errors in some cases produce missing data or outlying values in ATL11.

1. ATL06 outliers. Signal-finding blunders have the largest effect in the crossing-track data values, and may be eliminated (in part) by filtering based on the `/ptx/crossing_track_data/along_track_rss` values (smaller values are better), and on `/ptx/crossing_track_data/ATL06_quality_summary` values (zero indicates no problems identified).
2. Systematic off-pointing relative to the reference track also has its most significant effects on the `crossing_track_data` group, because data from cycles with significant off pointing are usually excluded from the along-track fit. Some of these events are identified in the ICESat-2 Technical Reference Table, which is available on request from the NSIDC.
3. ATL06 release 004 contains a small number of infinite values for some datasets, including `r_eff` (effective reflectance). These values may affect ATL11 values that are derived from an average of lower-level product values. Any value in ATL11 that is presented as infinite should be treated as invalid.
4. The `dac` (dynamic atmosphere correction) is computed based on atmospheric pressure globally, and is thus nonzero even over grounded ice, where there should be no dependence of surface height on surface pressure. Note that `dac` is not applied to any data in ATL11, and users who wish to apply it may make the rough approximation that the `dac` correction is valid anywhere the `ocean_tide` is nonzero.

***slope_change_rate* fixed at zero:**

As in previous releases, the surface-slope change rate is not being calculated because of concerns about the stability of the calculation when small numbers of repeat cycles are present at a reference point. All values of this field and its error are reported as zero or invalid.

Jumps in *delta_time* variable

The ATL11 *delta_time* variable is calculated based on all of the ATL06 data available from each cycle at each reference point. In some cases, data are available from only one beam in a pair at a reference point, and because the two beams are separated by ~ 2.5 km in the along-track direction, the *delta_time* values between the beams differ by around .36 s. In some cases, for subsequent reference points at which data from different beams are available, the *delta_time* value for a cycle will jump forwards or backwards by $\sim .18$ s. This is expected behavior for the algorithm, and does not indicate a problem.