New Parameters on ATL09 for Data Release 004

Group: **/profile_x/high_rate**
Surface_thresh. This parameter is the magnitude (in photons) of the surface signal that must be exceeded in order for the surface to be detected for each 25 Hz profile.
Surface_width. This parameter is the width (in bins) of the detected surface signal
Surface_conf. This gives the confidence of the surface signal detection

The above parameters are the result of implementing a new surface detection algorithm. It was discovered that the surface signal can extend over as many as 3-4 bins in areas of very rough terrain. The algorithm used in prior releases would often select the lowest of these bins as the surface height. This caused problems when looking for signal immediately above the surface. The new algorithm sets the surface bin (and associated height) to the topmost bin in instances where the surface return spans multiple bins.

ATL09 Issues in Release 003 that are fixed in Release 004

Profile_x/high_rate:

Apparent_surf_reflec: Negative values of this parameter, present in release 3, are now fixed.

Asr_cloud_probability: In release 3, this parameter occasionally became greater than 100. This is now corrected.

Backg_theoret: This parameter has been fixed.

Cab_prof: The calibration error for data that is affected by the South Atlantic Anomaly has been reduced.

Column_od_asr: An error in computing the lidar beam pointing angle correction has been fixed.

Dem_h: The MERIT DEM is now replacing GMTED for release 4. This should remove some of the problems seen in release 3.

Surface_h_dens: the problem of misidentifying some low clouds as the surface has been corrected.

Surface_sig: Negative values of this parameter, present in release 3, are now gone.

Profile_x/low_rate:

Bsnow_h: The This is the low rate (1 second) blowing snow height. In version 4, there is a misalignment between this parameter and the wind speed data such that a blowing snow detection can be reported (parameter *bsnow_h* not invalid) but the corresponding wind speed is reported as less than the threshold wind speed for blowing snow (4 m/s). This has been corrected in version 4.

ATL09 Known Issues for ASAS V5.4

(Data Release 004)

The following lists the known issues with the ASAS version 5.4 (release 004) ATL09 atmospheric parameters. We are actively working to correct the problems for the next release.

Note: The normal operation of the ATLAS produces atmospheric profiles at the 25 Hz rate (400 shot sums). However, for a number of weeks shortly after launch, the instrument team conducted tests which produced 50 Hz (200 shot sums) atmospheric profiles. There are a total of 54 granules affected, all occurring in October or November of 2018. This does not cause noticeable problems in the data processing or product parameters but the user should be aware of this. These granules were released to the public for releases 001 and 002, but are being withheld for this release (004).

Profile_x/high_rate

Bsnow_dens and ***bsnow_h_dens*** are currently undefined.

Cab_prof: During twilight (solar elevation angles -7 to -1), the calibration can be very poor. Also, in an area east of Africa westward to over South America, the South Atlantic Anomaly (SAA) causes added noise to the lidar signal. This is only noticeable at night and is evident as an increase in background. While calibration has been improved in this region, it can still have considerable error.

Cloud_flag_asr: This parameter works well over ocean, but is not as accurate over land. It tends to underestimate cloud cover over land. Also, over snow surfaces, it tends to miss optically thinner clouds that may be present.

Cloud_fold_flag: does not capture all instances of cloud folding (times when there are clouds above 15 km that are folded down to the -0.5 – 3 km height due to the 10 KHz laser repetition rate – see the atmosphere ATBD for a complete discussion of this).

Layer_attr: this is the cloud aerosol discrimination for each atmospheric layer detected. We have implemented a new algorithm for cloud/aerosol discrimination for release 4. While it has improved results somewhat, there are still deficiencies which we will work to correct in future releases.

Layer_top and layer_bot: For very optically thin layers such as elevated aerosol, at times instead of having 1 top and bottom to define the layer, there can be multiple tops and bottoms within the layer. This is caused by the layer finding algorithm picking up on small gradients of backscatter within the layer and or the effects of noise. This can also happen in thin cirrus clouds. Note also that ICESat-2 cannot detect clouds above 14 km which affects cloud amount in the tropical regions.

Note for Nighttime data collection:

The ATLAS instrument performs calibrations that are used to optimize the altimetry retrievals during nighttime passes over parts of the oceans. During the calibration maneuvers, the atmospheric data are not collected. This results in areas where no data are collected as seen in the figure below (white areas). This affects data collected prior to March, 2019. After this date the calibration strategy was changed which greatly reduced this problem.

2018/12 – ZN

Cloud Fraction

Aerosol Fraction