

Requirements for generating LIDAR Pre-Level 1B file process

Generating LIDAR Pre-Level 1B files

The Pre-Level 1B (PreL1B) files can be generated when ephemeris files, attitude files and GMAO meteorology files are available. The Level 1A (L1A) files contain data can directly extract and convert from the Level 0 (L0) without waiting for any other dynamic input files. Once the dynamic input files are available, more information can be added into the L1A files and become PreL1B files. These PreL1B files are the main input files for the other processes.

The addition information includes the geolocation of field of view (fov), altitude registration (altitude shift), spacecraft and sun information, viewing angles, and meteorology information. This process will produce two output granules; one for nighttime orbit and one for daytime orbit data.

This process is shown in Figure 1.

Pre-Level 1B Flow for One Orbit

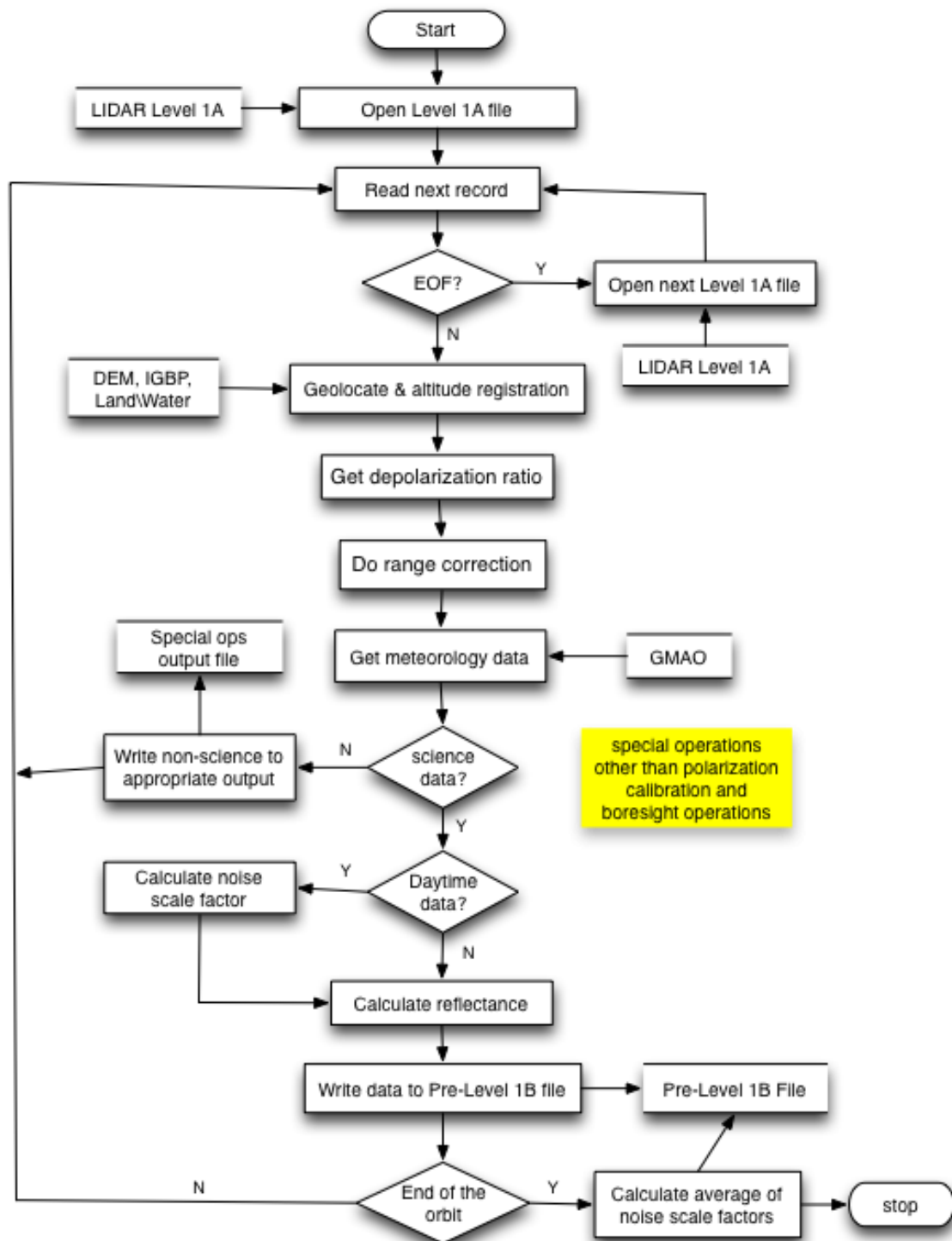


Figure 1 Top level flow of the Pre-Level 1B processes

Input files

The input files include LIDAR Level 1A files (two or three files cover the orbit), ephemeris files (two files; previous day and current day), attitude files (three files; previous, current, and next day), DEM files, IGBP, water/land, and GMAO meteorology files (three two-dimensional files and three three-dimensional files).

The contents for the Level 1A output file is shown in Table 1 and the metadata in Table 2. Each file contains 90 minutes data and one orbit contains about 99 minutes. To ensure to cover the whole orbit, each PGE will use three L1A files.

Table 1: LIDAR Level 1A Record

Parameter Name	Data Type	Elem/Rec
Profile_Time (TAI time)	Float_64	1
Profile_UTC_Time (yyyymmdd.ffffff)	Float_64	1
Profile_ID	Int_32	1
Day_Night_Flag	Int_8	1
Frame_Number	Int_16	1
Lidar_Mode	Int_16	1
Lidar_Submode	Int_16	1
Lidar_Receiver_Electronics_Status_532_Par	UInt_32	1
Lidar_Receiver_Electronics_Status_532_Per	UInt_32	1
Lidar_Receiver_Electronics_Status_1064	UInt_32	1
Active_Laser_Number	UInt16	1
Laser_Latitude	Float_32	1
Laser_Longitude	Float_32	1
Range_To_Mean_Sea_Level	Float_32	1
Backscatter_Start_Altitude	Float_32	1
Laser_Energy_Monitor_532	Float_32	1
Perpendicular_Amplifier_Gain_532	Float_32	1
Parallel_Amplifier_Gain_532	Float_32	1
Perpendicular_Background_Monitor_532	Float_32	1
Parallel_Background_Monitor_532	Float_32	1
Normalized_Backscatter_532_Parallel	Float_32	583
Normalized_Backscatter_532_Perpendicular	Float_32	583
Region_6_Merged_Shot_RMS_Noise_532_Per	Float_32	1
Region_6_Merged_Shot_RMS_Noise_532_Par	Float_32	1
Laser_Energy_Monitor_1064	Float_32	1
Amplifier_Gain_1064	Float_32	1
Normalized_Backscatter_1064	Float_32	583
Region_6_Merged_Shot_RMS_Noise_1064	Float_32	1
QC_Flag	UInt_32	1
QC_Flag_2	UInt_32	1

Table 2: LIDAR Level 1A Metadata Record

Parameter Name	Data Type	Elem/Rec
Product_ID	Char	80
Date_Time_at_Granule_Start	Char	28
Date_Time_at_Granule_End	Char	28
Date_Time_of_Production	Char	28
Initial_Subsatellite_Latitude	Float_32	1
Initial_Subsatellite_Longitude	Float_32	1
Final_Subsatellite_Latitude	Float_32	1
Final_Subsatellite_Longitude	Float_32	1
Orbit_Number_at_Granule_Start	Uint_32	1
Orbit_Number_at_Granule_End	Uint_32	1
Orbit_Number_Change_Time	Float_64	1
Path_Number_at_Granule_Start	Uint_16	1
Path_Number_at_Granule_End	Uint_16	1
Path_Number_Change_Time	Float_64	1
Lidar_L0_Files_Used	Char	240
Number_of_Good_Profiles	Int_32	1
Number_of_Bad_Profiles	Int_32	1
Percent_532-parallel_Bad	Float_32	1
Percent_532-perpendicular_Bad	Float_32	1
Percent_1064_Bad	Float_32	1
Percent_532-parallel_Missing	Float_32	1
Percent_532-perpendicular_Missing	Float_32	1
Percent_1064_Missing	Float_32	1
Lidar_Data_Altitudes	Float_32	583

Output files

There are two output files, one is for the nighttime portion of the orbit and one is for the daytime portion of the orbit. The contents of the Pre-L1B file show in Table 3 (Record) and Table 4 (File Metadata) (Note: the contents have not been confirmed yet):

Table 3: LIDAR Pre-Level 1B Record

Parameter Name	Data Type	Elem/Rec
LIDAR Profile Science Record		
Profile_Time (TAI time)	Float_64	1
Profile_UTC_Time (yyyymmdd.ffffff)	Float_64	1
Profile_Elapsed_Time*	Float_64	1
Profile_ID	Int_32	1
Land_Water_Mask	Int_8	1
IGBP_Surface_Type	Int_8	1

Parameter Name	Data Type	Elem/Rec
Day_Night_Flag	Int_8	1
Frame_Number	Int_16	1
Lidar_Mode	Int_16	1
Lidar_Submode	Int_16	1
Surface_Elevation	Float_32	1
Laser_Energy_532	Float_32	1
Perpendicular_Amplifier_Gain_532	Float_32	1
Parallel_Amplifier_Gain_532	Float_32	1
Perpendicular_Background_Monitor_532	Float_32	1
Parallel_Background_Monitor_532	Float_32	1
Depolarization_Gain_Ratio_532	Float_32	1
Depolarization_Gain_Ratio_Uncertainty_532	Float_32	1
Uncalibrated_Perpendicular_Attenuated_Backscatter_532	Float_32	583
Uncalibrated_Parallel_Attenuated_Backscatter_532	Float_32	583
Perpendicular_RMS_Baseline_532	Float_32	1
Parallel_RMS_Baseline_532	Float_32	1
Laser_Energy_1064	Float_32	1
Amplifier_Gain_1064	Float_32	1
Uncalibrated_Attenuated_Backscatter_Coefficient_1064	Float_32	583
RMS_Baseline_1064	Float_32	1
Ozone_Number_Density	Float_32	33
Relative_Humidity	Float_32	33
Temperature	Float_32	583
Pressure	Float_32	583
Molecular_Number_Density	Float_32	583
Molecular_Attenuated_Backscatter_Coefficient_532	Float_32	583
Molecular_Attenuated_Backscatter_Coefficient_1064	Float_32	583
Molecular_Attenuated_Backscatter_Coefficient_532_Parallel	Float_32	583
Molecular_Two_Way_Transmittance_532	Float_32	583
Molecular_Two_Way_Transmittance_1064	Float_32	583
Ozone_Two_Way_Transmittance_532	Float_32	583
Surface_Wind_Speeds	Float_32	2
Tropopause_Height	Float_32	1
Tropopause_Temperature	Float_32	1
Noise_Scale_Factor_532_Perpendicular	Float_32	1
Noise_Scale_Factor_532_Parallel	Float_32	1
Noise_Scale_Factor_1064	Float_32	1
Perpendicular_Column_Reflectance_532	Float_32	1
Perpendicular_Column_Reflectance_Uncertainty_532	Float_32	1
Parallel_Column_Reflectance_532	Float_32	1
Parallel_Column_Reflectance_Uncertainty_532	Float_32	1
QC_Flag	UInt_32	1
QC_Flag_2	UInt_32	1

Parameter Name	Data Type	Elem/Rec
LIDAR Profile Geolocation and Viewing Geometry Record		
Latitude	Float_32	1
Longitude	Float_32	1
Off_Nadir_Angle	Float_32	1
Viewing_Zenith_Angle	Float_32	1
Viewing_Azimuth_Angle	Float_32	1
Solar_Zenith_Angle	Float_32	1
Solar_Azimuth_Angle	Float_32	1
Scattering_Angle	Float_32	1
Surface_Altitude_Shift	Float_32	1
Number_Bins_Shift	Int_32	1
LIDAR Spacecraft Position, Attitude, and Celestial Record		
Spacecraft_Altitude	Float_32	1
Spacecraft_Position	Float_64	3
Spacecraft_Velocity	Float_64	3
Spacecraft_Attitude	Float_64	3
Spacecraft_Attitude_Rate	Float_64	3
Subsatellite_Latitude	Float_32	1
Subsatellite_Longitude	Float_32	1
Sun_Distance	Float_64	1
Subsolar_Latitude	Float_32	1
Subsolar_Longitude	Float_32	1

* Profile_Elapsed_Time is the reference time for this granule, which is the start time of the nighttime or daytime orbit. The elapsed times of the profiles can be calculated by subtracting this reference time. This parameter has only one record in each file.

Table 4: LIDAR Pre-Level 1B Metadata Record

Parameter Name	Data Type	Elem/Rec
Product_ID	Char	80
Date_Time_at_Granule_Start	Char	28
Date_Time_at_Granule_End	Char	28
Date_Time_of_Production	Char	28
Number_of_Good_Profiles	Int_32	1
Number_of_Bad_Profiles	Int_32	1
Initial_Subsatellite_Latitude	Float_32	1
Initial_Subsatellite_Longitude	Float_32	1
Final_Subsatellite_Latitude	Float_32	1
Final_Subsatellite_Longitude	Float_32	1
Orbit_Number_at_Granule_Start	Uint_32	1
Orbit_Number_at_Granule_End	Uint_32	1

Parameter Name	Data Type	Elem/Rec
Orbit_Number_Change_Time	Float_64	1
Path_Number_at_Granule_Start	Int_16	1
Path_Number_at_Granule_End	Int_16	1
Path_Number_Change_Time	Float_64	1
Lidar_L1A_Files_Used	Char	240
Ephemeris_Files_Used	Char	160
Attitude_Files_Used	Char	160
GEOS_Version	Char	64
GMAO_Files_Used	Char	480
Percent_532-parallel_Bad	Float_32	1
Percent_532-perpendicular_Bad	Float_32	1
Percent_1064_Bad	Float_32	1
Percent_532-parallel_Missing	Float_32	1
Percent_532-perpendicular_Missing	Float_32	1
Percent_1064_Missing	Float_32	1
Lidar_Data_Altitudes	Float_32	583
Met_Data_Altitudes	Float_32	33
Rayleigh_Extinction_Cross-section_532	Float_32	1
Rayleigh_Extinction_Cross-section_1064	Float_32	1
Rayleigh_Backscatter_Cross-section_532	Float_32	1
Rayleigh_Backscatter_Cross-section_1064	Float_32	1
Ozone_Absorption_Cross-section_532	Float_32	1
Ozone_Absorption_Cross-section_1064	Float_32	1

The parameters with “Bold” are the additional parameters from the L1A files. The parameters in red are suggested to add into the Pre-Level 1B files so that the MetManager is not required to call from the downstream PGEs.