

ICESat-2 Derived 30 m Along-Track Boreal Aboveground Biomass Density, Version 1 Technical Reference

1 INTRODUCTION

1.1 Overview

Data from NASA's ICESat-2 mission provide a comprehensive look at canopy structure for boreal forests using space-based lidar. This data set provides a quality-filtered set of [ATLAS/ICESat-2 L3A Land and Vegetation Height, Version 5 \(ATL08\)](#) observations of relative canopy heights and aboveground biomass density model results for circumpolar boreal forests. The data were collected at 30 m along-track segment lengths for strong beams only during the 2019–2021 high northern latitude growing seasons. 19,287,550 filtered ATL08 point observations were clipped to the extent of the boreal forest spatial domain. More information is available in Neuenschwander et al. (2024).

1.2 File Information

1.2.1 Format

The data set is a geodataframe of points for which each point feature has a spatial location (lat, lon) stored in the 'geometry' field, as well as other ICESat-2 derived vegetation metrics associated with vegetation height, biomass, and land cover classification. The data are available as a single GeoPackage file (.gpkg), an open format for geospatial information.

1.2.2 File Contents

The file contains the parameters listed in the following table.

Table 1. File Parameters

Variable	Description
tile_num	Tiled set of modeled aboveground biomass (AGB) grids (doi.org/10.3334/ORNLDAAC/2186)
seg_landcov	Land cover classification associated with ATL08 data as specified in the Data Dictionary, available on the ATL08 data set landing page (nsidc.org/data/ATL08)
lon	Longitude (decimal degrees)
lat	Latitude (decimal degrees)
RH_25	Relative canopy height (m) at the 25th percentile

Variable	Description
RH_50	Relative canopy height (m) at the 50th percentile
RH_60	Relative canopy height (m) at the 60th percentile
RH_70	Relative canopy height (m) at the 70th percentile
RH_75	Relative canopy height (m) at the 75th percentile
RH_80	Relative canopy height (m) at the 80th percentile
RH_90	Relative canopy height (m) at the 90th percentile
RH_98	Relative canopy height (m) at the 98th percentile; represents the top of the canopy
DOY	Day of year
YEAR	Year
REALM	'NA' for Nearctic or 'PA' for Palearctic
AGB_model_id	Model used to calculate AGB from RH
AGB_mean_mg_ha	AGB density estimate based on the mean of a set of modeled estimates from sampling the variance-covariance matrix n = 50 times (Mg/ha)
AGB_se_mg_ha	Square of the AGB model sigma
geometry	Point data

1.3 Spatial Information

The data are referenced to WGS 84, as described below:

```
DATUM["World Geodetic System 1984",
      ELLIPSOID["WGS 84",6378137,298.257223563,
               LENGTHUNIT["metre",1]],
      ID["EPSG",6326]],
PRIMEM["Greenwich",0,
        ANGLEUNIT["degree",0.0174532925199433],
        ID["EPSG",8901]],
CS[ellipsoidal,2],
  AXIS["longitude",east,
       ORDER[1],
       ANGLEUNIT["degree",0.0174532925199433,
                 ID["EPSG",9122]]],
```

```
AXIS[ "latitude", north,  
      ORDER[2],  
      ANGLEUNIT[ "degree", 0.0174532925199433,  
                ID[ "EPSG", 9122]]]]
```

NOTE: The coordinate reference system is similar to EPSG 4326 but with a reverse axis order (lon, lat).

1.4 Temporal Information

1 May 2019 to 30 September 2021

Although the data cover a 3-year period (i.e., 3 summers), the estimates represent a single epoch of biomass (circa 2020).

2 REFERENCE

Neuenschwander et al. (2024). [Manuscript in preparation].