Tools for working with the Geoscience Laser Altimeter System (GLAS) Data Products from the Ice, Cloud, and land Elevation Satellite (ICESat) Mission

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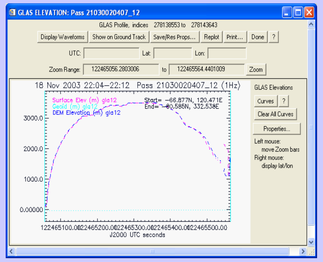
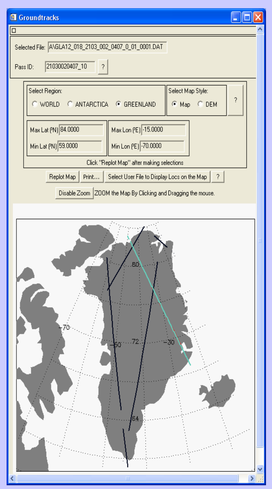
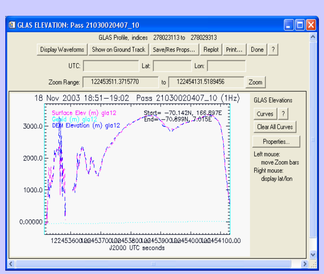
The Geoscience Laser Altimeter System (GLAS) is the sole instrument on the Ice, Cloud, and land Elevation Satellite (ICESat). The main objective of the ICESat mission is to provide accurate, high resolution data that will contribute to our understanding of ice-sheet mass balance investigations in the polar regions. The ICESat mission is an integral part of NASA's Earth-Sun System Division. The GLAS science team and Science Computing Facility (SCF) have worked with NSIDC to provide a suite of tools for users to read, visualize and subset the ICESat/GLAS data.
See: http://nsidc.org/data/icesat/tools.html for access to and documentation about these tools.

IDL Visualizer

- Reads data from an ICESat/GLAS file and views graphical summaries of variables.
- A quick-start tutorial is available on-line to help users get started viewing ICESat/GLAS data.
- Developed by the GLAS SCF.







NSIDC GLAS Altimetry elevation extractor Tool (NGAT)

- Extracts elevation and geoid data from GLAS altimetry products (GLA06 and GLA12-15) and outputs latitude, longitude, elevation, and geoid in ASCII columns.
- The NGAT runs under IDL (6.0 or greater) or the free IDL Virtual Machine (IDLVM) available from Research Systems Inc.
- Developed by NSIDC (Matt Savoie).

Record No.	Date	Time	Lat. (deg.)	Long. (deg.)	Elevation (m)	Geoid
372402615	03/07/2004	00:31:01.540	61.775047	213.540418	562.026	18.440000
372402615	03/07/2004	00:31:01.565	61.776580	213.539815	561.983	18.434615
372402615	03/07/2004	00:31:01.590	61.778114	213.539224	562.099	18.429231
372402615	03/07/2004	00:31:01.615	61.779650	213.538645	562.267	18.423846
372402615	03/07/2004	00:31:01.640	61.781187	213.538080	562.097	18.418462
372402615	03/07/2004	00:31:01.665	61.782726	213.537528	562.012	18.413077

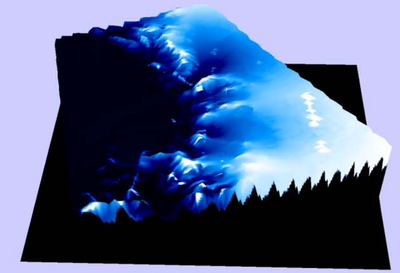
IDL Readers

- Reads data from an ICESat/GLAS file and prints all the variables in ASCII format.
- The readers run under IDL (6.0 or greater) or the free IDL Virtual Machine (IDLVM) available from Research Systems, Inc.
- Developed by the GLAS SCF.

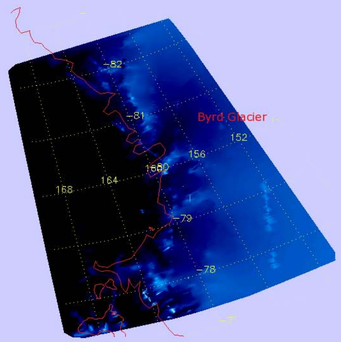
```
=GLA09
version=pv3_9
i_rec_ndx       =    249067082
i_UTCTime       =    119557908          298256
i_beams_coelev      =          32          32          32          32
i_beam_azimuth      =        1211        1219        1229        1244
i_pad_angle     =    467521      466939      466337      465917
i_spare0        =    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    0    0    0    0    0
i_AttFlg1       =     16          16          16          16
i_lat           =    44590601    44528798    44466894    44405034
i_lon           =    22967094    22954389    22941657    22928925
i_OrbFlg        =    0    0
    0    0
    0    0
i_spare1        =    0    0    0    0    0
i_LidarQF       =    0    0    0    0    0
i_spare2        =    0    0    0    0    0    0    0    0    0
i_topo_elev     =     465        1453         367         482
i_atm_dem       =     221         292         241         155
i_LRcld_bot     =    938     209     209   32767   32767   32767   32767
    32767   32767   32767
i_LRcld_top     =    968     247     247   32767   32767   32767   32767
    32767   32767   32767
i_LRcld_grd     =     63
i_spare3        =    0    0
i_MRcld_bot     =    224   32767   32767   32767   32767   32767   32767
    32767   32767   32767
    32767   32767   32767   32767   32767   32767   32767   32767   32767
```

Subsetter

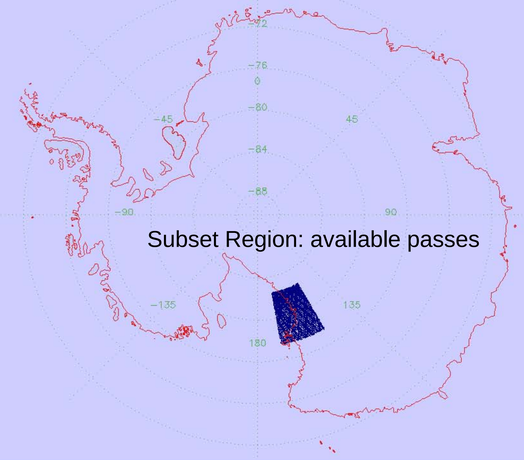
- User enters bounding coordinates and temporal range of interest in a web form on NSIDC's site.
- NSIDC provides the spatially subsetted data.
- Developed by NSIDC (Matt Savoie), in conjunction with the GLAS SCF.



ENVI 3D model of subset: Byrd Glacier and the Ross Ice Shelf



2D view of composite GLA14 Elevation Data



Subset Region: available passes

Fortran 90 Readers

- This set of programs reads data from an ICESat/GLAS file and prints all the variables in ASCII format (identical output as IDL reader; ***see left***).
- These are sample codes to help users develop their own applications.
- There is a separate program for each product type ("read_glaxx_file") where xx is the product number.
- The programs are written in Fortan 90 and developed in a HP/UX 11.x runtime environment.
- A relatively modern Fortran 90 compiler is required.
- Runs on only HP/UX and some Sun platforms.
- Developed by the GLAS SCF.

Antarctic and Greenland Ice Sheet Altimetry Data

The Level-2 ice sheet altimetry product (**GLA12**) contains the ice sheet elevation and elevation distribution calculated from algorithms fine-tuned for ice sheet returns. It also includes the laser footprint geolocation, reflectance, and the geodetic, instrument, and atmospheric corrections used to correct the range measurements. Parameters are at the full 40 shots per second resolution, but only for locations that fall within the ICESat ice sheet mask. Data granules contain approximately 23 hours (14 orbits) of data over the ice sheets.

Sea Ice Altimetry Data

The Level-2 sea ice altimetry product (**GLA13**) contains the sea ice freeboard and sea ice roughness calculated from algorithms fine-tuned for sea ice returns. It also includes the laser footprint geolocation, reflectance, and the geodetic, instrument, and atmospheric corrections used to correct the range measurements. Parameters will be at the full 40 shots per second resolution, but only for locations that fall within the ICESat sea ice mask. Data granules contain approximately 23 hours (14 orbits) of data over the sea ice regions.