

NSIDC DAAC Data Priority Workshop
January 11-12, 2006
Goddard Space Flight Center

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Introduction:

The NSIDC DAAC Data Priority Workshop is the first of several NASA HQ sponsored sessions to assess the data holdings of the DAACs and related data activities within EOSDIS. Chaired by NASA HQ, on 11 and 12 January 2006, a workshop was held at NASA Goddard Space Flight Center attended by several different participants. Representatives of the DAAC and NASA's EOSDIS Project Office presented information about product histories and usage by the community. Product developers were asked to attend to provide information on product theoretical basis, quality and accuracy, usage, and science value. The seven invited participants examined the science data products and were asked to provide recommendations for each specific product or product suite¹. This report summarizes the results of the workshop.

Meeting Purpose

The stated purpose for the workshop is to analyze and review holdings at the EOSDIS NSIDC DAAC for relevance and need².

It is vital that important and scientifically validated, research and climate quality data sets are catalogued and readily available, at minimum cost, to the research community. Accordingly, the EOSDIS Program created the Distributed Active Archive Centers to provide data management of data sets necessary for making progress in activities described in the agency's Earth Science research strategy.

Many products within the EOSDIS DAACs were agreed to be placed at the NSIDC DAAC through EOS Program requirements, for example "EOS Standard Products", which were selected through open solicitation and peer review. These Standard Products were acquired by NASA through contracts with EOS Principle investigators, who supplied the algorithms, produced under the auspices of GSFC ESDIS Project, and placed into the appropriate disciplinary DAAC. Other products were acquired at the recommendation of the DAAC's User Working Group, also known as the Polar DATA Group (PoDAG). NSIDC meets with the PoDAG group approximately twice a year to review activities at the DAAC as well as prioritizing data sets needed for Earth system science research.

NASA conducted this workshop in order to obtain insights and recommendations from key expert users on which products and product suites remain salient, valuable and of particular significance for Earth system science research, and whether any have become moribund. The EOSDIS Product Review activity is NASA's implementation of a Vision 2015 goal Evolution of the EOSDIS Element Study Team, and is part of moving the EOSDIS to a more flexible, distributed system capable of responding to changing science needs.

¹ Attendee List http://extranet.nsidc.org/nasa/daac/podag/prod_rev/attend.html

² Charter statement provided by NASA HQ
http://extranet.nsidc.org/nasa/daac/podag/prod_rev/charge.html

It is expected that the NSIDC DAAC, with the guidance NASA Program Scientist, will continue to work with the science community consensus in providing the best suite of products and services, commensurate with the needs, and as resources allow.

Part I: Description and Overview of data product ensembles

Brief descriptions of each product group or ensemble, as presented at the workshop, are provided below. Where appropriate to the understanding of the data group, workshop discussion narrative is also included. Details of data sets can be found in Appendix A or on the workshop support website³.

NSIDC divided the 120 data sets managed by the DAAC into six major groups, based primarily on sensor or sensor class. The Heritage category was further divided into three subgroups.

MODIS

Contains cryosphere standard products from the MODIS sensors on the Terra and Aqua satellites. Both L2 and L3 sea ice and snow cover products were presented.

AMSRE

The AMSRE sea ice products only were presented. The sea ice products are level 2 and 3.

GLAS

GLAS data include 15 standard products delivered to NSIDC. Level 1A (4 products) and L1B (2 products) are precursors to the Level 2 products. Of the Level 2 products 5 are related to elevation and 4 are related to atmosphere measurements. GLA05, 06, 12, 13, and 14 provide information about the cryosphere.

Passive Microwave

Twenty-one products either containing or derived from passive microwave data from SMMR, ESMR, and SSMI were reviewed. These consist of seven Brightness Temperature products, three combined sea ice/snow cover products, ten sea ice products, and one land data set.

Pathfinder

Pathfinder program data held by NSIDC include polar subsets of AVHRR orbital data and associated albedo and surface temperature products, radar altimetry data, and Radarsat SAR mosaiced products of Greenland and Antarctica.

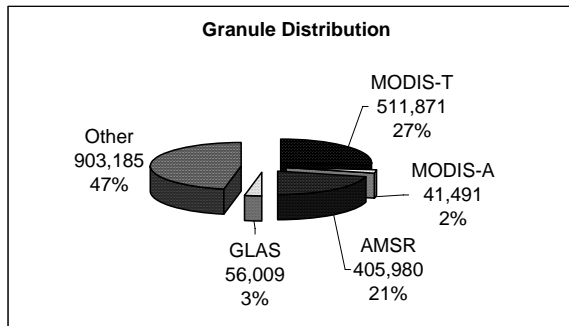
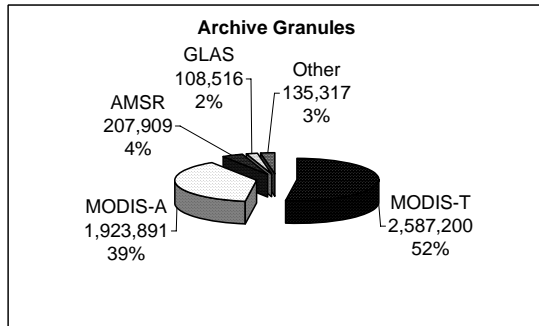
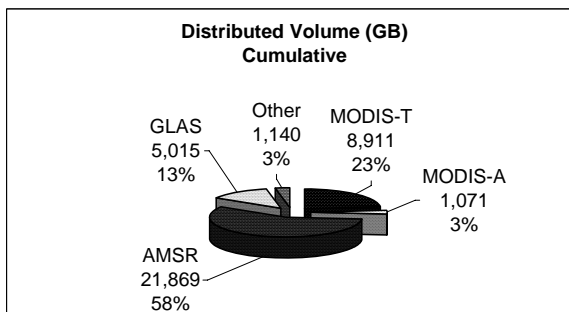
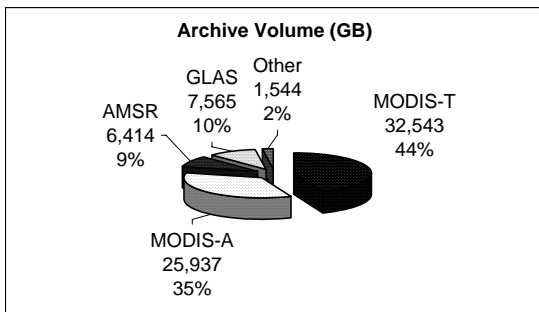
³ Workshop Website may be found at:
http://extranet.nsidc.org/nasa/daac/podag/prod_rev/index.html

Heritage

Heritage data consists of in-situ, field campaign, or other ancillary data which meet the NSIDC DAAC assigned responsibilities. They are further subdivided into those data from AMSRE validation experiments, the Cold Lands Field Experiments, and other various atmospheric, land, and ocean in-situ and field campaign data.

Overview Metrics for NSIDC DAAC holdings.

ESDT	Archive Granules	Archive Volume (GB)	Unique Users	Unknown Users	Users	Orders	Requests	Distribution Granules	Distribution Volume (GB)	Granule Size (GB)
MODIS-T	2,587,200	32,543	1,373	2,887	4,260	35,362	154,610	511,871	8,911	0.02
MODIS-A	1,923,891	25,937	225	10	235	11,144	14,143	41,491	1,071	0.03
AMSR	207,909	6,414	699	1,825	2,524	12,820	94,379	405,980	21,869	0.05
GLAS	108,516	7,565	495	92	587	807	10,614	56,009	5,015	0.09
Other	135,317	1,544	5,182	0	5,182			903,185	1,140	0.00



The above aggregated view of NSIDC DAAC holdings demonstrates the complex interplay of archive and distribution volumes and granules⁴.

⁴ Metrics are from the ESDIS Metrics System (EMS), compiled by J. Moses in November 2005

Part II: Recommendations

Meeting recommendations are divided into two main groups: general recommendations and data group specific. No priorities have been assigned to these recommendations in this report.

A: General Recommendations

- The NSIDC User Working Group (PoDAG) should look at the prioritization of all the data sets held by the NSIDC DAAC. PoDAG has reviewed NSIDC DAAC data on as needed basis for the last several meetings. The participants urged PoDAG to conduct a more encompassing review.
- Find a recognizable nickname for each data set and make it known by that. The participants found the short abbreviated names assigned to EOS Core System managed data sets confusing. They suggest that a more accessible name (nickname) be assigned which falls somewhere between the ECS short name and the extended title for the data set. For example: GLA01, the short title or nickname, and the long title might be named “GLAS/ICESat L1A Global Altimetry Orbital Track Data”

B: Recommendations by Product Ensembles

MODIS

- The participants observed that some MODIS data sets were candidates for further aggregation or fusion.
 - For example, the MODIS albedo product might be fused with an AVHRR albedo product.
- Process on demand capabilities might be employed for at least the 8 day and potentially other composite products. For example the 8 day snow extent might be produced ‘on the fly’ from a baseline 1 day product. In fact an ‘n-day’ tool might be developed that produces composites based on user input and on demand. Assessment of such tool implementations must be justified from IT and staff resource point of view.
- Product (MOD29P1N) (nighttime ice surface temperature embedded) was discussed at some length. Since the cloud detection does not work at night, this particular product seems to be of low value and of low use. Several observations came from this discussion.
 - It may be difficult to remove the product from production due to the relative inflexibility of the current MODAPS processing system software.
 - In order to validate a product it is important to distribute the product (with appropriate caveats) to users so that they can participate in validation...this implies the production of invalidated products in some instances is appropriate.

- The time a product resides in the data system under conditional or un-validated state might be used as a metric to determine usefulness of the product. In other words, “if the validation flag is not changed in five years, then get rid of the product”
- Same discussion could be applied to the snow albedo product (within MOD10A1)
 - A suggestion was made to put together an Ice Surface Temperature product over the ice sheets. The participants wondered why ice sheets didn't have a surface temperature product, when one exists for land, ocean, and sea ice. This recommendation might go the MODIS Science Team to be studied and if possible implemented, or it might be proposed to an NRA.

AMSRE

- An ice motion product should be developed. This recommendation might go to the AMSR Science Team to be implemented, and/or it might be proposed to an NRA.
- It was suggested that the AMSR team stop producing the AMSRE ice temperature product because it is completely unused and is invalid. It is a parameter in the currently produced and archived product. It was noted that it will take resources to remove the ice temperature code from the production process, and that it might be more cost effective to leave the product alone. Most likely, nothing could be accomplished until the next reprocessing campaign
- The participants noted that using the sea ice extent or concentration (or ice temperature) products required unbundling them from a rather large HDF file. They suggested that certain high use parameters in the sea ice granule be unbundled and distributed separately at the DAAC. The participants also noted that additional data formats (like geoTIFF) would make the product more useful to the community.
- The participants expressed concern over how to view metrics for the specific fields in the bundled products. Bundling of products does not allow for collection specific use metrics for a subcomponent. For example, sea ice extent because it is bundled with other sea ice parameters in one product. It is difficult to assess the user activity for say the ice temperature as compared to other sea ice parameters with the current structure.
- Clear nomenclature for AMSRE products was also requested. Discussion was similar to that for MODIS.

GLAS

Following material is from the ICESat telecom of March 31, 2006. More detailed notes from the telecom can be found on the NSIDC Data Priority Workshop website.

- Investigate the potential resources required to migrate the radar altimetry and the aircraft laser data to NSIDC and collocate with ICESat data; the goal is to be part of the Climate Data Record. NSIDC and the PoDAG need to discuss altimetry data from the point of view of an Earth Science Data Record. Discussion should include the Aircraft data held at Wallops, the satellite radar altimetry data held by GSFC (Zwally) and the ICESat data held by NSIDC. Develop a data management strategy that assures these data are accessible and secure for the next 10 years (minimum). The plan might include migration of holdings to NSIDC, if that proves to be the most advantageous route. Other alternatives discussed were to possibly add links to another website for radar altimetry data products
- HQ wants ICESat data to be generally available and easy to find by any user, not depending on inside knowledge or individual contacts within the community. The user community must know what data are available for what time period and what is its quality?
- Some of the issues that led to the multiple partial releases:
 - decision of launching as-is before all problems worked out which led to problems with laser pointing
 - The science team has dedicated significant effort to identify methodologies to correct problems, resulting in multiple reprocessing campaigns and data releases

Data is now flowing smoothly, and NSIDC has consistent data sets across all products, even if separate products have different releases

- How to communicate the information about current product status to users?
 - “Borg table” being constructed thru weekly meetings of science team. The table contains information about reprocessing, data quality, and it is to be posted on the NSIDC web site for general access.
- In order to publicize the ICESat data, suggested that NSIDC and the Science Team write an article for EOS about the ICESat data availability.
- NSIDC to identify what its data requirements will be for next year, to be able to respond to a DAAC Senior Review (Lucia T.)
- Clarify who users of NSIDC data are: # of distinct users? Types of users are they Science Team members?
- Calipso and NSIDC ICESat data
 - Calipso data is considered complementary to ICESat; a number of folks may want to compare GLAS data with Calipso NSIDC does not handle Calipso data

- NSIDC to investigate ways to bring Calipso data products and NSIDC ICESat data products together

Round Table discussion by team members:

Summary

- some of the workshop participants had not accessed GLAS products from NSIDC
- difficult to find data from the NSIDC web site; webpage needs to be maintained in a more responsive manner. (Borg table and ongoing updates need to be posted routinely)
- difficult to find data for the time periods you want
- graphs show interest in the data is growing thru 2005, therefore community is interested;
- expectation is that potential users have been waiting for problems to be fixed before accessing data
- there is a stronger interest in the altimetry data vs. the atmospheric data, by three to one; should the atmospheric data be archived at NSIDC?
- Ensure that the Atmospheres DAAC has the appropriate interlinks to the ICESAT atmospheric data so that users know of the atmosphere data collected by ICESat.

Passive Microwave

- Reduce the latency in the quality enhanced products produced (by GSFC).
- Possibly remove the NSIDC produced time series, if the Goddard data set can be timelier. The participants recommended that NASA should make an effort to reduce the latency on the delivery of the GSFC sea ice product.
- Concerning the Remote Sensing Systems (RSS, Frank Wentz) produced data; the participants suggested that RSS speed up their processing so that the 3 month production time lag could be reduced.
- Take steps to reduce confusion amongst users of passive microwave sea ice datasets distributed by NSIDC DAAC. Designations could be different for types of users. The participants asked that NSIDC provide a very detailed comparison of the algorithms used to create the sea ice datasets.

Pathfinder

- DEM data sets are unique and generally represent the state of understanding at time of release. The general consensus is that newer DEMs should replace existing versions, because they are of higher quality, accuracy etc.
- Look at which DEM data sets should be available on NSIDC website, and others which might be stored but not advertised. Keep complementary data sets, and remove from prominent access redundant versions. Document the changes to these datasets through time. These datasets may be good examples of those that can be processed with automated on-demand methodologies.
- W Abdalati will work with NSIDC to determine how to transfer the Altimetry DEMS held at GSFC (Zwally) to NSIDC.
- Explore ways to extend the polar AVHRR 5 km data set through 2005. It may be possible to acquire these data from Chuck Fowler/NOAA.
- Link to the J Key 25km data set (APP-x, AVHRR Polar Pathfinder extended). This would be an example of 'brokering' a dataset, which should be encouraged in the future.
- Suggest that NSIDC review access of the 1.25km product and see if the needs of the user community are being met.

Heritage

- IPAB (NSIDC-0084) should be removed from NSIDC and replaced with link to primary repository at the Cooperative Research Centre for Antarctica and the Southern Ocean. (Also look at the READER at NCDC data set distributed by SCAR to see if it has overlap with the Antarctic data sets developed by C. Shuman and J. Stroeve, see PoDAG 21 meeting minutes).
- PoDAG should review all datasets in this category.
- Use heritage data as a test case for moving data to lower levels of service, document the process, resources etc. and report back to PoDAG and HQ.

- Develop a plan to handle changes in disposition of datasets, especially the heritage and smaller or less active data sets. Bring this plan to PoDAG for input and review.
- Program for Arctic Regional Climate Assessment (PARCA): Take a look at what was available 10 years ago, what is still there now, and decide what has been lost, and what is important, and how much it would cost to bring in the important data sets.
- Follow up with J. Francis on the replacement Arctic radiosonde historic data set. NSIDC has been expecting this dataset to replace the existing HARA dataset

Part III: Management Overview and issues

Narrative description of DAAC management and key issues which inform the participants of the review about how the NSIDC and the NSIDC DAAC manage holdings and make decisions about data retention, access, and acquisition.

How does NSIDC function?

NSIDC University of Colorado Boulder Status and Charter

NSIDC is part of the Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado, Boulder, and is funded at the project level by national agencies. Primary among these agencies are the National Aeronautics and Space Administration (NASA), the National Science Foundation (NSF), and the National Oceanic and Atmospheric Administration (NOAA). NSIDC began as the World Data Center for Glaciology, Boulder, and continues in this capacity.

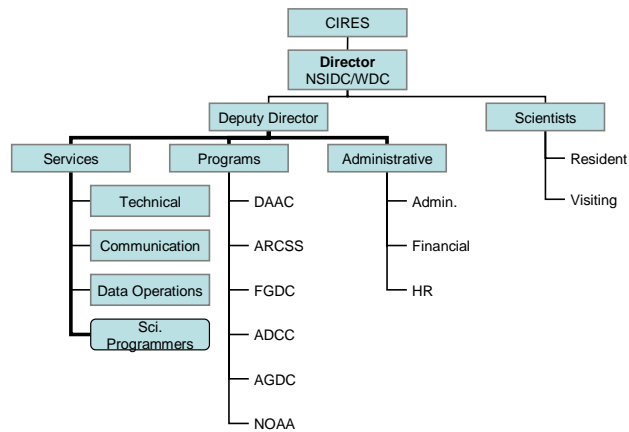
NOAA linkage and WDC heritage

NSIDC is chartered by NOAA NESDIS to operate as a snow and ice data center. The World Data Center for Glaciology is co-located with the NSIDC. The WDC preceded the formation of NSIDC. Both the WDC and NSIDC are recognized as official Centers of the University of Colorado, Boulder. The NOAA components of the NSIDC are funded and managed through a cooperative agreement between NOAA Environmental Observation Laboratories and NESDIS. The WDC was transferred from the USGS-DOI to NOAA-NESDIS and CU-Boulder in 1976. More information on the history of the NSIDC may be found at:

<http://www.nsidc.org/>

Organizational Tenets

NSIDC is a 'federation of centers' within a Center. Each component is funded by different agencies and programs of the U.S. Federal Government and operates semi-autonomously as dictated by agency, grant or contract requirements. Center-wide management coordinates activities and staff to optimally utilize staff and IT resources across all centers. Staff is organized in skill groups and is matrixed to the funded projects of the sub-centers. One of the most challenging management tasks is to forecast staff needs (skill type and FTE) across all projects.



Simplified Reporting Structure, NSIDC

Relationship between the DAAC and NSIDC

NASA’s Distributed Active Archive Center for Snow and Ice is a function of a contract between NASA to the University of Colorado to

- “support the development of algorithms and tools for the generation of new and improved snow and ice products
- acquire, produce, manage, archive and distribute snow and ice data products from ESE or other closely related instruments, as well as supporting/validation data from in-situ sources;
- facilitate the use of those products in modeling cryosphere-climate system processes; and
- Share DAAC expertise with the user community.”⁵

The DAAC contract represents about 60-65% of the available resources of the Center. The DAAC contains the most active IT infrastructure of any of the NSIDC projects. As such the DAAC drives priorities for computing systems, web

⁵ Statement of Work, NSIDC DAAC Contract, 2003.

environment, and so a lesser degree data management procedures, data and metadata formats, and style of user services interaction.

Practical or everyday attributes of the DAAC to NSIDC relationship

Coordination and leveraging of IT resources

The NASA investment in computing systems benefits other programs of NSIDC. In many cases the engineering development work of the DAAC project is leveraged by the other programs. For example the web technologies utilized for DAAC data sets is replicated across NOAA and NSF programs. (The 'branding' may indicate NSF or NOAA ownership, but the underlying technologies are similar.

Documentation and Metadata

Documentation and metadata standards required by NASA offers a different challenge. The metadata requirements for both NOAA and NSF projects are typically less extensive than DAAC EOSDIS requirements. The divergence of these externally mandated standards and practices has the potential to confuse users. For example the extensive technical documentation of EOS data sets is not available for most NSF or NOAA sponsored data sets. Our user services staff must resolve this confusion through careful explanation of data levels of service, and available documentation.

Staff Resources

NSIDC must actively manage day to day resource conflicts between its projects. The matrixed approach does create more management involvement than a more vertically organized data center. So far, we believe the approach is beneficial because it permits sharing of staff skills unique to an individual across several projects.

Data Policies

Because NSIDC is a matrixed organization of various programs and projects, the Center has developed data management policies that are stringent enough to guarantee adherence to standards, and consistent levels of service, yet are flexible enough to adapt to changing programmatic relationships and needs.

NSIDC follows a written data management policy. Since no one agency policy best fit NSIDC's unique activities and responsibilities, we have adopted our own policy. It is an ever-changing document that best reflects the current needs of the NSIDC programs, funding agencies, and scientific community. The NSIDC

DAAC participates in the processes outlined in the Data Policy. Excerpts from the Policy may be found in Appendix C⁶.

DAAC Data acquisition policy

Data become the responsibility of the NSIDC DAAC through a variety of methods.

- Designation by NASA HQ and or ESDIS as conveyed through the NASA Contract to the University of Colorado.
- Nomination by a member of the scientific community served by the DAAC. In this case the data set is vetted by NSIDC DAAC staff and management, and the DAAC User Working Group (PoDAG). Considerations such as appropriate scientific scope, needed resources etc. are considered.
- Nomination by another NSIDC project. Again, NSIDC DAAC staff and the User Working Group consider the nomination and make determination. (See also the role of the Program Coordination Board in appendix C)
- If a data set is accepted, then the NSIDC Data Policies are applied where appropriate and in agreement with stated ESDIS directives.

DAAC Brokered Data

Brokered data are also part of the DAAC data services. Brokered data reside at a non-NSIDC site, but are listed in the NSIDC DAAC data catalog. They are visible and searchable through DAAC web pages and search services. Brokered data are added to the NSIDC DAAC catalog through a process similar to acquired data. The data are nominated by the science community or internal NSIDC staff, evaluated by the NSIDC DAAC staff and the User Working Group. If demonstrated to be within scope they are added to the DAAC catalog.

Levels of Service

NSIDC supports a range of services broadly categorized as providing service to the user or for the data. Categories of services for the user include user services, data set software development, data set documentation, and data distribution. Categories of services for the data include data ingest, data processing, and data archiving. To aid in discussions with potential data providers, levels of services for each of these categories are described in Appendix B. In each category, the levels of service are described in order of increasing cost. In addition, depending on the needs of the data provider or user community, a wide range of value-added products or services may be developed as warranted.

⁶ The NSIDC Data Management Policy is published on the NSIDC internal website. Since it is intended for internal use only, it is not publicly available. The management of the Center approved the current version in July 2003.

The DAAC has not yet specifically labeled data sets with levels of service designations, (nor has any other NSIDC program), but it is our intention to pass every data set through a level of service review in collaboration with the User Working Group. Our first attempt at such a process was presented at the Data Priority Workshop in January.

Appendix A: Data set list from metrics presentation

Essential narrative from Science presentation

Brief descriptions of each product group or ensemble, as presented at the workshop are provided below. Where appropriate to the understanding of the data group, workshop discussion narrative is also included. Details of data sets can be found on the workshop support website⁷.

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Contains cryosphere standard products from the MODIS sensors on the Terra and Aqua satellites. Both L2 and L3 sea ice and snow cover products were presented.

Consult the presentation files on the website for more in-depth information. Selected slides are presented below.

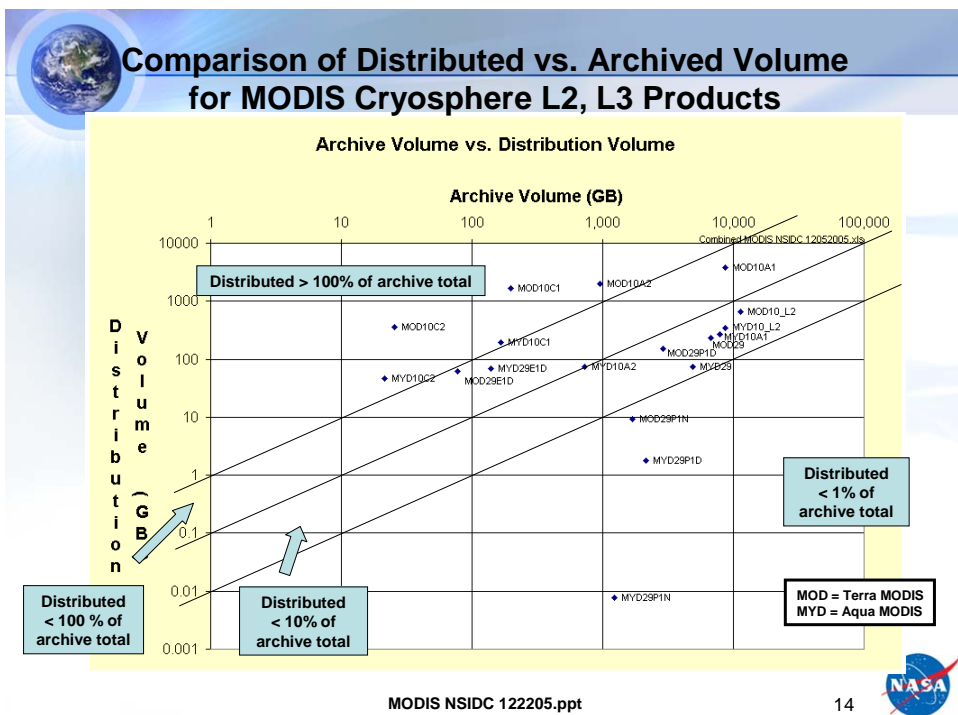
Why are Global Snow Cover and Sea Ice Important?

- *Snow cover with its large surface area, up to 46×10^6 km² in the Northern Hemisphere winter, and its high albedo, is a critical parameter in the Earth's global energy balance; springtime decreases in N.H. snow cover have been measured*
- *Snow cover supplies >75% of the water resources for the western United States, and is a key component of the water resources in many mountainous areas of the world*
- *The large surface area of sea ice and its high albedo are critical to the Earth's energy balance, and research shows that the N.H. sea ice extent has been decreasing*
- *Changes in the Earth's cryosphere must be measured by a variety of sensors and at a variety of different resolutions for observation and modeling studies*
- *It is also critical to develop products that are accurate and well characterized for creation of climate-data records (CDRs)*

⁷ Website may be found at: http://extranet.nsidc.org/nasa/daac/podag/prod_rev/

Conclusions

- Algorithm improvements developed for Collection 5 reduce the snow errors of commission which are generally quite low (<1% in Collection 4)
- Data dependencies and error propagation through sequence of products must be understood because the higher-level snow and sea ice products are built from the swath product
- MOD11 and MCD43 use MOD10 products as input
- MODIS daily snow-cover 500-m (MOD10A1 & MYD10A1) and CMG 0.05-deg (MOD10C1 and MYD10C1) products are well suited for development of CDRs
- MODIS daily sea ice IST 1-km (MOD29P1D & MYD29P1D) and daily global (MOD29E1D & MYD29E1D) products are well suited for development of CDRs (Scambos et al., submitted)
- Daily and composited products have proven useful for developing snow-cover depletion curves for modeling (Dery et al., 2005) and operational (M. Budde/USGS) uses
- USGS uses MODIS snow products in a model to map SWE in Afghanistan in a Famine Early Warning System (M. Budde/USGS)
- Streamflow forecasts with two-week lead-time using the VIC hydrologic model were improved through inclusion of MODIS snow maps to update model, in 71% of reported forecasts overall (McGuire et al., 2005)
- Note the increase in number of MODIS-snow publications in 2005!



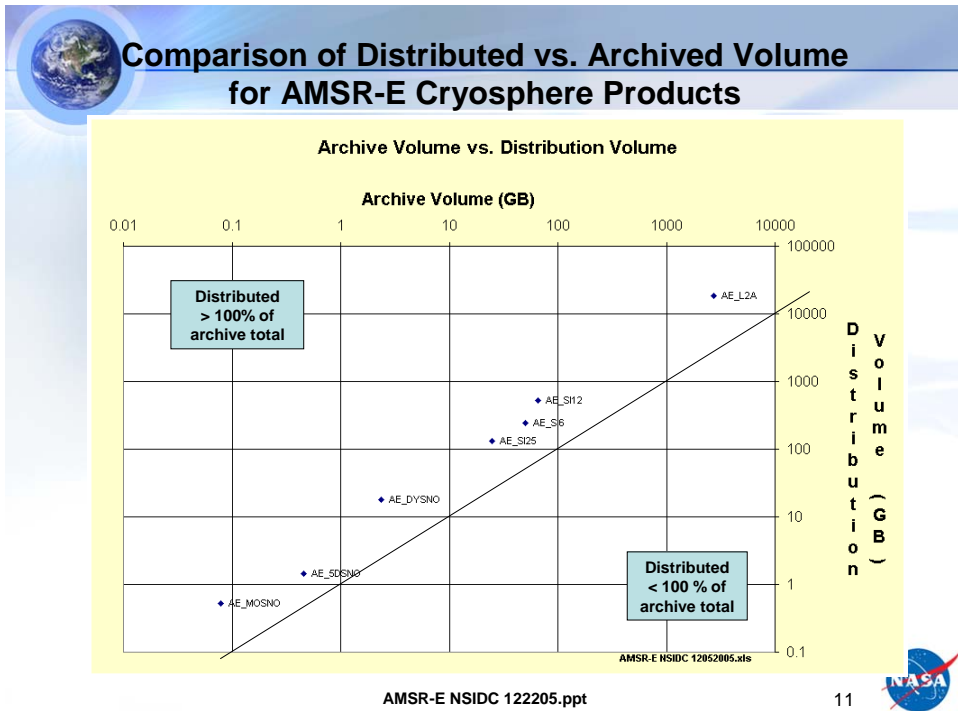
AMSRE

The AMSRE sea ice products only were presented. The sea ice products are level 2 and 3.

Consult the presentation files on the website for more in-depth information. Selected slides are presented below.

Comments from the community:

- HDF-files are large (about 50 MB @ 12.5 km) for each day.
- HDF is not easy to handle (suggestions for additional data formats included geoTIFF etc.).
- No separate sea ice concentration product.
- Requests for monthly ice concentration maps.
- Passive microwave ice drift/ice motion is widely used; should it become a standard product?



GLAS

GLAS data include 15 standard products delivered to NSIDC. Level 1A (4 products) and L1B (2 products) are precursors to the Level 2 products. Of the Level 2 products 5 are related to elevation and 4 are related to atmosphere measurements. GLA05, 06, 12, 13, and 14 provide information about the cryosphere.

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Science Results from ICESat

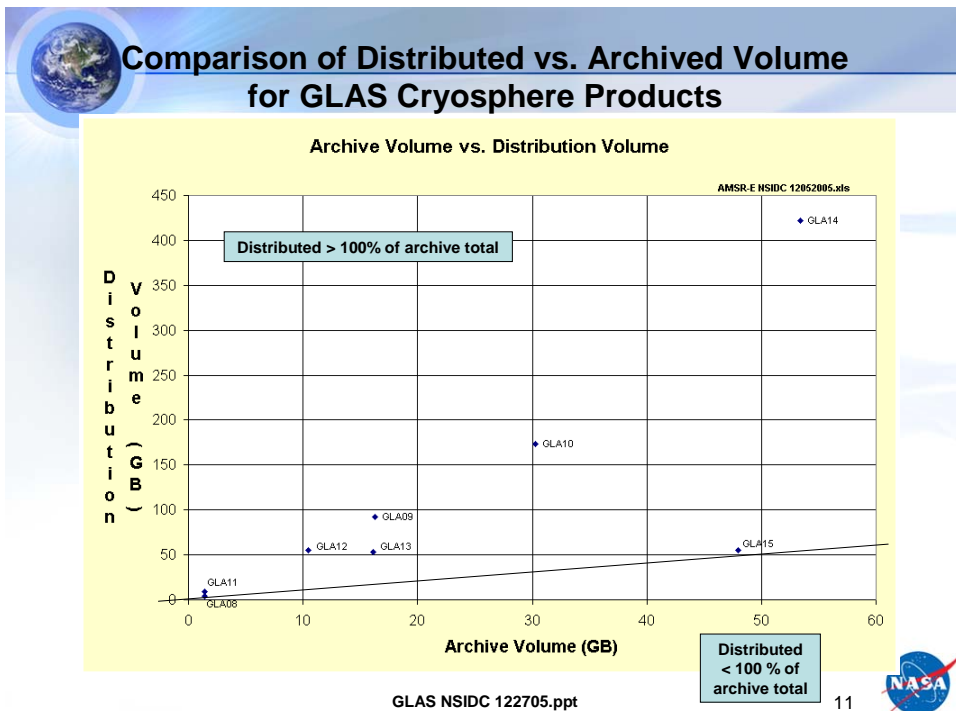
- ICESat sessions at 3 Fall AGU meetings.
 - 35 Papers published in Journals.
 - 26 papers in three ICESat special issues of *Geophysical Research Letters* plus 2 earlier on:
 - Overview
 - Calibration/validations and GLAS performance.
 - Ice sheet changes, ice shelves, icebergs, ice streams,..
 - Small glaciers.
 - Vegetation canopy height and biomass estimation.
 - Atmospheric science (clouds and aerosols).
 - Land topography.
 - Sea level comparisons, sea ice, and geoid.
- <http://www.agu.org/journals/ss/ICESAT1/>

Summary of Interdisciplinary Science Advances

- **Producing most accurate elevation maps of Greenland and Antarctic ice sheets.**
- **Initial ice sheet change-detection results from Greenland, Antarctica and Canadian ice caps**
- **Demonstrated ability to characterize detailed topographic features on ice sheet, ice shelves and ice streams**
- **Shown capability to detect ice sheet elevation changes of centimeters/year.**
- **Pioneering sea ice freeboard & thickness mapping (distributions and means).**

Summary of Interdisciplinary Science Advances

- Global mapping of heights of clouds and aerosols (unprecedented sensitivity and detail).
- Sensing of vegetation canopy heights and density and global biomass estimation.
- Precision mapping of land elevations
- Detection of river levels and slopes.
- Geoid mapping in high-latitude oceans.
- Developing ocean applications (e. g. near coastal areas, polar dynamic topography).
- Tide gage/altimetry sea-level rise calibration.



Passive Microwave

Twenty-one products either containing or derived from passive microwave data from SMMR, ESMR, and SSMI were reviewed. These consist of

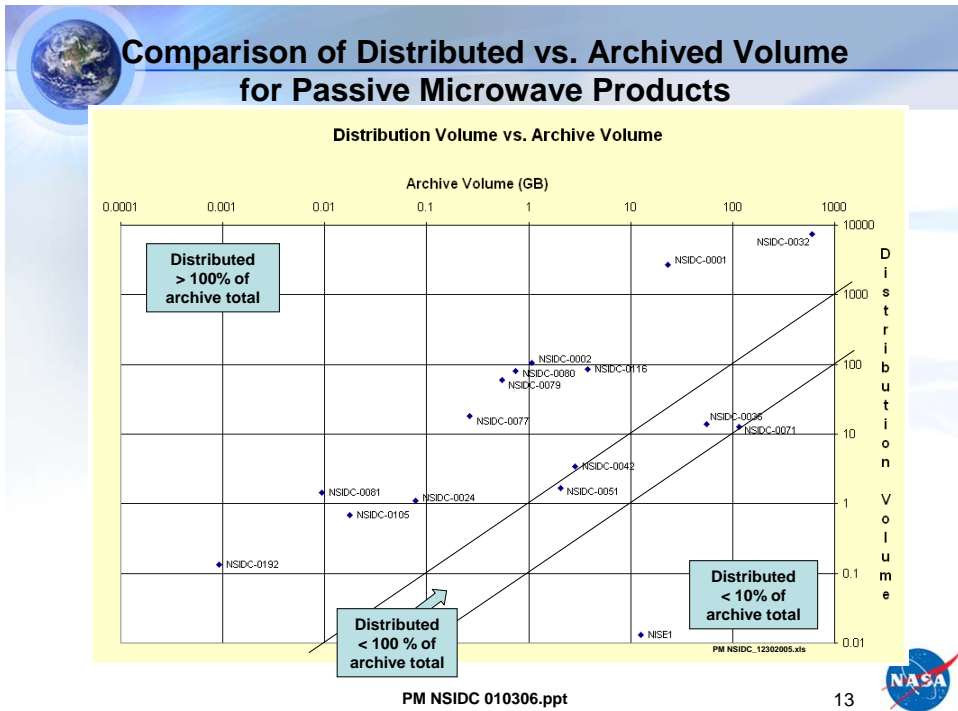
seven Brightness Temperature products, three combined sea ice/snow cover products, ten sea ice products, and one land data set.

Consult the presentation files on the website for more in-depth information. Selected slides are presented below.

The Passive Microwave Data Sets - Summary

- Brightness Temperatures
 - Nimbus-5 ESMR, Nimbus-7 SMMR, DMSP SSM/I, NRT SSM/I
- Combined Products
 - NRT SSM/I EASE Snow Extent and Ice Concentration (NISE)
 - Nimbus-7 SMMR Snow Cover and Depth
 - No. Hem. EASE Weekly Snow Cover and Sea Ice Extent, Ver. 2
- Land
 - DMSP F8 SSM/I Pathfinder Land Surface Products
- Sea Ice
 - Concentration:
 - DMSP SSM/I Polar Gridded, SMMR-SSM/I Polar Gridded, ESMR Polar Gridded, DMSP F8 Global, NRT SSM/I
 - Trends and Climatologies from SMMR and SSM/I
 - Other:
 - Snow Melt over Sea Ice from SMMR and SSM/I T_b s
 - Polar Pathfinder EASE Motion (from SMMR, SSM/I, AVHRR, and buoys)

[workbook](#)



Pathfinder

Pathfinder program data held by NSIDC include polar subsets of AVHRR orbital data and associated albedo and surface temperature products, radar altimetry data, and Radarsat SAR mosaic products of Greenland and Antarctica.

Consult the presentation files on the website for more in-depth information. Selected slides are presented below.

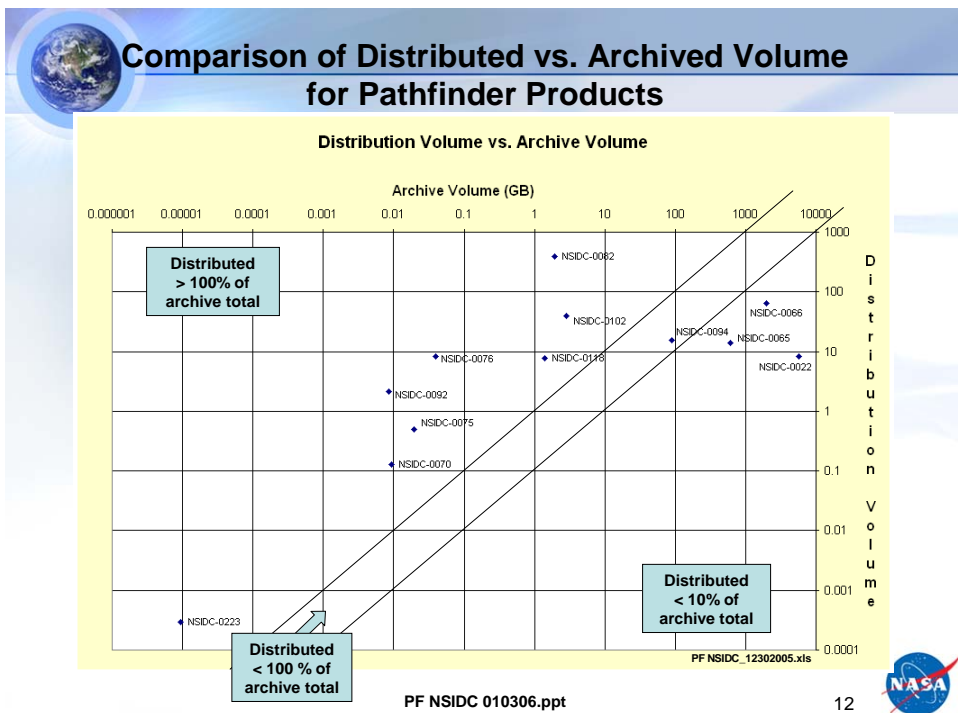
Data Sets discussed here:

- **AVHRR - visible, near-infrared, and thermal radiometer**
 - AVHRR 5km,25km Polar Pathfinder 1983 - 2002*
 - AVHRR 1.25km Polar Pathfinder 1996 - 2000*
 - AVHRR Polar 1-km Data Set 1993 - 2003

- **Radar Altimetry DEMs - Greenland and Antarctica**
 - Ekholm ~2km Greenland 1997
 - Bamber ~2km Greenland 1999
 - Bamber ~5km Antarctica 1995
 - RAMP DEM (Zwally ~5km Antarctica 1999)

- **SAR Mosaic products of the large ice sheets;**
 - Kwok/Fahnestock ERS-1 Greenland 1993
 - Jezek et al. Radarsat RAMP Antarctica 1997

NASA Snow and Ice DAAC Product Review NASA/GSFC, Greenbelt, MD January 11-12, 2006



Heritage

Heritage data consists of in-situ, field campaign, or other ancillary data which meet the NSIDC DAAC assigned responsibilities. They are further subdivided into those data from AMSRE validation experiments, the Cold Lands Field Experiments, and other various atmospheric, land, and ocean in-situ and field campaign data.


Consult the presentation files on the website for more in-depth information. Selected slides are presented below.

The Heritage Data Sets

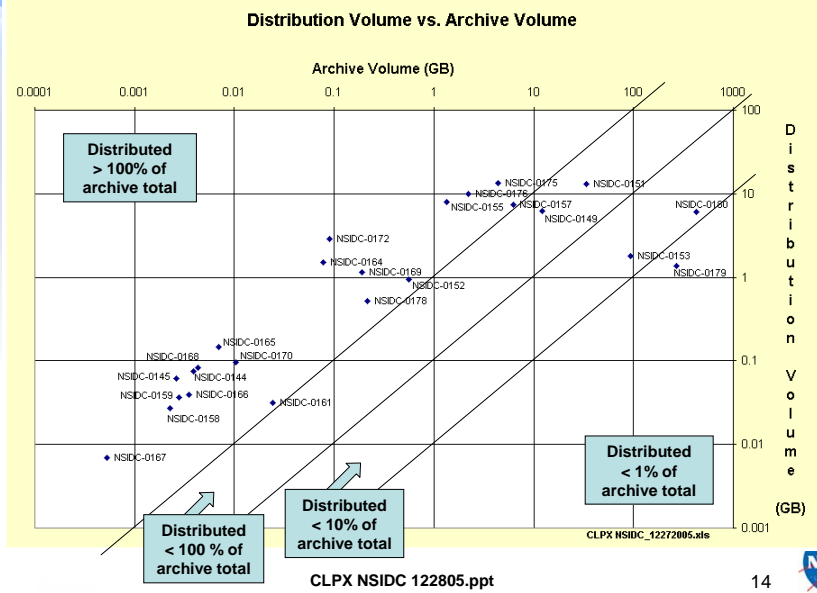
- AMSR Validation Data
 - SMEX, SMEX02, WAKASA BAY, BALTEX
- Cold Lands Processes Experiment
 - Airborne, Satellite, In Situ, Model Output
- Other Data
 - Atmospheric – HARA
 - Land –
 - Ocean
 - Miscellaneous

[Non-eos workbook](#)

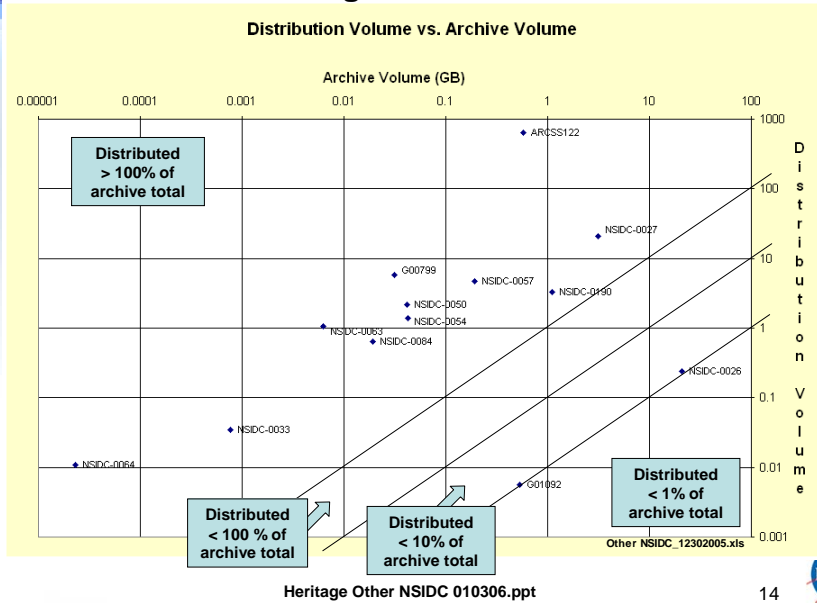
workbook

2 DAAC Product Review 

Comparison of Distributed vs. Archived Volume for CLPX Products



Comparison of Distributed vs. Archived Volume for Heritage Other Products



Appendix B: Levels of Service Descriptions

Levels of Service Detailed Definitions

- Details extracted from the NSIDC Data Management Plan 7/15/2003 revision
- Also consulted the SEEDS Draft Recommendations, V1.31

Provide User Services

<i>None</i>	User Services provides no support for the data set - typically used for disclaimed data that is not yet supported by NSIDC, or for brokered data sets.
<i>Referrals</i>	User Services points customers to another source (e.g., data center or PI) for the data
<i>General Support</i>	User Services provides normal baseline support including responding to user inquiries, tracking requests, and access to broader data center resources (programmers, OPS, etc.).
<i>Custom Services</i>	This may include things like reformatting or subsetting data, or creating non-standard or custom products. Examples of this include creating images for textbooks and creating a value-added product in direct response to a user request.

Ingest Data

<i>None</i>	The data is not held at NSIDC (e.g., brokered products).
<i>Ingest to Archive</i>	The data is ingested and archived as is - It may take some setup to prepare the way for data archival (e.g., directory structures may need to be set up); but otherwise NSIDC's responsibility is to verify that the data is successfully archived.
<i>Ingest with Quality Control (QC) to Archive</i>	Data goes through a QC process on its way to the archive. The QC may include such things as verifying that the data matches its descriptions, is named correctly, looks ok, is accompanied by complete metadata, etc.
<i>Custom Ingest</i>	Indicates that due to high data volume, time criticality or other complexities, the ingest process is actively monitored and controlled (e.g., MODIS ingest into the ECS system).

Data Processing

None	No processing is done at NSIDC.
Simple monitoring	Processing is automated; NSIDC's responsibility is to verify that the processing occurred successfully.
Custom processing	Significant manual intervention is required during the production process (e.g., to QC the results).

Data Distribution

None	NSIDC does not distribute the data (e.g., brokered products).
Monitored	Distribution is automated; NSIDC's role is to verify successful distribution and to ensure that data access restrictions are followed (if any).
Manual	Manual intervention is required to distribute the data (e.g., media distribution or the data needs to be staged).
Custom Distribution	Indicates that due to high volume, time criticality, data restrictions or other complexities, the distribution process is manually intensive (e.g., media distribution from the ECS system, EASE-Grid CD production).

Data Archiving

None	NSIDC does not archive the data.
Unsupported	NSIDC has the data, but it is not officially archived (i.e., the shoebox archive in somebody's office). This status should be avoided if at all possible, as there is absolutely no guarantee that the data will survive or even be known about in the future (i.e., if you would feel bad if the data were irretrievably lost, try to make sure the data does not stay in this state).
Minimal	(Partial step up from unsupported) Minimal preservation metadata is maintained; whatever media, documentation, etc. exists is managed by the archive management group. Media refresh, offsite-backups, etc. occur only as time and resources permit.
Standard support	A full set of preservation metadata is maintained, but NSIDC is not the primary archive for the data. Data recovery plans/agreements may exist, usually to recover data from the primary archive if the local copy is lost and/or destroyed. Media refresh and testing plans exist as appropriate. Provisions are made for data security.
Primary archive	A full set of preservation metadata is maintained, as are off-site copies of the data (or other recovery processes). Media refresh and testing plans exist as appropriate. Provisions are made for data security.

Data Set Production Software Development

None	Production software was not required for the data set.
Standard support	NSIDC follows its own internally established standards for software development. These standards include improvements or modifications to processing code or increased explanatory documentation when necessary. For in-house developed software, programmers review each other's code, and extensive testing is done to ensure the quality of the data set.
Custom support	For data sets developed outside of NSIDC, a product team determines the appropriate level of development based on the available resources and the needs of the user community.

Data Set Documentation

None	No documentation support is provided. This status should be avoided since it does not guarantee enough information to ensure that the data can be usefully preserved into the long term.
Metadata only	A standard form of metadata is created and/or captured for cataloging, tracking, or accessing. See the Catalog Team's levels of catalog metadata .
Metadata plus provider documentation	A standard form of metadata is created and/or captured for cataloging, tracking, or accessing. Additionally access is provided to original documentation.
Comprehensive documentation	The preferred level of service for data to be maintained and/or presented to the public for the long term. Metadata is created or captured. Documentation is written or provider documentation has been reviewed and edited. Additional documentation services are provided by creating special web sites, expanded sets of user documentation or other value-added products as needed.

Appendix C: Excerpts from NSIDC Data Management Policies

Overview

“The National Snow and Ice Data Center (NSIDC) Data Management Policies document outlines the Center's policies for acquiring, accessing, managing, distributing, and archiving data and metadata. These policies follow traditional archival standards, and reflect NSIDC's mission statement:

"NSIDC/WDC will make fundamental contributions to cryospheric science and will excel in managing data and disseminating information in order to advance understanding of the Earth system."

NSIDC programs adhere to the collection scope in the data they accept, disseminate and archive. By focusing the subject matter covered, NSIDC better serves current and future data users by providing quality levels of service, including knowledgeable support and creation of applicable tools and guidance documents.

Typically, archives are defined as the non-current but still useful records preserved by an organization or institution, or the repository itself. The term archives can also refer to organizations or institutions that collect and acquire records or data from outside sources, usually to serve researchers outside that organization. Because NSIDC functions as both a long-term archive and a short-term or "active archive," its data management roles and responsibilities are larger than a typical archive. NSIDC bases its data management policies for all data on proven archival principles and best practices. These principles are:

- **Archival records exist to be used, not merely saved for their own sake.**
- **Some records ought to be preserved long-term, even after their immediate usefulness has passed.**
- **Archival records ought to be preserved as completely and coherently as possible, including critical information about context and connections.**
- **Archival records ought to be organized properly and in a timely way so they can be used.**
- **Sensitive information and information given in situations presumed to be private should be protected from use as long as that sensitivity remains.**
- **Archivists should administer their collections equitably and impartially.**

- Archival repositories ought to cooperate in preserving historical records.

NSIDC incorporates these archival principles into its data management processes and they, along with NSIDC's mission statement and collection scope, serves as the core to NSIDC's Data Management Policies. Specifics of these policies will be elaborated in the remainder of this document.”

Data acquisition policy

“Data become the responsibility of NSIDC through a variety of official program agreements, formal and informal PI relationships, data rescue projects, and data exchanges. Thus, data can be both solicited and tendered, can arrive with or without funding for publication and archival, and can have various degrees of value to current and future user communities. New additions to the NSIDC catalog/collection begin with identifying the data to be added, followed by appraisal and acquisition phases. *All NSIDC programs recognize the collection scope of the Center and acquire data within that scope. At the same time, NSIDC acknowledges the individual data management requirements of the programs/projects it supports, and works to meet these needs”.*

”NSIDC and the programs that make up NSIDC actively solicit new data sets for archival and distribution. NSIDC's collection scope to "archive both cryospheric data and data from programs or instruments deemed of importance to the cryospheric community," requires NSIDC to be an active collector of new data and data sets that are gathered or discovered. Submission forms for PIs and other repositories of data are available online on the NSIDC web page, as well as on individual program pages. Many programs for which NSIDC is the official data archive are required to solicit data from data providers as part of their grant funding directives. NSIDC Programs with active solicitation policies include the International Arctic Research Center (IARC) Frozen Ground Data Center (FGDC) and Global Geocryological Data (GGD) System, the NSF Antarctic Glaciological Data Center (AGDC), and the NSF Arctic Systems Science (ARCSS) Data Coordination Center. For some programs, NSIDC will not archive all of the data, but will archive only the metadata that describes the data and gives the data location.

Data submission forms encourage the submission of data to NSIDC, while informing data providers and repositories that the submission serves only to begin a discussion of the appropriateness of the material for NSIDC, timeline for publication and archival, and the costs involved. When a data submission form has been received by NSIDC for a data set not covered by

any specific Program, *the Program Coordination Board⁸ (PCB) with relevant User Services and scientific input decides whether to accept the data and assigns a point of contact for the data.* Acceptance policies are outlined below.

All accepted data include a Deed of Gift or other documentation that spells out the rights and responsibilities of NSIDC, the funding program, and the data provider. Information that must be provided includes: Name and contact information of data provider, restrictions on the use of data, such as copyright restrictions/hold until published/restrictions on use outside of the United States, etc., funding provided for the archiving of the data (if any), terms of dispersal should the data be retired, deleted from the archive or updated. Whenever possible, data are accepted only in specific acceptable formats. If it is not possible to receive the data in one of these formats, the designated point of contact will seek funding to migrate the data to an acceptable format.”

Program Data and Agency Requests

Each program at NSIDC has an individual whose responsibilities include the collection, verification, archival and publication of new data. *Program Managers or their representatives follow both NSIDC policies and their program's policies for data management (see appendices for more information.)*

NSIDC serves as the sole archive of cryospheric data, and of data of importance to the cryospheric community, for many agencies. Data are occasionally submitted from, or at the request of, one of these agencies. *In many cases, the rights and responsibilities of NSIDC and the funding program are spelled out in the contract or grant. In other cases it will be necessary to pursue a separate agreement with the funding program to provide a blanket "Deed of Gift" or equivalent document covering all relevant data sets. In these cases, the Program solicits name and contact information as well as data set context and provenance information from the data provider, provides information about NSIDC's implied rights and responsibilities to the data provider, and solicits agreement or disapproval of these rights and responsibilities from the data provider. If the data provider does not agree to the implied rights and responsibilities, the program must pursue an individual data set Deed of Gift in order to accept the data.*

PI-Tendered Data Management Requests

⁸ The Program Coordination Board membership includes representatives from each major component of the NSIDC. They act as a governing board for data matters.

Many data sets come to NSIDC as a result of PI offerings that are unrelated to any program. *The Program Coordination Board's informed (USO, Science) appraisal of these data determines their appropriateness within NSIDC and the appropriate program to which they should be affiliated. NSIDC prefers that all data sets come to NSIDC with identified funding for their continuation and management.*

NSIDC recognizes that occasionally data of value to the cryospheric community become available for archiving, though without needed funding or support. When possible, the PCB or designated lead Program works with the data provider to identify possible future funding opportunities, such as data rescue or exchange. If the PCB or designated lead Program feels that the value of the data is great enough, the data are accepted as "orphan" and given a lower level of service to support it. (Please see Levels of Service, Appendix B.) The PCB or designated lead Program will continue to examine future funding opportunities to ensure the proper long-term management of the data at a full level of service.

In the appraisal of new, PI-tendered data, the PCB considers the following:

- *appropriateness to NSIDC's mission statement and collection scope;*
- *its relationship to other data archived at NSIDC and thus its ability to illuminate or increase the value of existing data;*
- *the cost of archiving the data (including space and resource needs);*
- *the value in strengthening bonds with funding agents and other agencies;*
- *outreach opportunities that fit within the NSIDC Outreach goals and objectives.*

Targets of Opportunity

Individuals associated with NSIDC, in the course of their research, data management, and data dissemination work, become aware of data deemed of value to NSIDC. Frequently these data are the results of current or planned research projects or fieldwork. *NSIDC works with the individuals involved to determine the appropriateness of the forthcoming data, and the DD makes sure that proper data management policies are involved in the transfer of these data to NSIDC.*

Data Exchanges

On occasion, NSIDC receives data from a data provider in exchange for NSIDC data products, to encourage international cooperation and dissemination of NSIDC data. *The PCB's appraisal of these data determines*

their appropriateness within NSIDC and the appropriate program to which they should be affiliated. It is recognized that these data seldom have available funding for archival processes.

Other

Some data sets and data products within the collection scope of the Center are created in-house by NSIDC personnel. *The acceptance of these data sets requires the same process as does the acceptance of new data, and steps are taken to ensure a high quality product that maintains its ties, through metadata and documentation, to the original or raw data product.*

Levels of Service

NSIDC supports a range of services broadly categorized as providing service to the user or for the data. Categories of services for the user include user services, data set software development, data set documentation, and data distribution. Categories of services for the data include data ingest, data processing, and data archiving. To aid in discussions with potential data providers, levels of services for each of these categories are described in Appendix B. In each category, the levels of service are described in order of increasing cost. In addition, depending on the needs of the data provider or user community, a wide range of value-added products or services may be developed as warranted.