Passive Microwave sea ice data and complications in the development of a sea ice climate data record

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http://nsidc.org

What passive microwave tells us

At the National Snow and Ice Data Center (NSIDC), passive microwave sea ice data sets have provided timely assessments of seasonal-scale variability as well as consistent long-term climate trends. Over the past 30 years, passive microwave data has assisted us in monitoring the declining Arctic sea ice. Today it is recognized as one of the most dramatic indicators of climate change.

Contacts & Information

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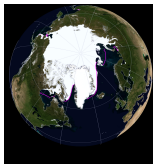
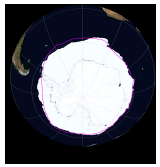
NSIDC Sea Ice Products: http://nsidc.org/data/seaice

NSIDC at a glance

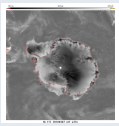
NSIDC has a cryospheric focus in both research and data management. Our research focus includes, changes in the cryosphere – Arctic sea ice, mountain glaciers, Antarctic ice shelves, permafrost, heat and water balances of the Arctic, and impacts on and responses of indigenous peoples. Our data management principles include, preservation with adequate access; access without preservation is impossible. Keep it simple and flexible: it's about data, not systems! We think about long-term archiving when planning for data collections. We involve scientists and users in data management, and data managers in science.



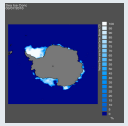


Production: From satellite to gridded products

NSIDC acquires SSM/I-SSMIS data from a series of Defense Meteorological Satellite Program (DMSP) satellites.



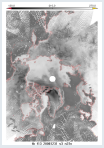
Near-real-time TBs



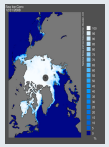
Near-real-time sea ice using NASA Team

NSIDC acquires near-real-time brightness temperatures from CLASS, producing polar stereographic TBs and sea ice products (above).

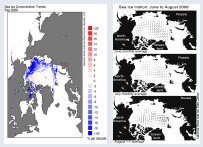
NSIDC acquires antenna temperatures from RSS producing quality controlled TBs, then used in sea ice products (below).

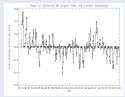


Processed brightness temperatures



Bootstrap and NASA Team sea ice products





Value-added products such as regional trends, and ice motion

Challenges: When satellites reach end of life

In March 2008, the F-13 platform began experiencing data gaps. This was expected as the satellite approached end of life. As data dropouts became more prevalent in 2009, NSIDC began the process of switching from the F-13 to F-17 satellite platform. A one-year overlap of data between the platforms allowed NSIDC to conduct inter-calibration tests to produce a consistent near-real-time sea ice product. NSIDC is now working to update all of our SSMI/SSMIS TB and sea ice data streams.

Arctic

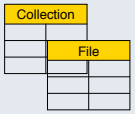
Antarctic

Development: What will it take to create a climate data record?

Consistent long-term data

NSIDC archives and distributes 30 years of SMMR/SSMI/SSMIS data.

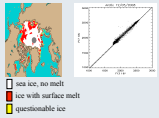
Comprehensive metadata & provenance information



NSIDC is working to create ISO-19115 standard metadata for all PM data. It is necessary to have processing history and software available for ease of reproducibility.

Data Quality Information

- Adopt better inter-sensor calibration
- Derive grid-cell quality



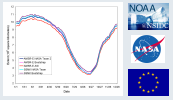
Use most recent sensor (i.e. AMSR-E) as calibration foundation rather than current method of original sensor (i.e. SMMR), Melt indicates underestimation of concentration by algorithms.

Multiple Formats

NSIDC is developing technology to allow the cryospheric community to choose their data format of choice.

Authoritative Climate Record

- Investigate combined algorithm
- Integrate with other CDR efforts



A combined algorithm is optimal as no single algorithm is best for all conditions. NSIDC distributes multiple sea ice products using different algorithms.

Moving Forward: What NSIDC is doing

Updating passive microwave data

With F-17 data now being the main data source for our gridded TBs and sea ice, NSIDC is working on adjusting all of our processing codes to bring these data sets up-to-date. In addition, we are working on streamlining the processes to make future reprocessing more timely.

Improving metadata schemas

NSIDC has embarked on a metadata workflow project to streamline internal processes to efficiently and thoroughly capture all levels of metadata, from collection to file level.

Collaborations

NSIDC works closely with NASA Goddard in the production of current sea ice records. W. Meier and others at NSIDC are also participating in two climate data record projects funded through the NOAA Scientific Data Stewardship program. Finally, NSIDC has collaborated with ESA on reprocessing efforts for a European sea ice climate data record.