Greenland Melt Analysis Spreadsheet

Supplementary Documentation for Greenland Today

1.1 Introduction

The Greenland Ice Sheet Today data collection contains daily, monthly, and annual melt areas for the Greenland Ice Sheet. The data are derived from the following passive microwave sensors: the Special Sensor Microwave Imager/Sounder (SSMIS), the Special Sensor Microwave/Imager (SSM/I), and the Scanning Multichannel Microwave Radiometer (SMMR). Together, these passive microwave sensors offer an extensive daily Greenland ice-melt record which spans from 1 April 1979 to the present. Note that from April 1979 to July 1986, data was derived from the SMMR sensor. These data are available only every other day, due to the satellite's narrow swath and less frequent coverage (SMMR passes only cover the island every other day). From July 1986 to the present, Greenland melt area is reported daily from both the SSM/I and SSMIS sensors. These satellites provide greater per-day coverage of the ice sheet. Data from all satellites are projected onto an approximately 25 km equal-area grid.

Note that the surface melting algorithm (i.e. the physics of measuring melt using passive microwaves) used to derive these data is very sensitive to the top few millimeters of the snow surface. Hence, in the beginning and end of the season of melting, the signal can change abruptly. This is also associated with the extended dark/cold evenings in the early and late seasons. When the sun sets, the warmth of the day leaves the surface, the snow re-freezes, and if the next day is cloudy and cold, one might see zero area melted. Note also that the grid cell size is 25 km; so for each cell, a substantial area within the cell must be melted for it to trigger the algorithm to say that melt has occurred.

1.2 Data Access

The file described in this document can be found here:

ftp://ftp.nsidc.org/pub/DATASETS/nsidc0755_nrt_greenland_melt_v1/greenland-daily-melt.xlsx

1.3 Spreadsheet Descriptions

This data set provides daily, monthly (for the months of April through October), and annual melt areas for the Greenland Ice Sheet in one convenient file (Greenland-daily-melt.xlsx). The spreadsheet contains nine data sheets, which are described in Table 1; the columns in each sheet are described in Tables 2-10. The spreadsheet also contains a tenth sheet called Attribution, for acknowledgements and references. For all sheets, a zero indicates that no melt occurred on that day or month and a blank cell indicates no data were acquired. For example, during the SMMR era (April 1979 through July 1986) there are data only every other day, so every other cell is blank.

Table 1. Description of Greenland-daily-melt.xlsx Data Sheets

Sheet Name	Description	Notes
melting_area_daily_km2	Contains the per-day melt area of the Greenland Ice Sheet, or the area that experienced some period of melting over a 24-hour interval.	For more information, see Table 2.
melting_area_monthly_mean_km2	Contains the average daily melt area (sum of daily melt area divided by number of days in the month) for each month in a given year.	For more information, see Table 3.
melting_area_monthy_max_km2	Contains the maximum daily melt area that occurred during each month.	For more information, see Table 4.
melting_area_annual_max_km2	Contains the single greatest day of melting for each year, including the date and the extent of melt area.	For more information, see Table 5.
melting_area_monthly_days_km2	Contains the cumulative melt area for each month and the number of days when melt was observed. NOTE: During the SMMR period, because the satellite only surveyed every other day, there are only 15 to 16 possible observation days each month.	For more information, see Table 6.
melting_area_annual_sum_km2	Contains the annual cumulative melt.	For more information, see Table 7.
melt_area_monthly_tot_km2_days	Contains the cumulative monthly melt.	For more information, see Table 8.
melt_area_month_cumul_area_km2	For each day of the year, contains the cumulative monthly melt area for a specific month and year.	For more information, see Table 9.
melt_area_annual_cumul_area_km2	For each day of the year, contains the cumulative annual melt area for the year specified in the column name.	For more information, see Table 10.
Attribution	Credits all institutions, organizations, and individuals who worked together to retrieve the data about the Greenland Ice Sheets.	N/A

Table 2. Description of melting_area_daily_km2

Column	Description	Units
A	Month of observation	Month (April to October)
B	Day of observation	Day of the month
C and on	Per-day melt area of the Greenland Ice Sheet. Each column contains data from a single year, proceeding from 1979 (Column C) through the current year.	km^2

Table 3. Description of melting_area_monthly_mean_km2

Column	Description	Units
A	Month of observation	Month (April to October)
B and on	Monthly mean melt area. Each column contains data from a single year, proceeding from 1979 (Column B) through the current year.	km^2

Table 4. Description of melting_area_monthy_max_km2

Column	Description	Units
A	Month of observation	Month (April to October)
B and on	Maximum daily melt area observed each month. Each column contains data from a single year, proceeding from 1979 (Column B) through the current year.	km^2

Table 5. Description of melting_area_annual_max_km2

Column	Description	Units
A	Year of observation	4-digit year
B	Date of observation	yyyy-mm-dd 00:00:00
C	Area of the single maximum day of melting	km^2

Table 6. Description of melting_area_monthly_days_km2

Column	Description	Units
A	Date of observation	yyyy-mm-dd 00:00:00
B	Cumulative melt area for each month	km^2
C	The number of observation days within each month. NOTE: During the SMMR period, because the satellite only surveyed every other day, there are only 15 to 16 observation days each month.	Days

Table 7. Description of melting_area_annual_sum_km2

Column	Description	Units
A	Month of final observation	Month (December)
B and on	Cumulative annual melt area. Each column contains data from a single year, proceeding from 1979 (Column B) through the current year.	km^2

Table 8. Description of melt_area_monthly_tot_km2_days

Column	Description	Units
A	Month of observation	Month (April to October)
B and on	Cumulative monthly melt area. Each column contains data from a single year, proceeding from 1979 (Column B) through the current year.	km^2

Table 9. Description of melt_area_month_cumul_area_km2

Column	Description	Units
A	Month of observation	Month (April to October)
B	Day of observation	Day of the month
C and on	Cumulative monthly melt area for each day of a month and year. Each column contains data from a single year, proceeding from 1979 (Column C) through current year.	km^2

Table 10. Description of melt_area_annual_cumul_area_km2

Column	Description	Units
A	Month of observation	Month (April to October)
B	Day of observation	Day of the month
C and on	Cumulative annual melt area for each day of a month and year. Note that the last row in the spreadsheet (October 31) is the cumulative melt over the entire year specified in the column name. Each column contains data from a single year, proceeding from 1979 (Column C) through the current year.	km^2