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## Co-Registered AMSR-E, QuikSCAT, and WMO Data

### Summary

This data set contains the following spatially and temporally co-registered data: Advanced Microwave Scanning Radiometer - Earth Observing System (AMSR-E) brightness temperatures for all channels; Quick Scatterometer (QuikSCAT) backscattering coefficients; and World Meteorological Organization (WMO) ground observations acquired from more than two thousand stations. There is a large, increasing interest in the potential arising from the combination of active and passive microwave data for the extraction of geophysical parameters from spaceborne platforms. Often, one of the major obstacles is the generation of spatially and temporally co-registered data sets for testing hypotheses, validating models, and developing retrieval approaches. The temporal coverage of this data set spans from 01 January 2002 through 19 March 2009 with AMSR-E data included for the 19 June 2002 through 19 March 2009 time period. The volume of the data set is approximately two gigabytes. Data are provided in tab-delimited ASCII text files and are available via FTP.

### Citation

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The following example shows how to cite the use of this data set in a publication. List the principal investigators, year of data set release, data set title and version number, dates of the data you used (for example, September to October 2003), publisher: NSIDC, and digital media.

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## Data Acquisition Methods

- The AMSR-E brightness temperatures (TBs) were obtained from the EASE-Grid re-projected TBs (<http://nsidc.org/data/nsidc-0301.html>; Knowles, K. W., M. H. Savoie, R. L. Armstrong, and M. J. Brodzik. 2006, updated current year. *AMSR-E/Aqua daily EASE-Grid Brightness Temperatures, 2002-2009*. Boulder, Colorado USA: National Snow and Ice Data Center. Digital media.)
- QuikSCAT data were obtained from the NASA Scatterometer Climate Record Pathfinder (SCP) project (<http://www.scp.byu.edu/>).
- WMO data were obtained from the National Climate Data Center (NCDC) (<http://www.ncdc.noaa.gov/oa/ncdc.html>). Stations were selected according to the criterion that snow is present for at least two weeks over the total data set (seven years).

## Spatial Coverage

Southernmost Latitude: 30.667000° N  
Northernmost Latitude: 79.550003° N  
Westernmost Longitude: 179.83301° W  
Easternmost Longitude: 180.00000° E

Geocoordinates for WMO stations are provided in the file called `stations_metadata.txt`. Within the `stations_metadata.txt` file, the first seven columns listed from left to right contain the regular format for WMO stations, such as station number, name, and location. The next three columns (columns 8, 9 and 10) contain latitude, longitude, and elevation (m), and the final two columns (11 and 12) contain EASE-grid coordinates.

Note: The latitude and longitude values provided in the `stations_metadata.txt` file should be divided by 1000.

### **Quality and Accuracy Information**

These data should be used for research purposes only; the investigators make no guarantees as to the quality of the processing. Data were used as is from the original source.

### **Data Volume**

The total volume of this data set is approximately two gigabytes.

### **Data Format**

Data are provided in ASCII text files, separated for each station.

The '\*\*\*\*\*' characters in certain fields indicate that no data were retrieved. Specifically, lines of brightness temperature data with many instances of '\*\*\*\*\*' should be used with caution, as conditions that caused invalid brightness temperatures in some fields may have affected other brightness temperatures.

Information on the WMO format is provided below this initial format section.

For each row (corresponding to a different date), the following data are reported in the following order (by column):

- 1) Int. Station number (WMO/DATSAV3 number) for the location.
- 2) Int. WBAN number where applicable- YEAR 15-18 Int. The year.
- 3) YEAR-MONTH-DAY
- 4) Mean temperature (.1 Fahrenheit)
- 5) # of observations used in calculating the previous field (mean temperature)
- 6) Mean dew point (.1 Fahrenheit)
- 7) # of observations used in calculating the previous field
- 8) Mean sea level pressure (.1 mb)
- 9) # of observations used in calculating the previous field
- 10) Mean station pressure (.1 mb)
- 11) # of observations used in calculating the previous field
- 12) Mean visibility (.1 miles)
- 13) # of observations used in calculating the previous field
- 14) Mean wind speed (.1 knots)
- 15) # of observations used in calculating the previous field
- 16) Maximum sustained wind speed (.1 knots)
- 17) Maximum wind gust (.1 knots)
- 18) Maximum temperature (.1 Fahrenheit)
- 19) Minimum temperature (.1 Fahrenheit)
- 20) Precipitation amount (.01 inches)
- 21) Snow depth (.1 inches)

22) Indicator for occurrence of:

Fog

Rain or Drizzle

Snow or Ice Pellets

Hail

Thunder

Tornado/Funnel Cloud (see WMO section below)

23) AMSR-e Tb asc v6

24) AMSR-e Tb asc h6

25) AMSR-e Tb asc v10

26) AMSR-e Tb asc h10

27) AMSR-e Tb asc v19

28) AMSR-e Tb asc h19

29) AMSR-e Tb asc v22

30) AMSR-e Tb asc h22

31) AMSR-e Tb asc v37

32) AMSR-e Tb asc h37

33) AMSR-e Tb asc v85

34) AMSR-e Tb asc h85

35) AMSR-e Tb desc v6

36) AMSR-e Tb desc h6

37) AMSR-e Tb desc v10

38) AMSR-e Tb desc h10

39) AMSR-e Tb desc v19

40) AMSR-e Tb desc h19

41) AMSR-e Tb desc v22

42) AMSR-e Tb desc h22

43) AMSR-e Tb desc v37

44) AMSR-e Tb desc h37

45) AMSR-e Tb desc v85

46) AMSR-e Tb desc h85

47) QuikSCAT X pixel location (in 3060,3060 SIR format)

48) QuikSCAT Y pixel location (both of these are -999 if the pixel was outside of QuikSCAT's footprint)

49) qs 'a' file (sigma-0 backscatter), horizontal polarization

50) qs 'a' file, vertical polarization (-33 is the no-data value for both of these)

51) qs 'V' file (sigma-0 stdev), horizontal polarization

52) qs 'V' file, vertical polarization (- 0.999985 is the no-data value for both of these)

53) qs 'E' file (sigma-0 error), horizontal polarization

54) qs 'E' file, vertical polarization (- 16.0000 is the no-data value for both of these)

55) qs 'J' file (average incidence angle), horizontal polarization

56) qs 'J' file, vertical polarization (3.05176e-05 is the no-data value for both of these)

## WMO Data Format Information

Details on the WMO data format are as follows:

The first record is the header record.

All ensuing records are data records as described below.

All 9s in a field, such as 99.99 for PRCP, indicate no report or insufficient data. FIELD POSITION TYPE DESCRIPTION

STN	1-6	Int.	Station number (WMO/DATSAV3 number) for the location.
WBAN	8-12	Int.	WBAN number where applicable--this is the historical "Weather Bureau Air Force Navy" number - with WBAN being the acronym.
YEAR	15-18	Int.	The year.
MODA	19-22	Int.	The month and day.
TEMP	25-30	Real	Mean temperature for the day in degrees Fahrenheit to tenths. Missing = 9999.9 (Celsius to tenths for metric version.)
Count	32-33	Int.	Number of observations used in calculating mean temperature.
DEWP	36-41	Real	Mean dew point for the day in degrees Fahrenheit to tenths. Missing = 9999.9 (Celsius to tenths for metric version.)
Count	43-44	Int.	Number of observations used in calculating mean dew point.
SLP	47-52	Real	Mean sea level pressure for the day in millibars to tenths. Missing = 9999.9
Count	54-55	Int.	Number of observations used in calculating mean sea level pressure.
STP	58-63	Real	Mean station pressure for the day in millibars to tenths. Missing = 9999.9
Count	65-66	Int.	Number of observations used in calculating mean station pressure.
VISIB	69-73	Real	Mean visibility for the day in miles

to tenths. Missing = 999.9  
(Kilometers to tenths for metric version.)

- Count 75-76 Int. Number of observations used in calculating mean visibility.
- WDSP 79-83 Real Mean wind speed for the day in knots to tenths. Missing = 999.9  
(Meters/second to tenths for metric version.)
- Count 85-86 Int. Number of observations used in calculating mean wind speed.
- MXSPD 89-93 Real Maximum sustained wind speed reported for the day in knots to tenths.  
Missing = 999.9  
(Meters/second to tenths for metric version.)
- GUST 96-100 Real Maximum wind gust reported for the day in knots to tenths. Missing = 999.9  
(Meters/second to tenths for metric version.)
- MAX 103-108 Real Maximum temperature reported during the day in Fahrenheit to tenths--time of max temp report varies by country and region, so this will sometimes not be the max for the calendar day. Missing = 9999.9  
(Celsius to tenths for metric version.)
- Flag 109-109 Char Blank indicates max temp was taken from the explicit max temp report and not from the 'hourly' data. \* indicates max temp was derived from the hourly data (i.e., highest hourly or synoptic-reported temperature).
- MIN 111-116 Real Minimum temperature reported during the day in Fahrenheit to tenths--time of min temp report varies by country and region, so this will sometimes not be the min for the calendar day. Missing = 9999.9  
(Celsius to tenths for metric version.)
- Flag 117-117 Char Blank indicates min temp was taken from the explicit min temp report and not from the 'hourly' data. \* indicates min temp was derived from the hourly data (i.e., lowest

hourly or synoptic-reported temperature).

PRCP 119-123 Real Total precipitation (rain and/or melted snow) reported during the day in inches and hundredths; will usually not end with the midnight observation--i.e., may include latter part of previous day. .00 indicates no measurable precipitation (includes a trace). Missing = 99.99 (For metric version, units = millimeters to tenths & missing = 999.9.) Note: Many stations do not report '0' on days with no precipitation--therefore, '99.99' will often appear on these days. Also, for example, a station may only report a 6-hour amount for the period during which rain fell. See Flag field for source of data.

Flag 124-124 Char A = 1 report of 6-hour precipitation amount.  
B = Summation of 2 reports of 6-hour precipitation amount.  
C = Summation of 3 reports of 6-hour precipitation amount.  
D = Summation of 4 reports of 6-hour precipitation amount.  
E = 1 report of 12-hour precipitation amount.  
F = Summation of 2 reports of 12-hour precipitation amount.  
G = 1 report of 24-hour precipitation amount.  
H = Station reported '0' as the amount for the day (eg, from 6-hour reports), but also reported at least one occurrence of precipitation in hourly observations--this could indicate a trace occurred, but should be considered as incomplete data for the day.  
I = Station did not report any precip data for the day and did not report any occurrences of precipitation in its hourly observations--it's still possible that precip occurred but was not reported.

SNDP 126-130 Real Snow depth in inches to tenths--last report for the day if reported more than once. Missing = 999.9 (Centimeters to tenths for metric version.) Note: Most stations do not report '0' on days with no snow on the ground--therefore, '999.9' will often appear on these days.

FRSHTT 133-138 Int. Indicators (1 = yes, 0 = no/not reported) for the occurrence during the day of:  
Fog ('F' - 1st digit).  
Rain or Drizzle ('R' - 2nd digit).  
Snow or Ice Pellets ('S' - 3rd digit).  
Hail ('H' - 4th digit).  
Thunder ('T' - 5th digit).  
Tornado or Funnel Cloud ('T' - 6th digit).

### **Project Details**

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