AMSR-E/Aqua Daily L3 Surface Soil Moisture, Interpretive Parameters, & QC EASE-Grids, Version 2

USER GUIDE

How to Cite These Data

As a condition of using these data, you must include a citation:

Njoku, E. G. 2004. *AMSR-E/Aqua Daily L3 Surface Soil Moisture, Interpretive Parameters, & QC EASE-Grids, Version 2*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/AMSR-E/AE_LAND3.002. [Date Accessed].

FOR QUESTIONS ABOUT THESE DATA, CONTACT NSIDC@NSIDC.ORG

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/AE_Land3

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1 DATA DESCRIPTION

1.1 Parameters

1.1.1 Brightness Temperatures (K)

6.9 GHz, 10.7 GHz, 18.7 GHz, and 36.5 GHz vertical and horizontal brightness temperatures are provided at 6.9 GHz resolution. 36.5 GHz and 89.0 GHz vertical and horizontal brightness temperatures are provided at 36.5 GHz resolution.

1.1.2 Surface Soil Moisture (g cm-3)

Soil moisture in the top ~1 cm of soil is averaged over the retrieval footprint. A value of -9999 indicates no retrieval, due to bad brightness temperature data in the retrieval channels or screening by land surface classification.

1.1.3 Vegetation/Roughness Parameter (kg m-2)

This term incorporates the effects of vegetation and roughness together. See the Derivation Techniques and Algorithms section in the AMSR-E/Aqua L2B Surface Soil Moisture, Ancillary Parameters, & QC EASE-Grids guide document. When interpreted as an effective vegetation water content, it is the total water content in the vertical column of vegetation, averaged over the retrieval footprint. A value of -9999 indicates no retrieval, due to bad brightness temperature data in the retrieval channels or screening by land surface classification. Refer to the Data Acquisition and Processing section of this guide document for more information.

1.2 File Information

1.2.1 Format

Data are stored in Hierarchical Data Format - Earth Observing System (HDF-EOS) Version 2.10 grid format. Other AMSR-E products are in HDF-EOS Version 2.7.2 format. This newer format of HDF-EOS is required for the projection specific to the Level-3 land product. See the Geolocation section of this document for more details.

1.2.2 Data Fields

Files contain core metadata, product-specific attributes, and data fields, as summarized in the Level-3 Soil Moisture Data Fields appendix.

1.2.3 File Contents

Each daily granule is approximately 60 MB.

1.2.4 Naming Convention

This section explains the file naming convention used for this product with an example. The date in the file name corresponds to the first scan of the granule.

Example file name: `AMSR_E_L3_DailyLand_T05_20020619.hdf`

`AMSR_E_L3_DailyLand_X##_yyyymmdd.hdf`

Refer to Table 1 for the valid values for the file name variables listed above.

Table 1.Valid Values for the File Name Variables

Variable	Description
X	Product Maturity Code
##	file version number
yyyy	four-digit year
mm	two-digit month
dd	two-digit day
hdf	HDF-EOS data format

Table 2. Valid Values for the Product Maturity Code

Product Maturity Code	Description
P	Preliminary - refers to non-standard, near-real-time data available from NSIDC. These data are only available for a limited time until the corresponding standard product is ingested at NSIDC.
B	Beta - indicates a developing algorithm with updates anticipated.
T	Transitional - period between beta and validated where the product is past the beta stage, but not quite ready for validation. This is where the algorithm matures and stabilizes.
V	Validated - products are upgraded to Validated once the algorithm is verified by the algorithm team and validated by the validation teams. Validated products have an associated validation stage.

Table 3. Validation Stages

Validation Stage	Description
Stage 1	Product accuracy is estimated using a small number of independent measurements obtained from selected locations, time periods, and ground-truth/field program efforts.
Stage 2	Product accuracy is assessed over a widely distributed set of locations and time periods via several ground-truth and validation efforts.
Stage 3	Product accuracy is assessed, and the uncertainties in the product are well-established via independent measurements made in a systematic and statistically robust way that represents global conditions.

Table 4 provides examples of file name extensions for related files that further describe or supplement data files.

Table 4. Related File Extensions and Descriptions

Extensions for Related Files	Description
.jpg	Browse data
.qa	Quality assurance information
.ph	Product history data
.xml	Metadata files

1.3 Spatial Information

1.3.1 Coverage

Spatial coverage is global for land surfaces, excluding snow-covered and densely vegetated areas.

1.3.2 Resolution

Input brightness temperature data, corresponding to a 56 km mean spatial resolution (for frequencies 6.9 GHz through 36.5 GHz), and a 12 km mean spatial resolution (for frequencies 36.5 GHz and 89 GHz), are resampled to a global cylindrical 25 km Equal-Area Scalable Earth Grid (EASE-Grid) cell spacing. The effective spatial resolutions are thus larger than the inherent 56 km and 12 km resolutions.

1.3.3 Geolocation

1.3.3.1 Projection

Data are provided in the EASE-Grid global cylindrical projection.

The projection used for AMSR-E Level-3 land products is a generalized form of the EASE-Grid called Cylindrical Equal-Area (CEA), which is user-defined projection number 97 in the General Cartographic Transformation Package (GCTP).

The SphereCode is -1 to indicate that the semi-major axis value (the first projection parameter) should be used in calculations instead of the default values defined in GCTP.

The PixelRegistration value is HDFE_CENTER. Although this is the default value for HDF-EOS, users may need to explicitly specify it if georegistering the data without the HDF-EOS library.

1.3.3.2 Grid Description

Level-2A brightness temperatures are resampled to a global cylindrical EASE-Grid with a nominal grid spacing of 25 km (true at 30° S). The size of the grid is 586 rows by 1383 columns. For more information, including details about the EASE-Grid projections plus related products and tools, see NSIDC's EASE-Grid web site.

For this EASE-Grid product, the tar file MI_geolocation.tar.gz, available via HTTPS, contains geolocation tools. These tools include map projection parameters (.mpp files), grid parameter definitions (.gpd files), latitude/longitude binary files, and conversion software such as C, FORTRAN (FORmula TRANslation), and IDL (Interactive Data Language).

1.4 Temporal Information

1.4.1 Coverage

See AMSR-E Data Versions for a summary of temporal coverage for different AMSR-E products and algorithms.

1.4.2 Resolution

Each granule has daily coverage.

2 DATA ACQUISITION AND PROCESSING

2.1 Acquisition

Please refer to the AMSR-E/Aqua L2B Surface Soil Moisture, Ancillary Parameters, & QC EASE-Grids user guide for a summary of input data.

2.2 Processing

2.2.1 Theory of Measurements

Please refer to the AMSR-E/Aqua L2B Surface Soil Moisture, Ancillary Parameters, & QC EASE-Grids documentation for more information on theory of measurements.

Measurements of soil moisture are most accurate in areas of low vegetation. Attenuation from vegetation increases the retrieval error in soil moisture (Njoku et al. 2003). Surface type classifications are assigned to indicate low and moderate vegetation, and retrievals are not performed in dense vegetation.

The retrieval algorithm does not explicitly model effects of topography, snow cover, clouds, and precipitation. Other potential error sources include anomalous inputs from bad radiometric data and low-level processing errors. The processing algorithm includes checks to identify these and other anomalies and assign appropriate flags (Njoku 1999).

Soil moisture retrievals represent averages over the horizontal retrieval footprint area. For example, it is assumed that if half of the retrieval footprint is bare soil and half is vegetated, then the output retrieved quantity is the vegetation water content of just the vegetation in the vegetated part of the footprint; however, this is not true. If half the footprint is bare, with 0 kg m-2, and the other half is vegetated with 6 kg m-2, then the output retrieved quantity will be 3 kg m-2 representing the average over the footprint. Similarly, for soil moisture if half the footprint is urban with 0 g cm-3 soil moisture and the other half is soil with 20 g cm-3 moisture, then the retrieved value will be close to 10 g cm-3, which is not the soil moisture of the soil-covered area, but is closer to the footprint average value.

Soil moisture retrievals represent vertical sampling depth in the top ~1 cm of soil. The actual sampling depth varies with the amount of moisture in the soil. Soil moisture deeper than ~1 cm below the surface may not be sensed by AMSR-E.

The 6.9 GHz channel is shared with mobile communication services; therefore, retrievals using this frequency are subject to Radio Frequency Interference (RFI), particularly near large urban land areas. The soil moisture algorithm uses the 10.7 GHz channel to mitigate the RFI problem. Refer to the Derivation Techniques and Algorithms section in this document.

Refer to Njoku et al. (2004) for an assessment of calibration biases over land, and methods used to correct these biases.

2.2.2 Derivation Techniques and Algorithms

Please refer to the AMSR-E/Aqua L2B Surface Soil Moisture, Ancillary Parameters, & QC EASE-Grids user guide for details on how brightness temperatures and soil variables are calculated. Refer to Njoku et al. (2004) for an assessment of calibration biases over land, and methods used to correct these biases.

2.2.2.1 Processing Steps

As an intermediate, internal step, the Level-2B land surface product (AE_Land) processing scheme generates Level-2B brightness temperatures. These, along with Level-2B soil moisture variables, are composited into Level-3, daily, global cylindrical EASE-Grids. Data from ascending and descending half-orbits are composited separately. If data from successive Level-2B file pairs fall on the same grid points, then the earlier data are overwritten. For grid points not filled by Level-2B data, such as open or inland water, a fill value of 9999 or 9999.0 is assigned to the Level-3 data depending on the data type, integer or floating-point. A value of -9999 indicates no retrieval, due to bad brightness temperature data in the retrieval channels or screening by land surface classification.

Surface type classification of gridded brightness temperatures identify and screen grid cells that include major water bodies, dense vegetation, snow, and permanent ice for which accurate retrievals are not possible. Other tests are performed, such as for excessive relief, precipitation, frozen ground, and RFI. However, since the reliability of these tests as well as their influence on the retrievals is not well characterized, detection of these conditions does not prevent retrievals from being made and values being written into the output array. The user must decide whether to do further screening on the data based on the surface type flags.

The Inversion_QC_Flag in the Level-3 land surface product (AE_Land3) is a 16 bit integer in which nine possible surface classes are represented by nine individual bits. A bit is assigned a value of one if the surface class that the bit represents is flagged by the classification subroutine. Three additional bits carry the QC flags from the Level-2 product. The sequence begins with the least significant bit, that is the rightmost bit, in order to keep the resulting word small in decimal values.

```
 16  15  14  13  12  11  10   9   8   7   6   5   4   3   2   1
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| 0 | 0 | 0 | 0 | ? | ? | ? | ? | ? | ? | ? | ? | ? | ? | ? | ? |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
```

Table 5. Surface Type Classifications

Bit Number	Surface Type
1	Permanent Ice Sheet
2	Mountainous Terrain
3	Snow
4	Frozen Ground
5	Precipitation
6	RFI
7	Dense Vegetation
8	Moderate Vegetation
9	Low Vegetation
10	Retrieval attempted and successful (Inversion_QC_Flag_1 = 10) Refer to the AE_Land documentation for inversion quality control flag values.
11	Retrieval attempted but unsuccessful (Inversion_QC_Flag_1 = 12) Refer to the AE_Land documentation for inversion quality control flag values.
12	Retrieval not attempted (Inversion_QC_Flag_1 = 14) Refer to the AE_Land documentation for inversion quality control flag values.

Surface_Type = (bit 1 * 2^0) + (bit 2 * 2^1) + (bit 3 * 2^2) + (bit 4 * 2^3) + (bit 5 * 2^4) + (bit 6 * 2^5) + (bit 7 * 2^6) + (bit 8 * 2^7) + (bit 9 * 2^8) + (bit 10 * 2^9) + (bit 11 * 2^{10}) + (bit 12 * 2^{11})

For example, if the tests for mountainous terrain, snow, and precipitation were all true and the other tests were all false, the value of Surface_Type would be 0000000000010110 binary or 22 decimals.

2.3 Quality, Errors, and Limitations

2.3.1 Error Sources

AMSR-E measurements of soil moisture are directly sensitive only to the top 1 cm of soil averaged over approximately 60 km spatial extent. Significant uncertainty may therefore arise when these measurements are compared against point-derived in-situ data, due to differences in sampling depth and spatial extent between satellite and in-situ observations. Refer to the Data Acquisition and Processing section of this guide document for more information.

2.3.2 Quality Assessment

Each HDF-EOS file contains core metadata with QA metadata flags that are set by the Science Investigator-led Processing System (SIPS) at the Global Hydrology and Climate Center (GHCC) prior to delivery to NSIDC. A separate metadata file in XML format is also delivered to NSIDC with the HDF-EOS file; it contains the same information as the core metadata. Three levels of quality assessment (QA) are conducted with the AMSR-E Level-2 and -3 products: automatic, operational, and science QA. If a product does not fail QA, it is ready to be used for higher-level processing, browse generation, active science QA, archive, and distribution. If a granule fails QA, SIPS does not send the granule to NSIDC until it is reprocessed. Level-3 products that fail QA are never delivered to NSIDC (Conway 2002).

2.3.2.1 Automatic QA

Level-3 automatic QA procedures involve simply evaluating the Level-2B soil product quality flags to determine if observations are valid for Level-3 products.

2.3.2.2 Operational QA

AMSR-E Level-2A data arriving at GHCC are subject to operational QA prior to processing higher-level products. Operational QA varies by product, but it typically checks for the following criteria in a given file (Conway 2002):

- File is correctly named and sized
- File contains all expected elements
- File is in the expected format
- Required EOS fields of Time, Latitude, and Longitude are present and populated
- Structural metadata is correct and complete
- The file is not a duplicate
- The HDF-EOS version number is provided in the global attributes
- The correct number of input files were available and processed

2.3.2.3 Science QA

AMSR-E Level-2A data arriving at GHCC are also subject to science QA prior to processing higher-level products. If less than 50 percent of a granule's data is good, the science Q/A flag is marked suspect when the granule is delivered to NSIDC. In the SIPS environment, the science QA includes checking the maximum and minimum variable values, and percent of missing data and out-of-bounds data per variable value. At the Science Computing Facility (SCF), also at GHCC, science QA involves reviewing the operational QA files, generating browse images, and performing the following additional automated QA procedures (Conway 2002):

- Historical data comparisons

- Detection of errors in geolocation
- Verification of calibration data
- Trends in calibration data
- Detection of large scatter among data points that should be consistent

Geolocation errors are corrected during Level-2A processing to prevent processing anomalies such as extended execution times and large percentages of out-of-bounds data in the products derived from Level-2A data.

The Team Lead SIPS (TLSIPS) developed tools for use at SIPS and SCF for inspecting the data granules. These tools generate a QA browse image in Portable Network Graphics (PNG) format and a QA summary report in text format for each data granule. Each browse file shows Level-2A and Level-2B data. These are forwarded from Remote Sensing Systems (RSS) to GHCC along with associated granule information, where they are converted to HDF raster images prior to delivery to NSIDC. The QA summary reports are available on the GHCC AMSR-E web page.

Please refer to the AMSR-E Validation Data for information about the accuracy and precision of AMSR-E observations.

2.4 Instrumentation

2.4.1 Description

See the AMSR-E Instrument Description document.

3 SOFTWARE AND TOOLS

For tools that work with AMSR-E data, see AMSR/ADEOS-II Overview

4 CONTACTS AND ACKNOWLEDGMENTS

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5 REFERENCES

Conway, D. 2002. Advanced Microwave Scanning Radiometer - EOS Quality Assurance Plan. Huntsville, AL: Global Hydrology and Climate Center.

Jackson, T. J., M. H. Cosh, R. Bindlish, P. J. Starks, D. D. Bosch, M. Seyfried, D. C. Goodrich, M. S. Moran, and D. Jinyang. 2010. Validation of Advanced Microwave Scanning Radiometer Soil Moisture Products. *Geoscience and Remote Sensing, IEEE Transactions* on 48(12): 4256-4272.

Njoku, Eni G., T. Chan, W. Crosson, and A. Limaye. 2004. Evaluation of the AMSR-E Data Calibration Over Land. Italian *Journal of Remote Sensing* 29(4): 19 - 37.

Njoku, Eni G., T. L. Jackson, V. Lakshmi, T. Chan, and S.V. Nghiem. 2003. Soil Moisture Retrieval from AMSR-E. *IEEE Transactions on Geoscience and Remote Sensing* 41(2): 215-229.

Njoku, Eni G., and T. K. Chan, 2006. Vegetation and Surface Roughness Effects on AMSR-E Land Observations. *Remote Sensing of Environment* 100(2): 190-199.

Njoku, E. G. 1999. AMSR Land Surface Parameters. Algorithm Theoretical Basis Document: Surface Soil Moisture, Land Surface Temperature, Vegetation Water Content, Version 3.0. Pasadena, California USA: NASA Jet Propulsion Laboratory. (PDF file, 1.16 MB)

For more information regarding related publications, see the Research Using AMSR-E Data web page.

6 DOCUMENT INFORMATION

6.1 Publication Date

March 2004

6.2 Date Last Updated

26 April 2021

APPENDIX A: LEVEL-3 SOIL MOISTURE DATA FIELDS

The following Notations are used in this document:

Type	Description
Float64	64-bit or 8-byte floating point
Int16	16-bit or 2-byte signed integer

There are two Fill Values:

Fill Values	Description
9999	Indicates pixels that are void of any retrieval due to inherent gaps between available L2A swaths.
-9999	Indicates no retrieval due to bad brightness temperature data or screening by land surface classification, or unsuccessful retrieval due to retrieval values outside the physical range.

Note: The dimension of each field is 586 rows x 1383 columns.

Table A - 1. Ascending Land Grid

Field Name	Data Type	Description	Scale Factor
A_Time	Float64	Scan start time. International Atomic Time in seconds with 01 January 1993 as the zero base (TAI93)	n/a
A_TB06.9V (Res 1)	Int16	6.9V GHz Tb (K) Level-2A 6.9 GHz data with a mean spatial resolution of 56 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
A_TB06.9H (Res 1)	Int16	6.9H GHz Tb (K) Level-2A 6.9 GHz data with a mean spatial resolution of 56 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.

Field Name	Data Type	Description	Scale Factor
A_TB10.7V (Res 1)	Int16	10.7V GHz Tb (K) Level-2A 10.7 GHz data with a mean spatial resolution of 56 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
A_TB10.7H (Res 1)	Int16	10.7H GHz Tb (K) Level-2A 10.7 GHz data with a mean spatial resolution of 56 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
A_TB18.7V (Res 1)	Int16	18.7V GHz Tb (K) Level-2A 18.7 GHz data with a mean spatial resolution of 56 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
A_TB18.7H (Res 1)	Int16	18.7H GHz Tb (K) Level-2A 18.7 GHz data with a mean spatial resolution of 56 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
A_TB36.5V (Res 1)	Int16	36.5V GHz Tb (K) Level-2A 36.5 GHz data with a mean spatial resolution of 56 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
A_TB36.5H (Res 1)	Int16	36.5H GHz Tb (K) Level-2A 36.5 GHz data with a mean spatial resolution of 56 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
A_TB36.5V (Res 4)	Int16	36.5V GHz Tb (K) Level-2A 36.5 GHz data with a mean spatial resolution of 12 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.

Field Name	Data Type	Description	Scale Factor
A_TB36.5H (Res 4)	Int16	36.5H GHz Tb (K) Level-2A 36.5 GHz data with a mean spatial resolution of 12 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
A_TB89.0V (Res 4)	Int16	89.0V GHz Tb (K) Level-2A 89.0 GHz data with a mean spatial resolution of 12 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
A_TB89.0H (Res 4)	Int16	89.0H GHz Tb (K) Level-2A 89.0 GHz data with a mean spatial resolution of 12 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
A_Soil_Moisture	Int16	Soil moisture at 10.7 GHz resolution (g cm-3). Range: 0 to 500.	Multiply data values by 0.001 to obtain soil moisture in g cm-3.
A_Veg_Water_Content	Int16	The Vegetation Water Content field (kg m-2) incorporates the effects of vegetation and roughness together. See the Derivation Techniques and Algorithms section in the AMSR-E/Aqua L2B Surface Soil Moisture, Ancillary Parameters, & QC EASE-Grids Guide Document. When interpreted as vegetation water content, it is the total water content in the vertical column of vegetation averaged over the retrieval footprint.	Multiply data values by 0.01 to obtain vegetation water content in kg m-2.
A_Land_Surface_Temp	Int16	Land Surface Temperature (K) is not calculated because of Radio Frequency Interference (RFI) contamination in the 6.9 GHz channels. The field contains only fill values.	Multiply data values by 0.1 to obtain units in K.

Field Name	Data Type	Description	Scale Factor
A_Inversion_QC_Flag	Int16	Inversion quality control flag. Also includes surface type flags encoded in individual bits of this integer. For a description of the contents, see the Processing Steps section of the AMSR-E/Aqua Daily L3 Surface Soil Moisture, Interpretive Parameters, & QC EASE-Grids Guide Document. For grid points such as open or inland water, a fill value of 9999 is assigned.	n/a

Table A - 2. Descending Land Grid

Field Name	Data Type	Description	Scale Factor
D_Time	Float64	Scan start time. International Atomic Time in seconds with 01 January 1993 as the zero base (TAI93).	n/a
D_TB06.9V (Res 1)	Int16	6.9V GHz Tb (K) Level-2A 6.9 GHz data with a mean spatial resolution of 56 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
D_TB06.9H (Res 1)	Int16	6.9H GHz Tb (K) Level-2A 6.9 GHz data with a mean spatial resolution of 56 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
D_TB10.7V (Res 1)	Int16	10.7V GHz Tb (K) Level-2A 10.7 GHz data with a mean spatial resolution of 56 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
D_TB10.7H (Res 1)	Int16	10.7H GHz Tb (K) Level-2A 10.7 GHz data with a mean spatial resolution of 56 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.

Field Name	Data Type	Description	Scale Factor
D_TB18.7V (Res 1)	Int16	18.7V GHz Tb (K) Level-2A 18.7 GHz data with a mean spatial resolution of 56 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
D_TB18.7H (Res 1)	Int16	18.7H GHz Tb (K) Level-2A 18.7 GHz data with a mean spatial resolution of 56 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
D_TB36.5V (Res 1)	Int16	36.5V GHz Tb (K) Level-2A 36.5 GHz data with a mean spatial resolution of 56 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
D_TB36.5H (Res 1)	Int16	36.5H GHz Tb (K) Level-2A 36.5 GHz data with a mean spatial resolution of 56 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
D_TB36.5V (Res 4)	Int16	36.5V GHz Tb (K) Level-2A 36.5 GHz data with a mean spatial resolution of 12 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
D_TB36.5H (Res 4)	Int16	36.5H GHz Tb (K) Level-2A 36.5 GHz data with a mean spatial resolution of 12 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
D_TB89.0V (Res 4)	Int16	89.0V GHz Tb (K) Level-2A 89.0 GHz data with a mean spatial resolution of 12 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.

Field Name	Data Type	Description	Scale Factor
D_TB89.0H (Res 4)	Int16	89.0H GHz Tb (K) Level-2A 89.0 GHz data with a mean spatial resolution of 12 km were resampled to a 25 km EASE-Grid to create this data field.	Multiply data values by 0.1 to obtain units in K.
D_Soil_Moisture	Int16	Soil moisture at 10.7 GHz resolution (g cm-3). Range: 0 to 500.	Multiply data values by 0.001 to obtain soil moisture in g cm-3.
D_Veg_Water_Content	Int16	The Vegetation Water Content field (kg m-2) incorporates the effects of vegetation and roughness together. See the Derivation Techniques and Algorithms section in the AMSR-E/Aqua L2B Surface Soil Moisture, Ancillary Parameters, & QC EASE-Grids Guide Document. When interpreted as vegetation water content, it is the total water content in the vertical column of vegetation averaged over the retrieval footprint.	Multiply data values by 0.01 to obtain vegetation water content in kg m-2.
D_Land_Surface_Temp	Int16	Land Surface Temperature (K) is not calculated because of Radio Frequency Interference (RFI) contamination in the 6.9 GHz channels. The field contains only fill values.	Multiply data values by 0.1 to obtain units in K.
D_Inversion_QC_Flag	Int16	Inversion quality control flag. Also includes surface type flags encoded in individual bits of this integer. For a description of the contents, see the Processing Steps section of the AMSR-E/Aqua Daily L3 Surface Soil Moisture, Interpretive Parameters, & QC EASE-Grids Guide Document. For grid points such as open or inland water, a fill value of 9999 is assigned.	n/a