

AMSR-E Products and NASA's AMSR-E Validation Data at NSIDC

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<http://nsidc.org>

The Advanced Microwave Scanning Radiometer – Earth Observing System (AMSR-E) is a mission instrument aboard the NASA Aqua satellite, launched on 4 May 2002. AMSR-E is a multichannel passive microwave radiometer that is capable of measuring geophysical variables in the global water cycle, such as snow, sea ice, sea surface temperature, precipitation and soil moisture, providing finer spatial resolution than previously possible with spaceborne microwave radiometers. The sensor field of view of AMSR-E more than doubles that of the Scanning Multichannel Microwave Radiometer (SMMR) and Special Sensor Microwave/Imager (SSM/I) instruments, ranging from 5.4 km to 57 km depending on frequency. In addition, AMSR-E combines—in one sensor—all channels that SMMR and SSM/I had individually. AMSR-E has channels with center frequencies of 6.9, 10.7, 18.7, 23.8, 36.5, and 89 GHz.

Post-launch AMSR-E validation efforts address data quality by validating the retrieved products with ground truth data and by providing the basis for algorithm enhancements. Conducted in locations around the world, the AMSR-E validation experiments include ground, aircraft, and satellite remote sensing measurements and concentrate on the disciplines of soil moisture, rainfall, and the cryosphere.

The National Snow and Ice Data Center (NSIDC) Distributed Active Archive Center (DAAC) archives and distributes all AMSR-E standard products, including Level-1A, Level-2, and Level-3 data. The NSIDC DAAC also serves as a portal to NASA's AMSR-E Validation Program data products and information.

Soil Moisture

Cryosphere

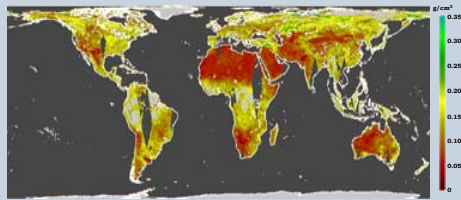
Rainfall

L1A, L2A Tbs, and Ocean

Standard Products

Product	Spatial Resolution
L2B Surface Soil Moisture, Ancillary Params, & QC EASE-Grids	25 km
Daily L3 Surface Soil Moisture, Interpretive Params, & QC EASE-Grids	25 km

AMSR-E's low-frequency channels provide routine global measurements of surface wetness. Soil moisture is key to hydrologic modeling, crop production, weather and climate prediction, and flood and drought monitoring. Wet soil can be identified in the AMSR-E observations in areas of low and moderate vegetation. The AMSR-E soil moisture algorithms utilize the 10.7 and 18.7 GHz X-band to derive daily surface soil moisture and vegetation/surface roughness.



AMSR-E Daily Level-3 Surface Soil Moisture in global 25 km EASE-Grid, 1 November 2006.

Validation

The AMSR-E soil moisture validation effort focuses on instrumented experiments with comprehensive airborne and in situ surface sampling. Specific validation objectives include assessing and refining soil moisture algorithm performance; verifying soil moisture estimation accuracy; investigating the effects of vegetation, surface temperature, topography, and soil texture on soil moisture accuracy; and determining the regions that are useful for AMSR-E soil moisture validation measurements.

Ground

Soil moisture/water content, bulk density, temperature, and salinity, precipitation

Aircraft

PALS, GPS, PSR, AIRSAR, ESTAR

Satellite

NDVI, NDWI, AMSR-E, ASTER, ERS-2, Landsat, SSM/I, QuikSCAT

Vegetation

LAI, vegetation index and cover

Meteorological

Precipitation, aerosols, temperature, wind



Dr. Tom Jackson of the USDA-ARS Hydrology and Remote Sensing Laboratory collects soil core samples during SMEX03 in Alabama, USA.

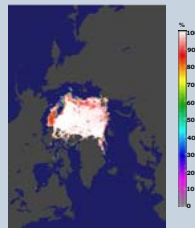
Campaign	Dates	Location
SMEX02	6 Jun – 12 Jul 2002	Iowa, USA
SMEX03	23 Jun – 18 Jul 2003	Iowa, Georgia & Alabama, USA; Brazil
SMEX04 – NAME	2 – s28 Aug 2004	Arizona, USA; Sonora Region, Mexico
SMEX05	13 Jun – 4 Jul 2005	Iowa, USA

Standard Products

Product	Spatial Resolution
Daily L3 6.25 km 89 GHz Brightness Temperature (Tb) Polar Grids	6.25 km
Daily L3 12.5 km Tb, Sea Ice Conc., & Snow Depth Polar Grids	12.5 km
Daily L3 25 km Tb, Sea Ice Temperature, & Sea Ice Conc. Polar Grids	25 km
Daily L3 Global Snow Water Equivalent EASE-Grids	25 km
5-Day L3 Global Snow Water Equivalent EASE-Grids	25 km
Monthly L3 Global Snow Water Equivalent EASE-Grids	25 km

Monitoring of sea-ice parameters, such as ice concentration, type, and extent, is necessary to understand how this frozen blanket over the ocean affects the larger climate system. AMSR-E measurements allow for the derivation of sea ice concentrations in both polar regions.

AMSR-E also measures the scattering effects of snow. Snow cover provides an important storage mechanism for water during the winter months and, like sea ice, has a large influence on how much sunlight is reflected from the Earth.



AMSR-E Level-3 Daily N. Hemisphere 12.5 km Sea Ice Concentration for 14 September 2006, the Arctic sea ice minimum.

Validation

The AMSR-E cryospheric data validation program includes campaigns to validate the AMSR-E sea ice concentration, sea ice temperature, snow depth, brightness temperature, and snow water equivalent. The validation campaigns examine the effects of certain factors (atmospheric and surface conditions, spatial variability and resolution) on the retrieval algorithms and evaluate the accuracy of the derived parameters.

Campaign	Dates	Location
CLPX	Feb & Mar 2002 & 2003	Colorado & Wyoming, USA
AMSRice03	4 - 22 Mar 2003	Bering, Beaufort, & Chukchi Seas
AMSRice06	18-25 Mar 2006	Bering, Beaufort, & Chukchi Seas
Meltpond2000	Jun – Jul 2000	Baffin Bay; Canadian Archipelago
East Antarctic	15 Sep – 31 Oct 2003	East Antarctic
West Antarctic	14 Aug – 4 Sep 2003	West Antarctic

Ground

Snow water equivalent, density, depth, cover, and stratigraphy, brightness temperature, ice temperature, sea ice thickness

Aircraft

AIRSAR, PSR, LIDAR

Satellite

AMSR-E, SSM/I, RADARST, Landsat, MODIS, AVHRR

Model

LAPS, RUC-20, RUC-40, LDAS

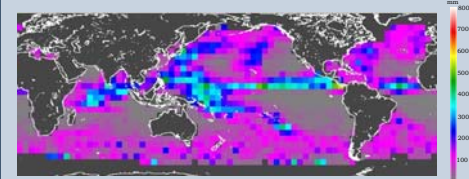
Measuring ice thickness and snow depth along a transect using an EM51 (in kayak) and a Magnaprobe snow depth recorder with GPS during the AMSRice03 campaign.



Standard Products

Product	Spatial Resolution
L2B Global Swath RainRate/Type GSFIC Profiling Algorithm	5.4 km
Monthly L3 5x5 deg Rainfall Accumulations	5°

Precipitation and evaporation have extremely important roles: precipitation provides water to the biosphere and evaporation acts as an air conditioning agent removing excess heat from the Earth's surface. AMSR-E measures rain rates over both land and ocean. Over the ocean, the AMSR-E microwave frequencies can probe through smaller cloud particles to measure the microwave emission from the larger raindrops. Over land, AMSR-E can measure the scattering effects of large ice particles, which later melt to form raindrops.



October 2006 monthly rain accumulation over the ocean from the AMSR-E Level-3 5x5 degree Monthly Rain Grid.

Validation

The AMSR-E rainfall validation effort consists of gauge-based and radar validation of AMSR-E global rain rate measurements. Gauge-based studies investigate instantaneous rain rate, stratiform/convective rain type, and daily and monthly rain accumulation. The radar studies investigate water vapor profiles and cloud information, such as vertical cloud structure, radar backscatter, and radiative properties of different cloud types.

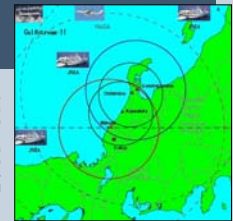
Ground

Rain rate, type, and accumulations, radar reflectivity

Aircraft

MIR, AMMR, ACR, APR-2, PSR

This map represents the study area for the Wakasa Bay field campaign in 2003. The equipment used in the area included two C-band Dual-Polarized Doppler Radars from Japan; Gullstream II - a Japanese research aircraft; NASA P-3 aircraft; and ground and ship based observations.
Credit: David O.C. Starr, NASA

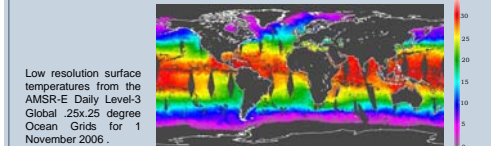


Campaign	Dates	Location
Eureka, CA NEXRAD	24 - 28 Aug 2000	California, USA
Iowa City, IA Gauge Cluster Site	18 Jun 2002 - 13 Nov 2003	Iowa, USA
BALTEX Gauge/Radar Experiment	1 Sep 2002 - 31 May 2003	Gotland Island, Sweden
Wakasa Bay Field Campaign 2003	14 Jan – 3 Feb 2003	Wakasa Bay, Japan

Standard Products

Product	Spatial Resolution
L1A Raw Observation Counts	n/a
L2A Global Swath Spatially-Resampled Brightness Temperatures (Tb)	5.4-56 km
L2B Global Swath Ocean Products derived from Wentz Algorithm	12-56 km
Daily L3 Global Ascending/Descending .25x.25 deg Ocean Grids	0.25°
Weekly L3 Global Ascending/Descending .25x.25 deg Ocean Grids	0.25°
Monthly L3 Global Ascending/Descending .25x.25 deg Ocean Grids	0.25°

Over the ocean AMSR-E provides sea surface temperatures (SSTs), columnar water vapor, and columnar cloud liquid water. SST fluctuations are known to have a profound impact on weather patterns across the globe, and AMSR-E's all-weather capability provides a significant improvement in the ability to monitor SSTs and the processes controlling them. Total integrated water vapor is important for the understanding of how water is cycled through the atmosphere.



Low resolution surface temperatures from the AMSR-E Daily Level-3 Global .25x.25 degree Ocean Grids for 1 November 2006.

Data Access and Information

AMSR-E Products

NSIDC AMSR-E Web site

<http://nsidc.org/data/amsre/>
Product documentation, order options, version history, research bibliography, related links, and news.

EOS Data Gateway (EDG)

<http://nsidc.org/~imswww/pub/imswelcome/index.html>
Search and order the entire AMSR-E data archive.

Data Pool

http://nsidc.org/data/data_pool
Direct FTP access to the most recent 75 days of AMSR-E data.

Subscriptions

<http://nsidc.org/daac/subscriptions.html>
Automatic delivery of AMSR-E data as it is received at NSIDC.

AMSR-E Validation

NSIDC AMSR-E Validation Web site

http://nsidc.org/data/amsr_validation/
Data access, product documentation, campaign information, related links, and news.