AMSR Instrument Description

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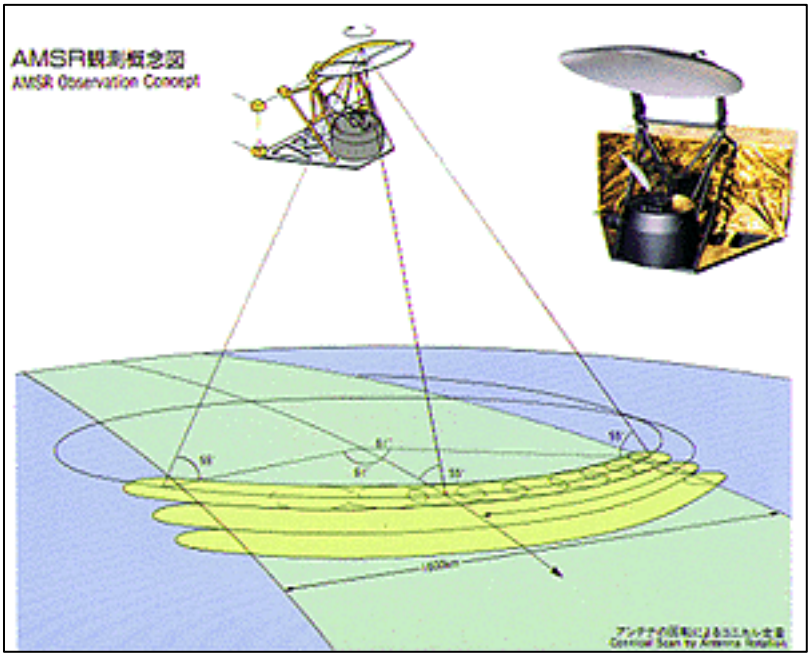

Figure 1. AMSR instrument. Image courtesy of the Japan Aerospace Exploration Agency (JAXA).

1 SENSOR OR INSTRUMENT DESCRIPTION

The Advanced Microwave Scanning Radiometer (AMSR) was launched on board the Advanced Earth Observing Satellite II (ADEOS-II), also known as Midori-II, on 14 December 2002. AMSR was an eight-frequency, passive-microwave radiometer system with the ability to observe from day to night, under any weather conditions with less cloud effects. It measured horizontally and vertically polarized radiances at 6.9, 10.65, 18.7, 23.8, 36.5, and 89.0 GHz; and vertically polarized radiances at 50.3 and 52.8 GHz. Spatial resolution of the individual measurements varies from 5 km at 89 GHz to ~50 km at 6.9 and 10.65 GHz. AMSR was developed and launched by the Japan Aerospace Exploration Agency (JAXA) with close cooperation of U.S. and Japanese scientists.

AMSR improves upon past microwave radiometers. The spatial resolution of AMSR data doubles that of Scanning Multichannel Microwave Radiometer (SMMR) and Special Sensor Microwave/Imager (SSM/I) data. Also, AMSR combines into one sensor all the channels that SMMR and SSM/I had individually. The following table compares operating characteristics of AMSR with previous sensors:

Table 1. Comparative Operating Characteristics of SMMR, SSM/I, AMSR-E, and AMSR

Parameter	SMMR (Nimbus-7)	SSM/I (DMSP-F08, F10, F11, F13)	AMSR-E (Aqua)	AMSR (ADEOS-II)
Time Period	1978 to 1987	1987 to Present	2002 to Present	2003
Frequencies (GHz)	6.6, 10.7, 18, 21, 37	19.3, 22.3, 36.5, 85.5	6.9, 10.7, 18.7, 23.8, 36.5, 89.0	6.9, 10.65, 18.7, 23.8, 36.5, 89.0, 50.3, 52.8
Sample Footprint Sizes (km)	148 x 95 (6.6 GHz) 27 x 18 (37 GHz)	37 x 28 (37 GHz) 15 x 13 (85.5 GHz)	74 x 43 (6.9 GHz) 14 x 8 (36.5 GHz) 6 x 4 (89.0 GHz)	70 x 40 (6.9 GHz) 14 x 8 (36.5 GHz) 6 x 4 (89.0 GHz)

Note: On 25 December 2003, ADEOS-II experienced an instrument anomaly which terminated the collection of earth observation data by AMSR.

2 KEY VARIABLES

AMSR measured geophysical variables such as atmospheric water vapor, precipitation, sea surface wind speed, sea surface temperature, soil moisture, sea ice extent, and snow water equivalent.

3 PRINCIPLES OF OPERATION

AMSR acquired radiance data by scanning the Earth's surface conically or mechanically and rotating its antenna along the satellite path. The aperture diameter of AMSR's antenna is 2 m with a sampling interval of 10 km for the 6 GHz to 36 GHz channels and 5 km for the 89 GHz channel It scanned conically at a nominal 55 degree angle of incidence on the Earth’s surface and had a swath width of 1600 km.

Table 2. Operating Characteristics

Frequency (GHz)	6.9	10.65	18.7	23.8	36.5	89.0	50.3	52.8
Spatial Resolution (km)	50		25		15	5	10	
Bandwidth (MHz)	350	100	200	400	1,000	3,000	200	400
Polarization	Horizontal and Vertical						Vertical	
IFOV (km)	40x70	27x46	14x25	17x29	8x14	3x6	6x10	
Incident Angle	~55 degrees							
Cross Polarization	below -2dB							

Frequency (GHz)	6.9	10.65	18.7	23.8	36.5	89.0	50.3	52.8
Swath Width	1,600 km							
Dynamic Range	2.7 - 340 K							
Absolute Accuracy	1 K (1σ)							
Noise Equivalent change in Temperature (NEdT)	0.3 K - 1.0 K (1σ)						2 K (1σ)	
Quantization	12-bit	10-bit						

4 MANUFACTURER OF SENSOR OR INSTRUMENT

The Mitsubishi Electric Corporation developed AMSR through a contract with JAXA. For information on ADEOS-II the satellite, please see the Platform Description: ADEOS-II web site.

5 CALIBRATION

AMSR had a high-temperature calibration source (about 340 K) and a small reflector to acquire the radiant temperature of deep space (at about 3 K). This external calibration scheme was first introduced by the Special Sensor Microwave/Imager (SSM/I) on the Defense Meteorological Satellites Program (DMSP) satellites. Each feed horn, from 6.9-89 GHz, sees the calibration sources once per scan period.

6 SCIENCE DATA FLOW

Under normal operating conditions, Remote Sensing Systems (RSS) in Santa Rosa, California, received Level-1A data from JAXA via the NASA Jet Propulsion Laboratory (JPL) Physical Oceanography Distributed Active Archive Center (PODAAC). RSS generated a Level-2A resampled brightness temperature product and transmitted it via FTP to the Global Hydrology Climate Center (GHCC) AMSR Science Investigator-led Processing System (SIPS). The AMSR SIPS team processed the Level-2A data into Level-2B swath products and then into Level-3 daily, weekly, and monthly gridded products. The Level-2A, -2B, -3 products, associated metadata, production histories, quality assurance files, ancillary files, and Delivery Algorithm Packages (DAPs) were transferred to the National Snow and Ice Data Center (NSIDC) Distributed Active Archive Center (DAAC) for archival and distribution to users.

7 DATA ACCESS

For access to AMSR data from the ADEOS-II platform, please see the AMSR/ADEOS-II Data web site.

8 LIST OF ACRONYMS

The following acronyms and abbreviations are used in this document:

ADEOS-II	Advanced Earth Observing Satellite II
AMSR	Advanced Microwave Scanning Radiometer
DAAC	Distributed Active Archive Center
DAP	Delivery Algorithm Package
GHCC	Global Hydrology Climate Center
IFOV	Instantaneous-Field-of-View
JAXA	Japan Aerospace Exploration Agency
JPL	Jet Propulsion Laboratory
NEdT	Noise Equivalent change in Temperature
NSIDC	National Snow and Ice Data Center
PODAAC	Physical Oceanography Distributed Active Archive Center
RSS	Remote Sensing System
SIPS	Science Investigator-led Processing System
SMMR	Scanning Multichannel Microwave Radiometer
SSM/I	Special Sensor Microwave/Imager

9 REFERENCES

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