Summary of SMMR, SSM/I, and SSMIS Sensors

TABLE OF CONTENTS

1 SMMR, SSM/I, AND SSMIS SENSORS

The Scanning Multi-channel Microwave Radiometer (SMMR) sensor, carried on the Nimbus-7 satellite, allowed for a number of experiments related to pollution control, oceanography, and meteorology. Launched on 25 October 1978 from Vandenberg Air Force Base, California, the Nimbus-7 spacecraft was the last in a series of operational weather satellites operated by the National Oceanic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA) to carry the SMMR instrument.

Beginning in 1987, a series of Defense Meteorological Satellite Program (DMSP) satellites carried two subsequent sensors, the Special Sensor Microwave Imager (SSM/I) and the Special Sensor Microwave Imager/Sounder (SSMIS). Measurements from these sensors provide global passive microwave data as well as other specialized meteorological, oceanographic, and solar-geophysical data in support of worldwide Department of Defense (DoD), Department of Commerce (DoC), National Oceanic and Atmospheric Administration (NOAA), and National Aeronautics and Space Administration (NASA) operations.

2 DESCRIPTION OF SENSORS USED IN NSIDC DATA SETS

Scanning Multi-channel Microwave Radiometer (SMMR)
SMMR was a ten-channel sensor that measured orthogonally polarized antenna temperature data in five microwave frequencies: 6.6, 10.7, 18.0, 21.0, and 37.0 GHz.

Special Sensor Microwave Imager (SSM/I)
The SSM/I sensor was a seven-channel, four-frequency, orthogonally polarized, passive microwave radiometric system that measured atmospheric, ocean, and terrain microwave brightness temperatures at 19.35, 22.2, 37.0, and 85.5 GHz.

Special Sensor Microwave Imager/Sounder (SSMIS)
SSMIS is a 24-channel, passive microwave radiometer designed to obtain a variety of polarized atmospheric temperature, moisture, and land variables under most weather conditions. Channel frequencies range from 19 GHz to 183 GHz. Note that the 85.5 GHz channel on SSM/I was replaced with a 91.655 GHz channel on SSMIS.

Table 1 provides an overview of the SMMR, SSM/I, and SSMIS sensors and their associated satellites.

Satellite*	Microwave Imagery Sensor	Sensor Frequencies (GHz)	Temporal Coverage (YYYY/MM/DD)	Ascending Equator Crossing Time (Local Time)	Descending Equator Crossing Time (Local Time)	Approximate Swath Width for Microwave Imagery	Launch Date (YYYY/MM/DD)
DMSP-F18	SSMIS	19, 22, 37, 91	2010/01/29 - present	18:03	07:08	1700 km	2009/10/18
DMSP-F17	SSMIS	19, 22, 37, 91	2006/11/04 - present	18:33	06:20	1700 km	2006/11/04
DMSP-F16	SSMIS	19, 22, 37, 91	2005/11/04 - present	15:52	03:52	1700 km	2003/10/18
DMSP-F15	SSMIS	19, 22, 37, 91	2000/01/24 - present	14:50	02:47	1500 km	1999/12/12
DMSP-F13	SSM/I	19, 22, 37, 85	1995/05/03 - 2008/12/31	17:43	05:51	1400 km	1995/03/24
DMSP-F11	SSM/I	19, 22, 37, 85	1991/12/03 - 1995/09/30	18:25	05:00	1400 km	1991/11/28
DMSP-F10	SSM/I	19, 22, 37, 85	1992/03/09 - 1997/11/04	22:08**	07:30**	1400 km	1990/12/01
DMSP-F8	SSM/I	19, 22, 37, 85	1987/09/07 - 1991/12/30	06:17	06:10	1400 km	1987/06/18
Nimbus-7	SMMR	6, 10, 18, 21, 37	1978/10/25 - 1987/08/20	12:00	12:00	783 km	1978/10/24

*All satellites are in a near-circular, sun-synchronous, polar orbit.

**Due to the DMSP-F10 satellite not achieving its desired orbit, the equator crossing time increased by approximately 45 minutes per year; as of 1995/09/02, the local equator crossing times were 22:08 (ascending) and 07:30 (descending).

3 RESOURCES

For more details regarding the satellites and sensors listed in Table 1, refer to the following resources:

- Remote Sensing Systems (RSS):
  - Crossing Times
  - SSM/I, SSMIS
- World Meteorological Organization (WMO) Observing Systems Capability Analysis and Review Tool (OSCAR)

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