Summary of SMMR, SSM/I, and SSMIS Sensors

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

*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)

4 REFERENCES

For further reading, consult the following references:


