CHAPTER 5

OBSERVATIONS

5.1 Radar Observing and Reporting Plans.

5.1.1 General Description. The Departments of Defense, Commerce, and Transportation operate a national network of Doppler Weather Surveillance Radars (WSR-88D). Within DOT, FAA operates three other radar systems: long-range radar, Airport Surveillance Radar (ASR) 9 and 11, and the Terminal Doppler Weather Radar (TDWR).

5.1.2 Observing and Reporting. The WSR-88D Radar Product Generator (RPG) generates graphic products that are distributed to users for detection and evaluation of weather features, generally associated with precipitation and storms. Additionally, the WSR-88D automatically generates a product called the radar coded message (RCM). The RCM is centrally collected and quality controlled by the NWS at the Silver Spring, MD facility. NWS produces and edits a national grid of composite RCMs and derived Radar OBservations (ROB), that include storm detection (SD) and manually digitized radar (MDR) sections, for WSR-88D sites. The NWS uses a sophisticated multi-step computer program to produce the "derived ROBs." Once the ROBs are generated with the "AUTO" appended, the derived radar observations (ROBs) are then made available to all users.

The FAA's long-range radars show reflectivity on displays in the ARTCC for enroute controllers. An interface was developed that allows these radars to be integrated into AWIPS. It is currently used in South Dakota for snow events. This interface has potential for severe storms as well. The range is about 200 miles and the display uses the standard three color, six level that are common through most of aviation. The second type of radar equipment is the ASR 9 and 11, both of which have a weather channel that provides weather information to terminal controllers. This information is used by the Integrated Terminal Weather System (ITWS) to develop mosaics for terminal areas which depict microbursts, wind shear, current weather, and forecasts out to one hour. The third radar type is the TDWR which will be at 45 locations. It provides information similar to ITWS but not in the level of detail necessary for detecting microbursts and forecasts. It is FAA's intention to eventually make all the data and products available to users, probably through a combination of direct connections and Internet sites. Controllers are encouraged to give pilots information they have on the weather displayed on their scopes. The FAA radar product development team (research) is looking into how to integrate these radars with WSR-88D so all the data will be used in detection and forecasting.

5.2 Rawinsonde-Observing Stations.

5.2.1 NWS Network Stations. Rawinsonde observations are made each day at 00:00 UTC and 12:00 UTC at 92 NWS Stations - 69 in the conterminous United States, 13 in Alaska, 9 in the Pacific, and 1 in Puerto Rico. These stations will take special observations, when requested by the Storm Prediction Center, in support of severe weather forecasts. Upper-air data from the

surface to heights exceeding 30 km are encoded and transmitted to the NWSTG for distribution to Federal agencies and other data users. The NWS Upper-air Observations web page is: http://www.ua.nws.noaa.gov/ which provides further information on the NWS rawinsonde network.

NWS has begun an effort to replace its current network of obsolete rawinsonde observing systems with a modern system that improves the quantity, availability and accuracy of upper-air data. The new system will utilize Global Positioning System (GPS) radiosondes, which measure winds aloft more accurately than obtained with the current system.

5.2.2 Other Network Stations. There are approximately 5 rawinsonde network stations operated by DOD, along with additional sites operated by NASA and other federal agencies, that take and disseminate soundings at 00:00 UTC and/or 12:00 UTC. These sites may not be available to take special soundings in support of severe weather forecasting.

5.2.3 Non-network Stations. DOD, DOE, and NOAA's Environmental Research Labs take unscheduled upper-air observations at mobile locations and Federal facilities in support of weather/climate research programs. Some of these programs encode and disseminate the observations in real-time for operational use. Non-network upper-air stations, which might be sources of operational data, are provided in Table 5-1**.**

5.2.4 Requests for Special Observations. Any special rawinsonde or pilot balloon (PIBAL) observations needed during the continuous weather monitoring underway at SPC and at AFWA are authorized and will be requested when needed. When special upper air network soundings are required, the requests should normally be made for 0600Z or 1800Z. The lead forecaster, SPC, will initiate the request to the NWS and NASA stations. The Commander, AFWA, will similarly request soundings from DOD stations. SPC will then coordinate with NCO. Although WFOs have the authority to request special upper air observations during periods of potentially severe storms of all types, requests for special soundings during periods of potentially severe local storms should be made by SPC. The agency taking the special sounding is responsible for funding. Military requests for NWS or NASA soundings should be made to the lead forecaster at SPC (405-579-0702). NWS requests for USAF soundings should be made to the AFWA duty officer (402-294-2586 or FTS 866-2586).

5.3 <u>Lightning Detection System (LDS).</u> The National Weather Service (NWS) and other Government agencies currently incorporate lightning data into their day-to-day operations. Since 1996, the federal government has purchased lightning data from a private contractor with the NWS serving as the contract administrator. The FAA's Automated Lightning Detection and Reporting System (ALDARS) incorporates this data into automated surface observations and some prototype systems that combine information from several sources. The Bureau of Land Management (BLM) uses lightning strike location and polarity information in managing wild fires. NASA uses lightning data in support of their spaceflight operations. The DOD uses lightning data for decision-making related to refueling and munitions handling activities. These agencies are exploring ways of using lightning data in concert with data from other sources and sensors.

Table 5-1. Non-Network Upper Air Stations That Might be Sources of Data

STATION	OPERATED BY	TIME OF OBSERVATIONS	DISTRIBUTION	AGENCY CONTACT	WILL TAKE REQUESTED SPECIALS
Aberdeen Proving Ground	USA	Mon-Fri 1100Z and as required	AMIS MIST	Charles Clough STECS-PO-OM DSN 298-7908 COM 410-278-7908	Yes
Cold Regions Test Center	USA	Unscheduled	AMIS MIST	Craig Eglund DSN 317-873-4326 COM 907-873-4326	Yes
Dugway Proving Ground, UT	USA	Unscheduled	AMIS MIST	Chris Biltoft STEDP-MT-M DSN 789-5101 COM 801-831-5101	Yes
Edwards AFB, CA	USAF	Unscheduled	AMIS	Commander 412, OSS/OSW DSN 527-4318 COM 661-277-4318	No
Eglin AFB, FL	USAF	Unscheduled	AMIS	46 WS/CC DSN 872-5324 COM 850-882-5324	No
Fort Bragg, NC	USAF	Unscheduled	AMIS MIST	Commander 18 WS/CC DSN 239-3150 COM 910-432-3150	No
Fort Huachuca, AZ	USA	Mon-Fri 1200Z	AMIS MIST	Art Trapp AMSTE-TC-AM DSN 879-3906 COM 602-538-3906	Yes
Fort Lewis, WA	USAF	Unscheduled	AMIS	Commander Det 6, 1 WXG DSN 357-5967 COM 206-967-5967	No

Table 5-1 (continued) Non-Network Upper Air Stations That Might be Sources of Data

STATION	OPERATED BY	TIME OF OBSERVATIONS	DISTRIBUTION	AGENCY CONTACT	WILL TAKE REQUESTED SPECIALS
Fort Riley, KS	USAF	Unscheduled	AMIS MIST	Commander Det 8, 1 WXG DSN 856-3327 COM 913-239-3327	No
Fort Sill, OK	USAF	Mon-Fri 1100Z-1500Z	AMIS	Commander Det 11, 1 WXG DSN 639-3200 COM 405-351-3200	No
Marshall Space Flight Center, Huntsville, AL	NASA	Unscheduled	Local loop to WSO Huntsville, AL, then to RAWARC	Bob Turner COM 205-961-4614	Yes
Naval Air Weapons Station China Lake, CA	USN	Monday-Friday 1230Z and as required	MIDDS AMIS	Lloyd Corbett DSN 437-5058 COM 619-939-6058	Yes
Navy Pacific Missile Test Center Point Mugu, CA	USN	Monday-Friday 1300Z, 1800Z, and 2200Z	MIDDS AMIS	Darwin Tolzin DSN 351-8508 COM 805-982-8508	Yes
Navy Pacific Missile Test Center San Nicolas Is., CA	USN	Monday-Friday 1400Z and 2000Z	MIDDS AMIS	Darwin Tolzin DSN 351-8508 COM 805-982-8508	Yes
Redstone Arsenal	USA	Unscheduled	AMIS MIST	James Young DSN 746-2449 COM 205-876-2441	Yes
White Sands Missile Range, NM	USA	Unscheduled	AMIS MIST	Chief, Forecast Section White Sands Met Team DSN 258-2605/1032 COM 505-678-2605/1932	Yes
Yuma Proving Ground, AZ	USA	Mon-Fri 1200Z and as required	AMIS MIST	Dean Weingarten STEYP-RS-TS-W DSN 899-6070 COM 602-328-6070	Yes

Research continues in the use of lightning mappers and other technology and in the development of the ability to depict total lightning strikes as a forecasting and warning tool.

5.4 Surface Weather Observational Network.

5.4.1 Land Surface Observations. To provide the basic weather data needed for analyses performed by NCEP, SPC, AFWA, and FNMOC all available surface data are used. The following stations provide data:

- WFOs/Data Collection Offices (DCOs), Automated Meteorological Observing Stations (AMOS), Supplementary Aviation Weather Reporting Stations (SAWRS), and A-Paid Stations (private contractors paid to take an aviation surface observation);

- DOT/Federal Aviation Administration and USCG weather reporting stations, including flight service stations, towers, bases, and contract weather observing stations;

- DOD weather reporting stations;

- Automatic surface observing systems such as the Automated Surface Observing System (ASOS) and the Automated Weather Observing System (AWOS) and their
replacements; and

- DOI weather and hydrological reporting stations (RAWS and SNOTEL)

5.4.1.1 Augmentation and backup of automated surface observing systems. Augmentation is accomplished at staffed locations and is defined as the process of manually observing and adding weather information to an automated surface observing system's observation that the system is not capable of providing. At designated airport locations, NWS and FAA observers are required to augment ASOS observations as defined by the ASOS Service standards listed under each FAA Aviation Service Levels (see Figure 5-1). At all sites, the minimum required augmentation is to report tornadic activity, hail, virga, volcanic ash, and/or thunderstorms (except where ALDARS is available).

NWS and FAA observers also are required to backup ASOS at designated locations to insure missing or nonrepresentative data are corrected. Backup is the manual observation and reporting of elements that the system would normally report but are missing or considered not representative. To support daily climatological records, all NWS staffed sites collocated with ASOS are also required to provide other specified data in a daily Supplementary Climatological Data product.

5.4.2 Marine Surface Observations. Marine surface observations are taken by observers at land stations and on ship and by automated reporting from automated reporting stations. The National Data Buoy Center (NDBC) maintains automated reporting stations in the Gulf of Mexico, in the coastal and offshore areas of the Atlantic and Pacific Oceans, and in the Great Lakes. These data acquisition systems obtain measurements of meteorological and

"D" Service Level:
No augmentation required - stand alone ASOS

"C" Service Level:
Thunderstorm occurrence
Funnel clouds
Hail
Virga
Volcanic Ash
Tower visibility

"B" Service Level:
all "C" Level required data
Long-line Runway Visual Range (RVR) at designated sites
(RVR 10 minute mean or instantaneous reading)
Freezing drizzle or freezing rain
Ice pellets
Snow depth on ground
Snow increasing rapidly remark (SNOINCR)
Thunderstorm/lightning location remark
Observed significant weather not at station

"A" Service Level:
all "C" and "B" required data
Long-line RVR at designated sites
(RVR 10 minute mean or visibility increments
down to 1/8, 1/16/ and 0)
Sector visibility
Variable sky
Cloud types
Cloud layers above 12,000 feet
Widespread dust, sand, and smoke obstructions
Volcanic eruptions

Figure 5-1. Civilian airports with ASOSs are assigned a specific FAA Aviation Service Levels (A, B ,C, and D) which has associated ASOS Service standards, as specified above. These standards specify what additional data, if any, are required to be observed and added to each ASOS observation.

oceanographic parameters for operations and research purposes. Appendix F contains moored buoy station locations and configurations (Table F-1) and the locations of Coastal-Marine Automated Network (C-MAN) stations (Table F-2). Figures F-2 through F-3 show the locations of all moored buoys and C-MAN stations and Figure F-4 is a detailed chart of the network in the Gulf of Mexico and along the southeast U.S. coast. The operational status and measurement capability of stations can be obtained on-line via NDBC's Internet home page at: http://www.ndbc.noaa.gov/ or from NDBC Division, Building 3203, Stennis Space Center, MS 39529-6000, phone 228-688-7720.

Personnel on USN, USCG, and NOAA ships, along with civilian Volunteer Observing Ships (VOS) at sea, take and transmit marine observations back to the U.S. About 1,600 ships participate in the VOS program, which is managed by NWS, by taking and transmitting the marine observations every six hours.

5.4.2.1 Data Acquisition. Moored buoy and C-MAN stations routinely acquire, store, and transmit data every hour; a few selected stations report every half hour. Data obtained operationally include sea-level pressure, wind speed and direction, peak wind, and air temperature. Sea-surface temperature and wave spectra data are measured by all moored buoys and a limited number of C-MAN stations. Relative humidity is measured at many moored buoy and C-MAN stations where most beneficial to forecast operations.

5.5 Pilot Reports (PIREPs).

5.5.1 Observations. Pilots are encouraged to report weather conditions along the route of flight to confirm forecasted conditions or to indicate conditions differing significantly from those forecast. Pilots should report any weather conditions they encounter which are hazardous to flight.

5.5.2 Accept/Solicit Reports. All FAA air traffic facilities are required to accept PIREPs. They are also required to solicit PIREPs when current or forecast conditions are below ceiling of 5,000FT, visibility less than 5 miles and/or when thunderstorms, turbulence or icing are occurring or forecast. Additionally, AFSS/FSS end all pilot weather briefings with a request for PIREPs.

5.6 Severe Local Storm Reports by Nonmeteorological Agencies and Individuals. The National Weather Service uses observations of severe local storms, particularly tornadoes, from many non-meteorological agencies and personnel such as: utility companies, State Highway Patrols, local police departments, road maintenance patrols, citizen spotters (network), cooperative National Weather Service climatological observers, amateur radio groups, local Civil Defense organizations, radio and television station mobile units, city employees and individual citizens. Local Storm Reports are received by various means and are not uniform at each office. The means include amateur radio or Civil Defense radio facilities with a transceiver often located in the WFOs and operated by local cooperators, police radio, direct telephone lines involving unlisted numbers, the National Warning System (NAWAS), State Highway Patrols, teletypewriter circuits. Local Storm Reports are disseminated to mass news disseminators, to other NWS WFOs, SPC, and to safety agencies by NWS circuits (first priority, except for a more expedient means in some local areas). These Reports are also verbally disseminated by

NAWAS, telephones (hotlines and commercial), and Civil Defense radio facilities. The "fan-out" principle is used wherever practical.

5.7 Severe Storm Surveillance by Meteorological Satellites.

5.7.1 Geostationary Operational Environmental Satellite (GOES). The GOES system consists of two operational spacecraft: GOES-8 at 75 degrees west longitude, and GOES-10 (the successor to GOES-9) at 135 degrees west longitude. GOES-8 introduced a 3-axis stabilized geosynchronous satellite to NOAA operations. These satellites ushered in a new era of products and services, providing improved real-time satellite data to the NWS forecast offices and national centers. GOES-11 was launched on May 3, 2000. This new satellite will provide the same capabilities as GOES-8 and GOES-10. This new satellite is stored on orbit at 106 degrees West until required to replace either of the older operational satellites. GOES-9 is located at 106 degrees West as a short term replacement in the event of a catastrophic failure of either of the older operational satellites. GOES-M (GOES-12 on orbit) is scheduled for launch no earlier than July 12, 2001. GOES-M is similar to GOES-8 through GOES-11, with a few exceptions. The current 12 microwave channel (channel 5), which has 4 km resolution, will be replaced by a 13.3 microwave channel (channel 6), which will have 8 km resolution. This new channel should aid in the tracking of satellite-derived winds. In addition, the current 6.7 microwave channel (channel 13-the water vapor channel) will improve from 8 km to 4 km resolution. GOES-M will be placed into on-orbit storage after initial checkout and will be available to replace GOES-8 or GOES-10, as required.

5.7.1.1 GOES Scan Operations. The spacecraft routinely scan the United States every 15 minutes, except every three hours a full disk image is scanned, taking nearly 30 minutes. Forecasters now view GOES data more frequently and with greater spatial resolution. The GOES-8 and GOES-10 spacecraft were also designed for flexible scanning of the earth. Any variation of scan or sector coverage at regular time intervals can be scheduled in a 30 minute time frame. Rapid Scan Operations (RSO) and Super Rapid Scan Operations (SRSO) are available on the current generation of GOES satellites. RSO and SRSO operations allow for small sections of the earth to be scanned more frequently, at up to one minute intervals. However by doing so, other portions of the earth are scanned with less regularity. Definitions of the GOES RSO and SRSO scanning coverage and scanning times can be found at http://www.ssd.noaa.gov. See “GOES Scanning Schedules” on this web site.

5.7.1.1.1 Requests for Special Satellite Sectors. The NWS sites may request, via the NCEP Senior Duty Meterologist (SDM), RSO and SRSO GOES data on critical severe storm days. The SDM will coordinate this operational request through NESDIS, Satellite Services Division (SSD), Satellite Analysis Branch (SAB). The DOD and research requests are taken directly by SAB, which coordinates the request with the NCO SDM. The details of these procedures are described in the NESDIS/NWS Satellite Schedule Coordination and Dissemination Procedures plan which is available at the SSD website (http://www.ssd.noaa.gov) for users within the government and selected other users (e.g., CIRA and COMET). See “Satellite Schedule Coordination and Dissemination Procedures” on this web site.

5.7.1.1.2 Special Products. Requirements for GOES dissemination schedules are coordinated and provided through NESDIS, Satellite Services Division, and described in the NESDIS/NWS Satellite Schedule Coordination and Dissemination Procedures (provided by the Satellite Services Division, by calling 301-763-8051).

5.7.1.2 GOES Imagers. GOES-8 and GOES-10 host an imager capable of detecting atmospheric temperature and moisture measurements in five spectral bands at high resolutions, including the new 3.9 micron and 12.0 micron wavelengths. GOES-8 and GOES-10 also have the feature of transmitting these five spectral bands simultaneously, affording the user community continuous views of atmospheric measurements in various wavelengths, each with its own meteorological and hydrological applications. The five channels and respective resolutions are as follows:

- Channel 1 (Visible, .55 to .75 microns) - one kilometer resolution.
- Channel 2 (Infrared, 3.8 to 4.0 microns) - four kilometer resolution.
- Channel 3 (Water Vapor, 6.5 to 7.0 microns) - eight kilometer resolution.
- Channel 4 (Infrared, 10.2 to 11.2 microns) - four kilometer resolution.
- Channel 5 (Infrared, 11.5 to 12.5 microns) - four kilometer resolution.

5.7.1.3 GOES Products. The principal GOES-8 and GOES-10 products (see Table 5-2a) are half-hourly pictures with navigation and calibration files included. During the daylight hours, one, two, four, and eight kilometer resolution visible fixed standard sectors are produced for AWIPS/NOAAPort distribution, and equivalent infrared sectors (4 kilometer), including Water Vapor (8 kilometer), for all available channels are available 24 hours a day. Satellite raw and remapped imagery, with navigation and calibration, are available to Regional and Mesoscale Meteorological Team Advanced Meteorological Satellite Demonstration and Interpretation System (RAMSDIS) users within the NWS and NESDIS community. Using the 3.9 micron and 10.7 micron channels together, a low level cloud/fog product is produced which the WFOs now use routinely. This is a new capability, since these were the first geostationary satellites to use the 3.9 micron channel.

5.7.2 NOAA Polar-Orbiting Satellites. These satellites each cross the U.S. twice per day at twelve hour intervals for each geographical area near the Equatorial crossing times listed in Table 5.4a. Data are available via direct readout (HRPT or APT) or central processing. The current primary polar orbiting satellites are NOAA-15 and NOAA-16, although older satellites still have limited capabilities. NOAA-15 provided the same capabilities as previous NOAA

satellites, plus an Advanced Microwave Sounder Unit (AMSU) was added. NOAA-16 was launched on September 21, 2000. This new satellite has capabilities similar to NOAA-15.

5.7.3 Defense Meteorological Satellite Program (DMSP) Polar-Orbiting System. The DMSP constellation consists of at least two spacecraft placed in sun-synchronous orbits best suited to support military operations (see Table 5-4b). In addition to the very high resolution visible and infrared imagery, DMSP provides a variety of remotely sensed terrestrial and space environmental data. A suite of microwave radiometers provides microwave imagery as well as surface characteristics and upper air temperature and moisture soundings.

Table 5-2a. GOES and NOAA Satellite and Satellite Data Availability for the Severe Local Storms Season.

SATELLITE	TYPE OF DATA	LOCAL TIME	PRODUCTS
GOES-8 at 75°W GOES-9 at 106°W (on orbit storage) GOES-10 at 135° W GOES-11 at 106°W (on orbit storage)	Multispectral Imager and Sounder 5 Channels for Imager 19 Channels for Sounder	Every 30 min, in Routine Scan Mode, provides 3 sectors with prescribed coverages: Northern Hemisphere (NH) or Extended NH; Continental U.S. or Pacific U.S.; and Southern Hemisphere (SH). Exception is transmission of full disk every 3 hours. (Available Rapid Scan Operations yield increased transmissions to 7.5 minute intervals to capture rapidly changing, dynamic weather events).	1. 1, 2, 4, and 8 km resolution visible standard sectors. 2. 4 km equivalent resolution IR sectors. 3. Equivalent and full resolution IR enhanced imagery. 4. Full disk Infrared every 3 hours. 5. 8 km water vapor sectors. 6. Quantitative precipitation estimates; high density cloud and water vapor motion wind vectors; and experimental visible and sounder winds. 7. Operational moisture sounder data (precipitable water) in four levels for inclusion in NCEP numerical models. Other sounder products including gradient winds, vertical temperature and moisture profiles, mid-level winds, and derived product imagery (precipitable water, lifted index, and surface skin temperature). 8. Tropical storm monitoring and derivation of intensity analysis. 9. Volcanic ash monitoring and dissemination of Volcanic Ash Advisory Statements. 10. Daily northern hemisphere snow cover analysis. 11. Twice daily fire and smoke analysis over specific areas within CONUS.
NOAA-16 NOAA-15 NOAA-14 NOAA-12 (replaced by NOAA-15 for processing)	AVHRR GAC AND LAC (recorded), HRPT, AMSU, HIRS AVHRR (experiencing some difficulties) GAC and LAC (recorded), HRPT and APT (direct), RTOVS, AMSU same as NOAA-15 (except no AMSU) AVHRR GAC AND LAC, HRPT and APT (direct) TOVS	0155D/1355A 0722D/1922A 0337D/1537A 0504D/1704A	1. 1 km resolution HRPT and Local Area Coverage (LAC) data. 2. 4 km resolution APT and Global Area Coverage (GAC) data. 3. Mapped imagery. 4. Unmapped imagery (all data types) at DMSP sites. 5. Sea-surface temperature analysis. 6. Soundings. 7. Moisture profiles. 8. Remapped GAC ectors. 9. Sounding-derived products--total precipitable water, rain rate, and surface winds under sounding (NOAA-15 & NOAA-16). 10. Daily northern hemisphere snow cover analysis. 11. Twice daily fire and smoke analysis over specific areas within CONUS.

GVAR - GOES Variable
GAC- Global Area Coverage (recorded reduced resolution data for central processing)
LAC - Local Area Coverage (recorded high-resolution data, limited amount)
ATOVS - Advanced TIROS-N Operational Vertical Sounder
AMSU - Advanced Microwave Sounding Unit
RTOVS - Revised TIROS-N Operational Vertical Sounder
HRPT - High Resolution Picture Transmission (1.1 km)
APT - Automated Picture Transmission (4 km)
AVHRR - Advanced Very High Resolution Radiometer
Under Local Time heading: D - descending orbit
A - ascending orbit

Table 5-2b. DMSP Satellite and Satellite Data Availability for the Severe Local Storms Season.

SATELLITE	TYPE OF DATA	LOCAL TIME	PRODUCTS
DMSP F-12	OLS Imagery (recorded and direct), SSM/I (non-functional), SSM/T-1 (non-functional), SSM/T-2 (recorded and direct)	0805D/2005A	1. 0.3 nm (regional) and 1.5 nm (global) resolution (visual and infrared) imagery available via stored data recovery through AFWA. 2. Regional coverage at 0.3 nm and 1.5 nm resolution (visual and infrared) imagery available from numerous DOD tactical terminals.
DMSP F-13	OLS Imagery (recorded and direct), SSM/I, SSM/T-1	0605D/1805A	3. SSM/T-1, SSM/T-2, SSM/I data transmitted to NESDIS and FNMOC from AFWA
DMSP F-14	OLS Imagery (recorded and direct), SSM/I, SSM/T-1 (inop), SSM/T-2	0840D/2040A	
DMSP F-15	OLS Imagery (recorded and direct), SSM/I, SSM/T-1, SSM/T-2	0930D/2130A	

Under Local Time heading: D - descending orbit
A - ascending orbit
DMSP - Defense Meteorological Satellite Program
OLS - Operational Line Scanning
SSM/I - Special Sensor Microwave Imager
SSM/T-1 - Special Sensor Microwave Temperature Sounder
SSM/T-2 - Special Sensor Microwave Moisture Sounder