EOS Direct Broadcast
Real-Time Products for the
US National Weather Service

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Objectives:
• Acquisition and processing of EOS Terra and Aqua direct broadcast (DB) data.
• Distribution of data to customers in real-time.
• Development of software for data processing.

Accomplishments:
• Have acquired more than 20,000 Terra and Aqua passes.
• MODIS, AIRS, and AMSR-E Level 1B data, browse images, and Level 2 products are produced automatically and made available via anonymous FTP and the Web.
• IMAPP MODIS/AIRS/AMSR-E software now in use in on every continent.

Funding: NASA, NOAA IPO
Major Customers for EOS Direct Broadcast Data from SSEC

National Weather Service
Imagery for Forecasters

Naval Research Lab Monterey
NexSat Website
Product Development

Canadian Ice Service
Ice Analyses

NOAA Great Lakes Environmental Research Lab
JPEG and GeoTIFF images for Great Lakes

NASA/Environmental Protection Agency IDEA Project
L1B data and images for air quality forecasts
Canadian Ice Service integrates MODIS into operational data stream for ice monitoring

CIS data suite includes RadarSat and Envisat (SAR); AMSR, QuikScat and SSM/I (microwave); MODIS, OLS, NOAA and GOES (visible images).

• MODIS supplements SAR data in clear sky conditions.
• 250 meter resolution true color GeoTIFF images are obtained daily from SSEC for Great Lakes, Hudson Bay, Labrador coast, and Gulf of St. Lawrence.

MODIS helps to define ice boundary along southern Prince Edward Island

MODIS DB image 2006/02/18 15:26 UTC  
CIS Ice Analysis 2006/02/18
NASA/EPA Air Quality Monitoring and Forecasting

MODIS Aerosol Optical Depth and Surface PM2.5 integrated with Trajectory Model
MODIS Today: [http://www.ssec.wisc.edu/modis-today/](http://www.ssec.wisc.edu/modis-today/)
MODIS Today: Google Earth Integration

Images available within 60 min.
SSEC Direct Broadcast Processing System: Schematic

- UW-Madison Network
  - Gigabit Layer-2 Firewall
  - Client/Operator Workstations

- Private Network Switch
  - 16 port NetGear (Gigabit)

- Sun V40z (springbok)
  - 2 x dual core Opteron
  - 8GB RAM, 1.2TB disk
  - Cluster head node

- Sun X2200-M2
  - 2 x dual core Opteron
  - 16GB RAM, 250GB disk
  - Cluster compute nodes

- SSEC Gigabit network

- SSEC EOS Direct Broadcast Processing and Distribution System
  - October 2007

- Sun SPARC (xband)
  - Pass scheduling and acquisition

- IBM eServer (eosdb)
  - Web server

- Dell Storage Server (ftp)
  - FTP server
MODIS Products for the US National Weather Service

SSEC began routine insertion into NWS Central Region data feed on 30 June 2006.

**Current feed consists of:**
- MODIS L1B Bands 1 (.86 micron), 7 (2.1 micron), 26 (1.38 micron), 20 (4.0 micron), 27 (6.7 micron) and 31 (11 micron)
- Cloud Phase, TPW, Cloud Top Temperatures, Fog, SST, NDVI, LST

**Keys to success:**
- Provide something better or new to forecasters (e.g., higher resolution)
- Must be delivered in a format that can be accepted by AWIPS
- Must have a person at the forecast offices to champion the data

Steve Hentz, Lead Forecaster, NWSFO MKE
Main AWIPS display tool is known as **D2D**

**Display**

2 (Two)

**Dimensions**

**AWIPS**

Advanced

Weather

Interactive

Processing System
SSEC Real-time Products: Value to NWS Forecasters

- Near-term (less than 12 hours) forecasts
  - Diagnosing heavy precipitation potential
    - Total Precipitable Water (TPW)
  - Determining precipitation type
    - Snow or freezing drizzle?
- Short-term (12 to 36 hours) forecasts
  - Areas of fog formation
  - Temperatures in lakeshore areas
- Post-event analysis
  - Temperature of significant convective cells
- Aviation
  - Small-scale orographic turbulence
- Climatology
  - Diagnosing areas of accumulated snow
  - Formation of ice on sizeable lakes and other waterways
- Marine
  - Wind shift on Great Lakes
CIMSS/SSEC AWIPS Imagery Distribution Network

- Davenport, Iowa
- La Crosse, Wisconsin
- Milwaukee, Wisconsin
- Riverton, Wyoming
- Reno, Nevada
- Indianapolis, Indiana
- Billings, Montana
- Springfield, Missouri
- Aberdeen, South Dakota
- Wichita, Kansas
- Green Bay, Wisconsin
- Duluth, Minnesota
- Minneapolis, Minnesota
- Spokane, Washington
- Des Moines, Iowa
- Kennedy Space Center
NWS at KSC began using MODIS real-time products from SSEC in Nov. 2007 to support NASA Space Shuttle launch and landing forecasts.

MODIS Sea Surface Temperature (SST) near to shore helps to forecast duration of rain showers at the Cape.
The main short term forecast problem is east flow and marine layer influence over eastern Wisconsin...and dense fog potential in the west. Think most of the dense fog would be in the river valleys...with a tendency for patchy fog and some stratus again in the east with more of a gradient. MODIS 1 km imagery last night showed the dense fog in Lone Rock and Boscobel was confined to the immediate Wisconsin River Valley...important information. The local River Valley dense fog is not seen in the normal 2 km GOES. (Hentz/MKX)
MODIS Imagery in AWIPS

Band 1: Visible channel (0.6µm)

MODIS visible channel

GOES visible channel
MODIS Imagery in AWIPS

Band 7: Snow/Ice channel (2.1µm)

0.66 µm channel

2.1 µm channel

Snow/ice vs. supercooled water cloud discrimination
MODIS Imagery in AWIPS

Band 20: Shortwave Infrared (3.7µm)

Improved fire detection capability
MODIS Imagery in AWIPS
Vegetation Index and Land Surface Temperature

Vegetation Index (NDVI)
Land Surface Temperature

Helps with Fire Weather Forecasting
MODIS Imagery in AWIPS

Band 31: Infrared window (11.0μm)

1-km MODIS
Improved feature identification (overshooting tops, enhanced-v)

4-km GOES
MODIS Imagery in AWIPS
Fog/stratus product (11.0µm - 3.7µm)

1-km MODIS
Improved fog/stratus detection capability

4-km GOES
MODIS Imagery in AWIPS

Sea surface temperature

Identify areas of upwelling ⇒ Maximum temperature forecast
MODIS Imagery in AWIPS

Cloud phase product

Can aid in the precipitation type forecast problem
MODIS True Color Imagery Viewer
MODIS True Color Imagery Viewer
MODIS True Color Imagery Viewer

Image valid time: 20070817 1609Z

University of Wisconsin - Madison
MODIS Images in Google Earth

Dust vs. Smoke can be Discriminated in True Color Imagery

Image courtesy of J. Zeitler, NWS Austin TX

18 March 2008
For more information, see the online lesson

http://cimss.ssec.wisc.edu/goes/visit/modis.html