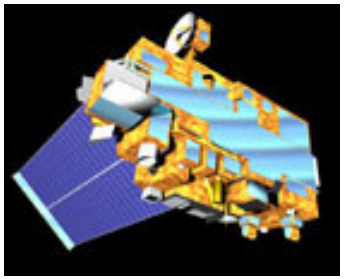
EOS Direct Broadcast at SSEC: Current Status and Near-term Plans



Liam Gumley, Kathleen Strabala, Tom Rink, Allen Huang,
Elisabeth Weisz, Jim Davies, Jerry Robaidek, Rosie Spangler

MODIS Atmosphere Group

14 July 2004

EOS Direct Broadcast Reception and Processing at SSEC

Objectives: Routine acquisition and processing of EOS direct broadcast data. Distribution of software for data processing.

Accomplishments:

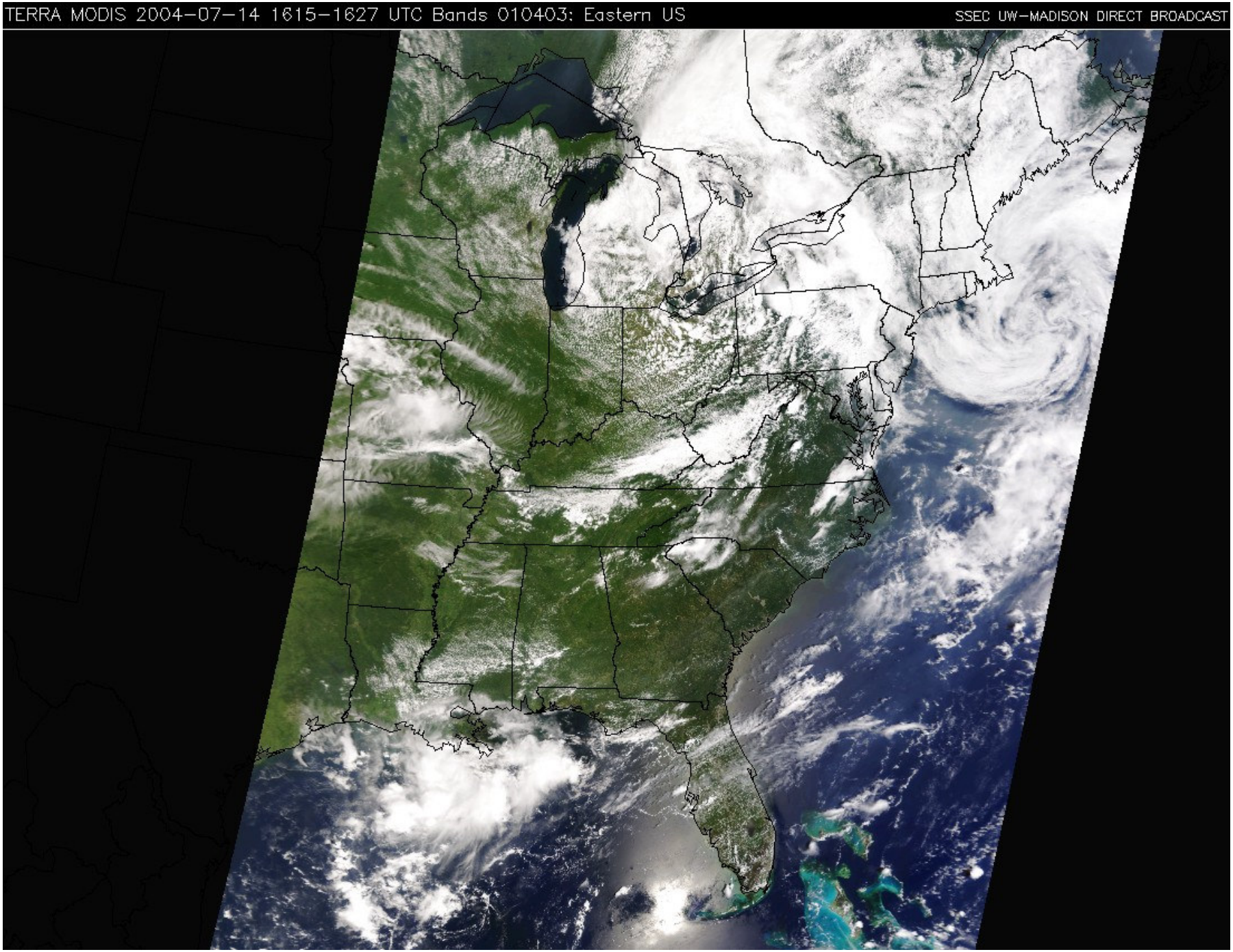
- Ground station operational January 2001. Have acquired more than 5300 Terra and 1650 Aqua passes.
- MODIS and AIRS/AMSU Level 1B data and browse images, and Level 2 products, are produced automatically and made available via anonymous FTP, DODS and Web.
- IMAPP software for processing EOS direct broadcast data now in use in USA, UK, Germany, Russia, Japan, China, S. Korea, Singapore, Australia (to name a few).

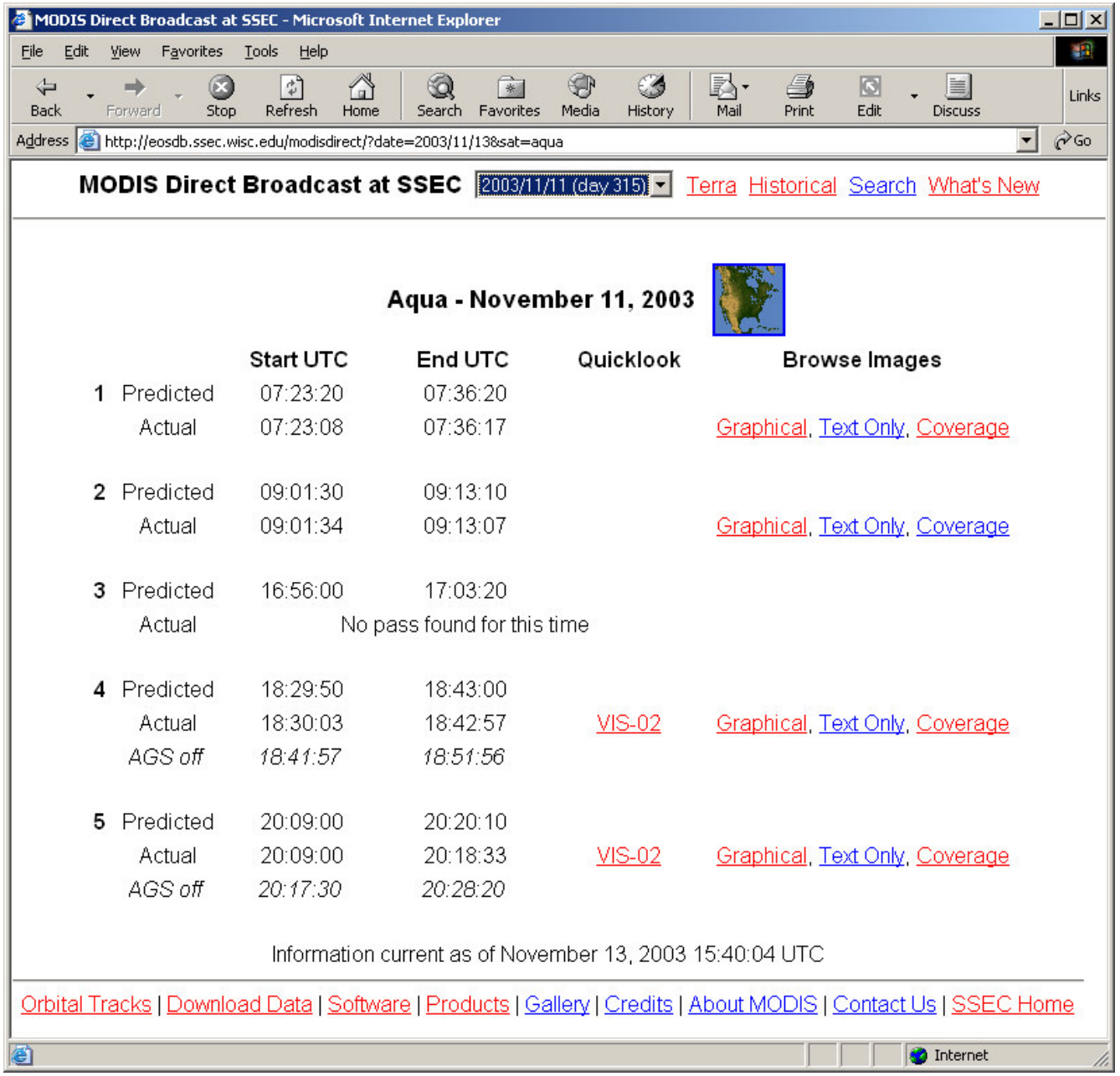
SSEC X-band Groundstation

SeaSpace 4.4 meter antenna; operational since Jan. 2001.

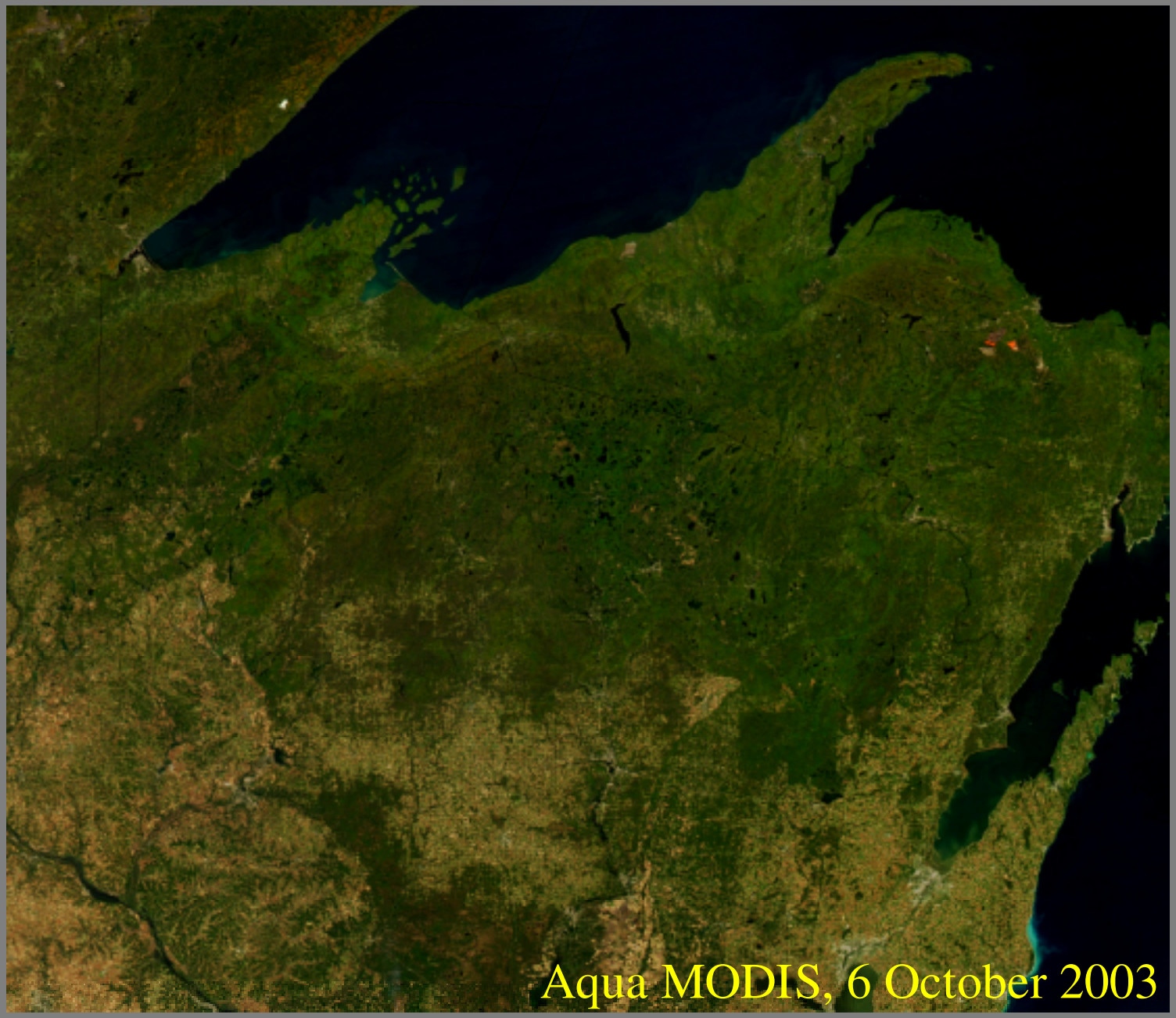
Receives Terra, Aqua, Oceansat, ERS-2, Radarsat, ADEOS-II.

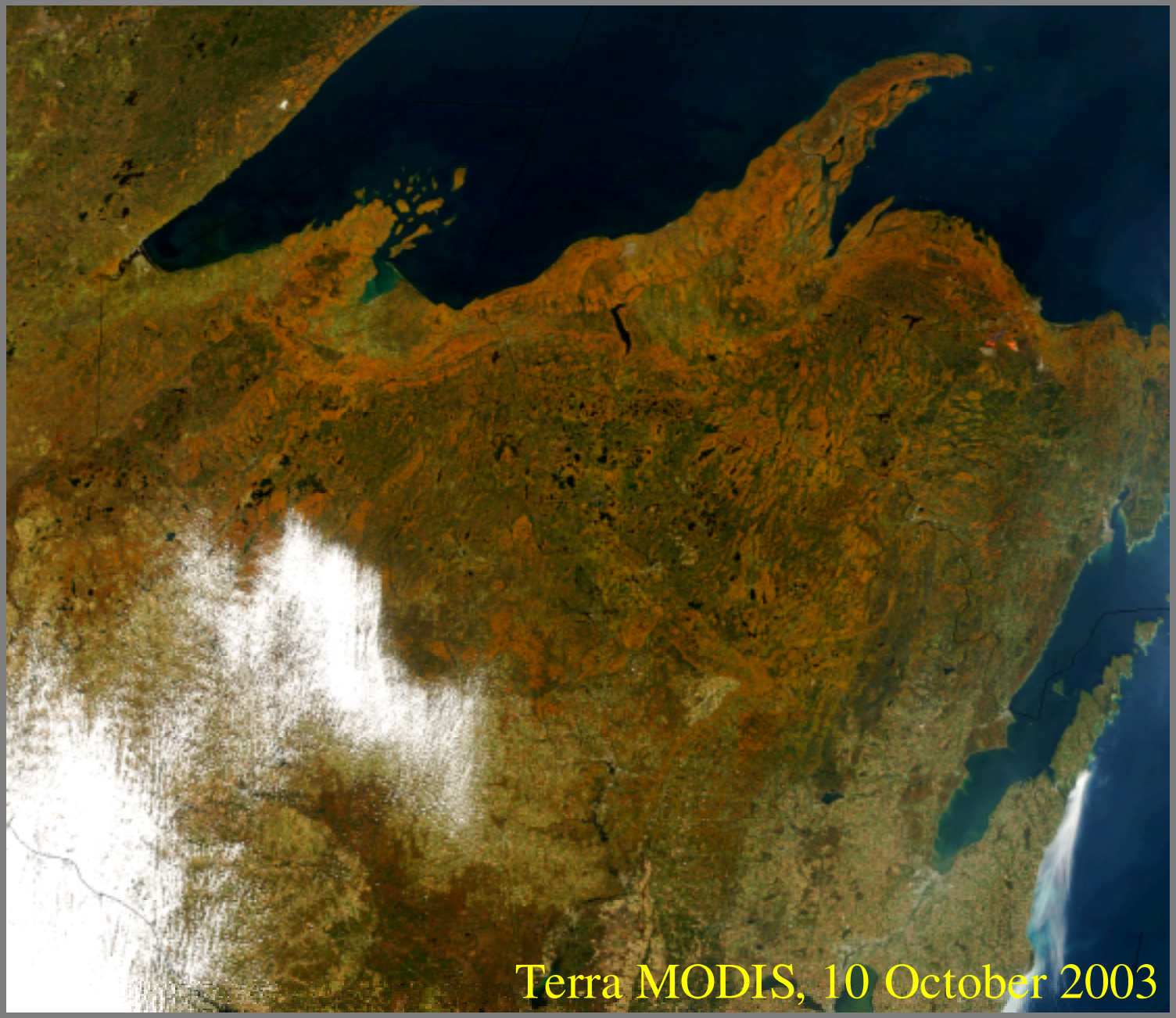
Line of sight to the horizon in all directions.


TERRA MODIS 2004-07-14 1615-1627 UTC Bands 010403: Eastern US
SSEC UW-MADISON DIRECT BROADCAST



http://eosdb.ssec.wisc.edu/modisdirect/


Aqua MODIS, 6 October 2003


Terra MODIS, 10 October 2003

International MODIS/AIRS Processing Package

Goal: Transform direct broadcast Level-0 data to calibrated & geolocated radiances (Level-1B) and science data products (Level-2).

Features:

- Ported to a range of platforms (IRIX, SunOS, AIX, HPUX, Linux),
- The only required tool kit is NCSA HDF4,
- Processing environment is greatly simplified,
- Passes of arbitrary size may be processed,
- Available at no cost; licensed under GNU GPL
- Funded by NASA (250K/yr 01-03, 350K/yr 03-06)

Available from:

http://cimss.ssec.wisc.edu/~gumley/IMAPP/

IMAPP Status

MODIS Level 1B products

- calibration, geolocation (L1B)

MODIS Level 2 products

- cloud mask *1 km/250 m – 48 bits of information*
- cloud top properties (height, temperature, emissivity, phase) *5x5 km retrievals over clouds*
- atmospheric profiles (T, q, total precipitable water vapor, stability indices, total ozone, skin temperature)

  5x5 km retrievals clear sky only
- sea surface temperatures *1x1 km all scenes*

MODIS utilities

- destriping band 26 (correct for band 5 spectral leak)
- creating true color images tutorial

AIRS products

- AIRS/AMSU Level 1 (with JPL)

CIMSS Near-Real Time IMAPP automated processing

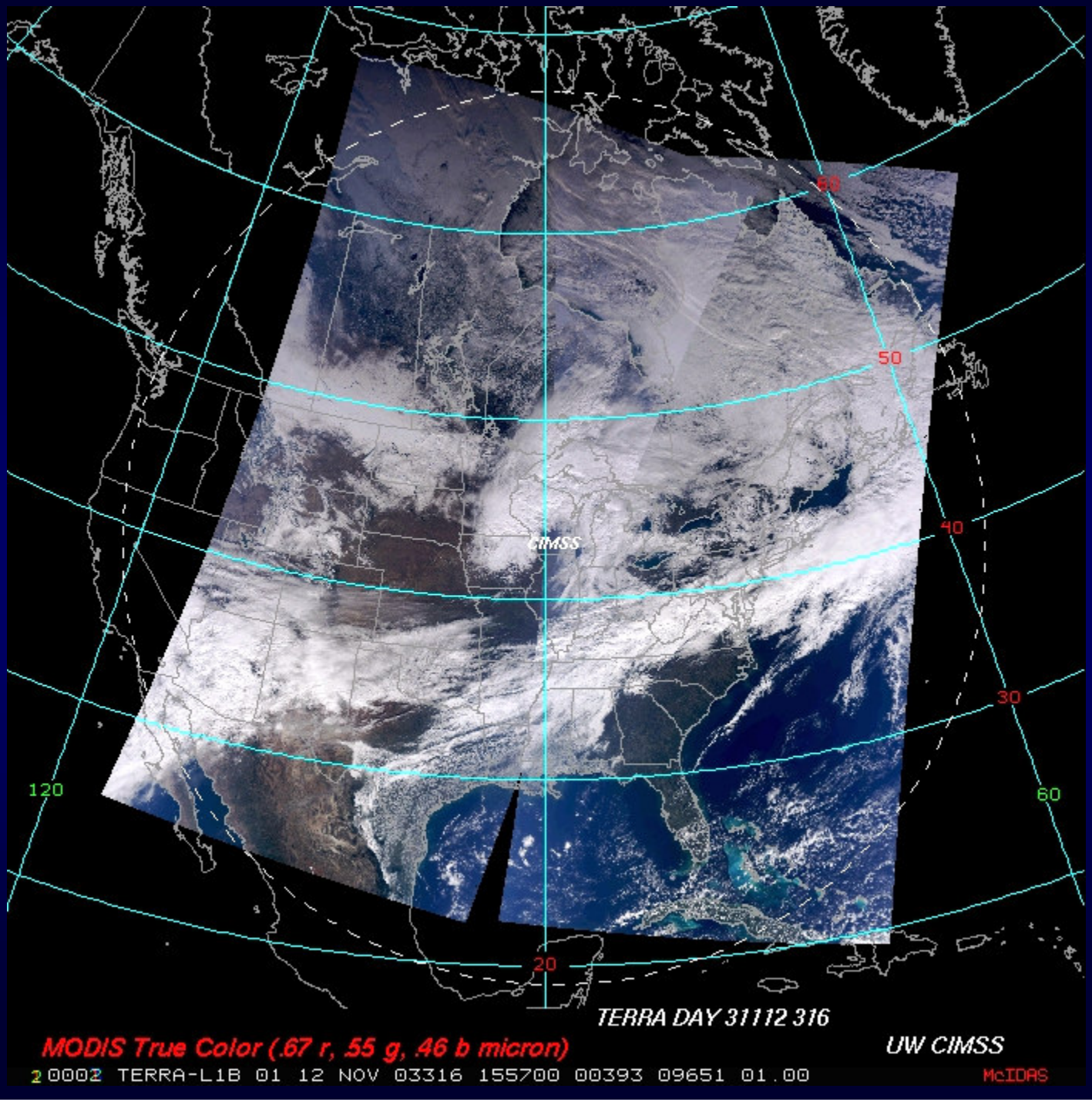
Applications:

- MODIS L1B and science product validation
- Testing of MODIS operational product changes
- Quick look images for identifying regions of spectral or meteorological interest
- Support for field experiments
- Testbed for new IMAPP products (ie., Surface Reflectance)
- Channel simulation for future instruments (Advanced Baseline Imager - 2012)

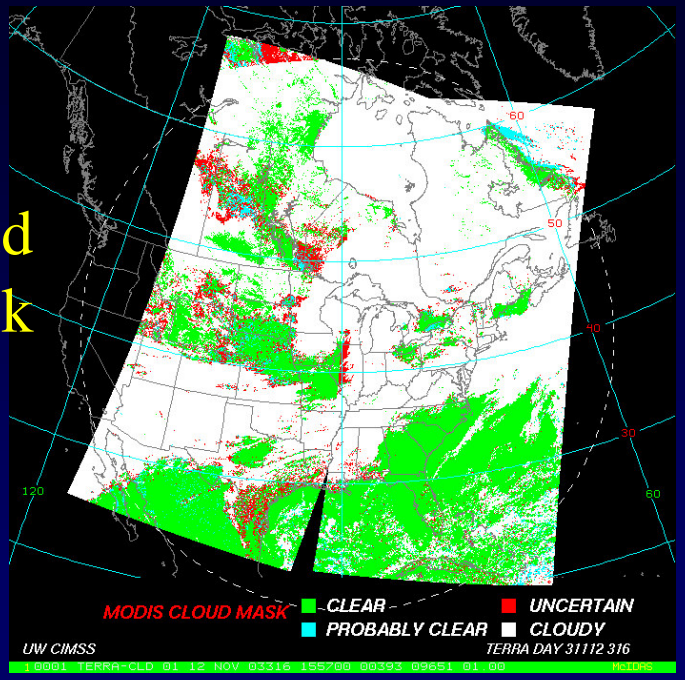
http://cimss.ssec.wisc.edu/goes/abi/airs_broadcast/aniairs.html

IMAPP
Terra/Aqua
MODIS
Level 2
Products

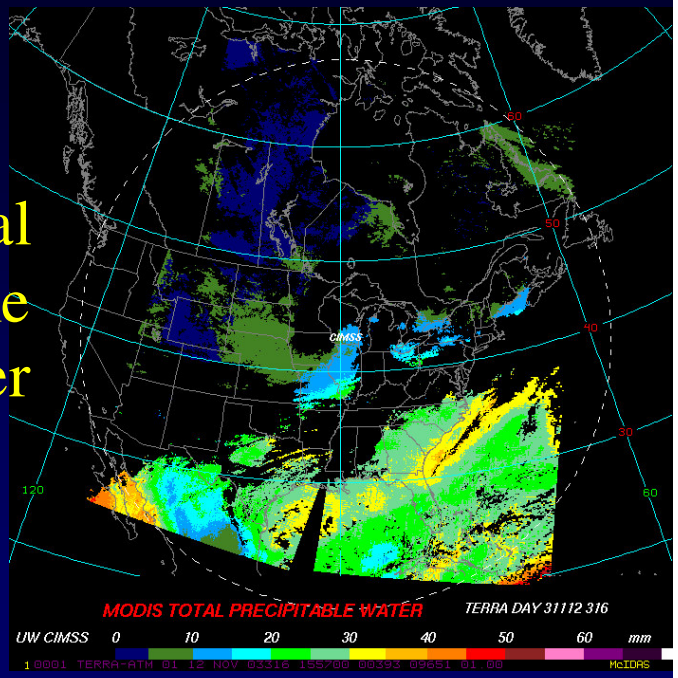
Automatic
Production at
SSEC



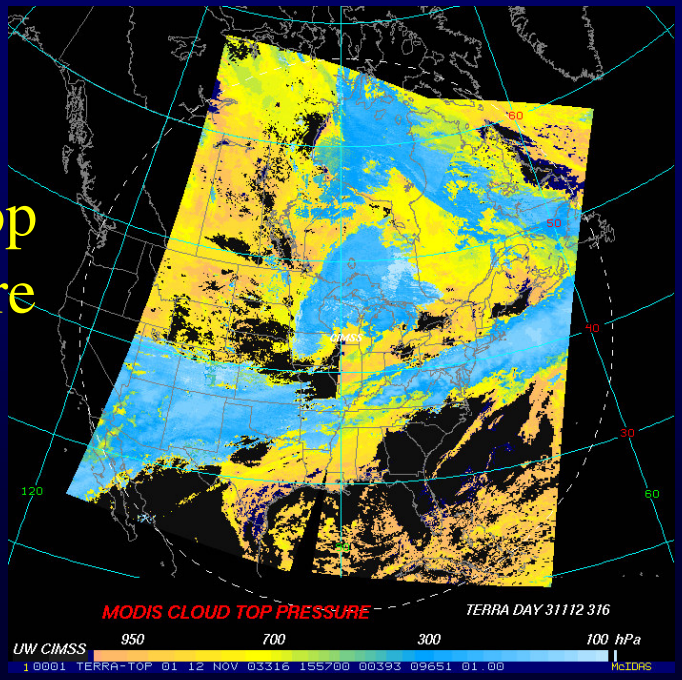
Cloud Mask



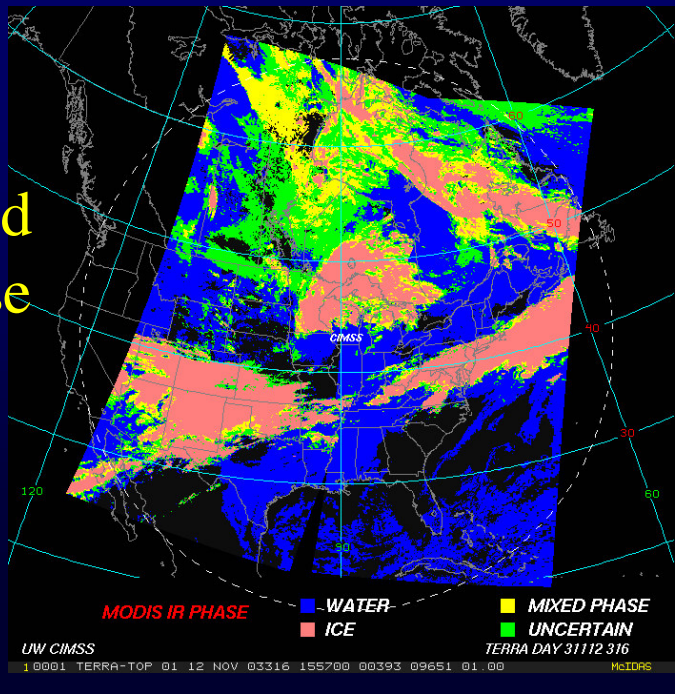
Total Precipitable Water



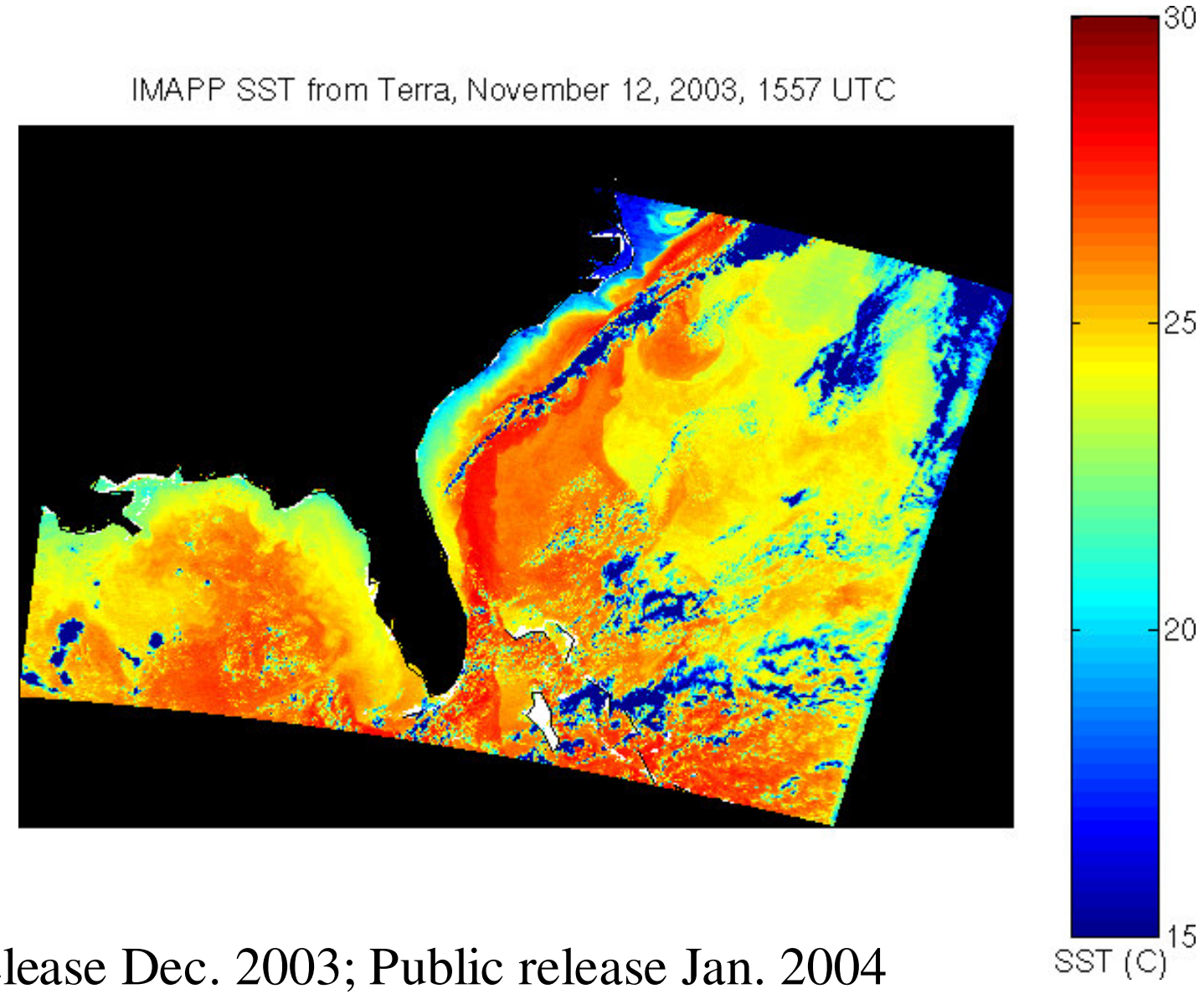
Cloud Top Pressure



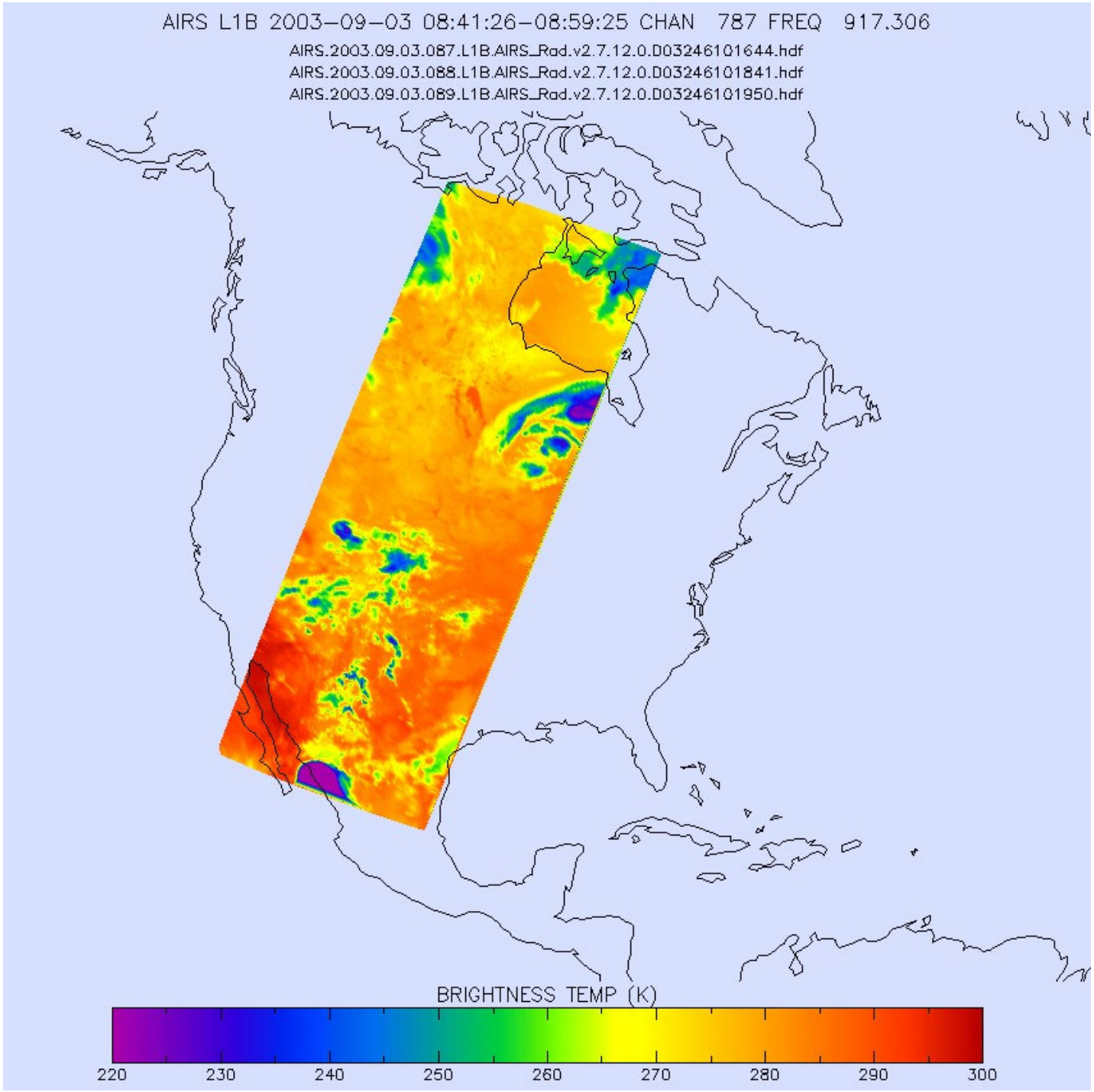
Cloud Phase

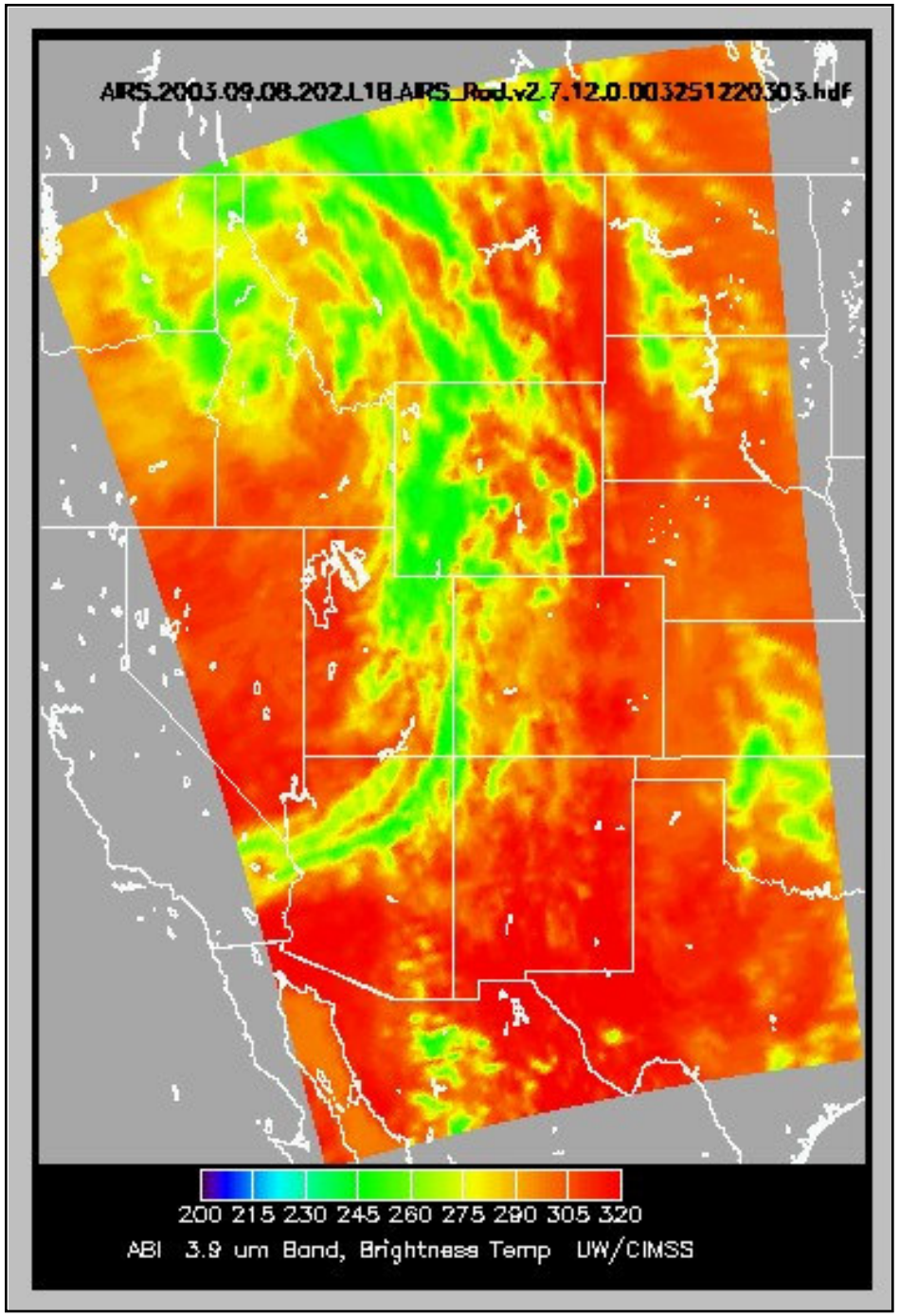


IMAPP MODIS Sea Surface Temperature



Beta release Dec. 2003; Public release Jan. 2004


AIRS L1B 2003-09-03 08:41:26-08:59:25 CHAN 787 FREQ 917.306
AIRS.2003.09.03.087.L1B.AIRS_Rad.v2.7.12.0.D03246101644.hdf
AIRS.2003.09.03.088.L1B.AIRS_Rad.v2.7.12.0.D03246101841.hdf
AIRS.2003.09.03.089.L1B.AIRS_Rad.v2.7.12.0.D03246101950.hdf
BRIGHTNESS TEMP (K)
220
230
240
250
260
270
280
290
300



Simulated Advanced Baseline Imager (ABI) 3.9 micron Brightness Temperature from AIRS UW Direct Broadcast IMAPP Real time product

Aqua 8 September 2003

20:21 UTC

IMAPP Product Applications

- Providing US National Weather Service forecasters with near real-time high spatial resolution imagery and products (NASA SPORT).
- Providing MODIS Aerosol and Cloud data for Infusing Satellite Data into Environmental Applications (IDEA) project to aid in Air Quality Forecasts by the US EPA.
- Water quality monitoring - University of Wisconsin
- Aiding the Canadian Ice Service in monitoring the amount of ice on Hudson Bay for shipping concerns.
- Supplying cloud information from IMAPP as part of the European CLOUDMAP 2 project.

IDEA

Infusing satellite Data into Environmental Applications

The IDEA team values your feedback! Please send any comments, problems and suggestions to SSEC Webmaster.

Latest Forecast Discussion - May 27, 2004

MODIS AOD over continental US shows relatively low aerosol loading with moderate AOD plume exiting the mid-Atlantic Coast. Region of moderate PM2.5 AQI in Midwestern AIRNow data is obscured by clouds.

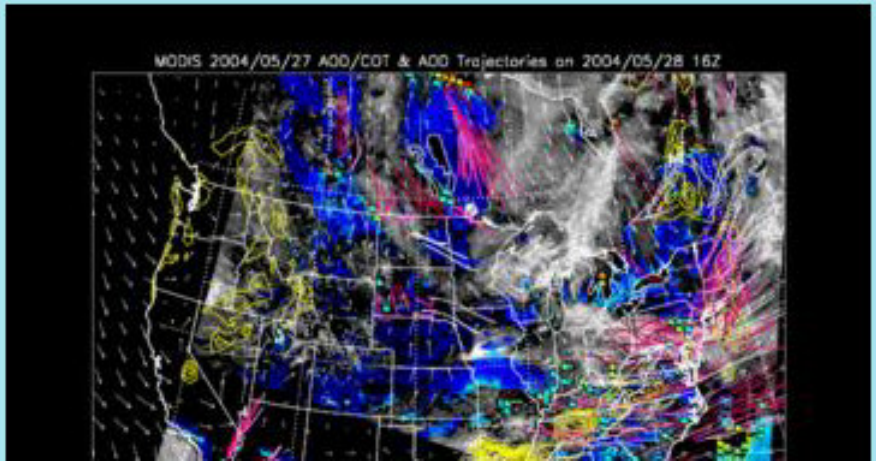
Moderate (~0.4) MODIS AOD in south-central US forecasted to be advected towards Virginia and Carolinias on 05/28 with rapid advection off the South-eastern coast by 05/29. Possibility of recirculation of aerosol loading off the coast associated with high pressure system over Florida.

More

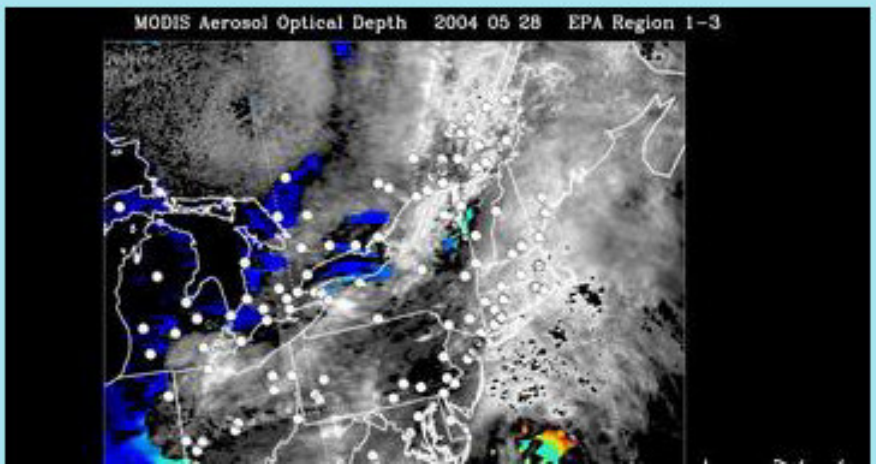
bradp 05:17 PM EDT | Comments (0)

http://idea.ssec.wisc.edu

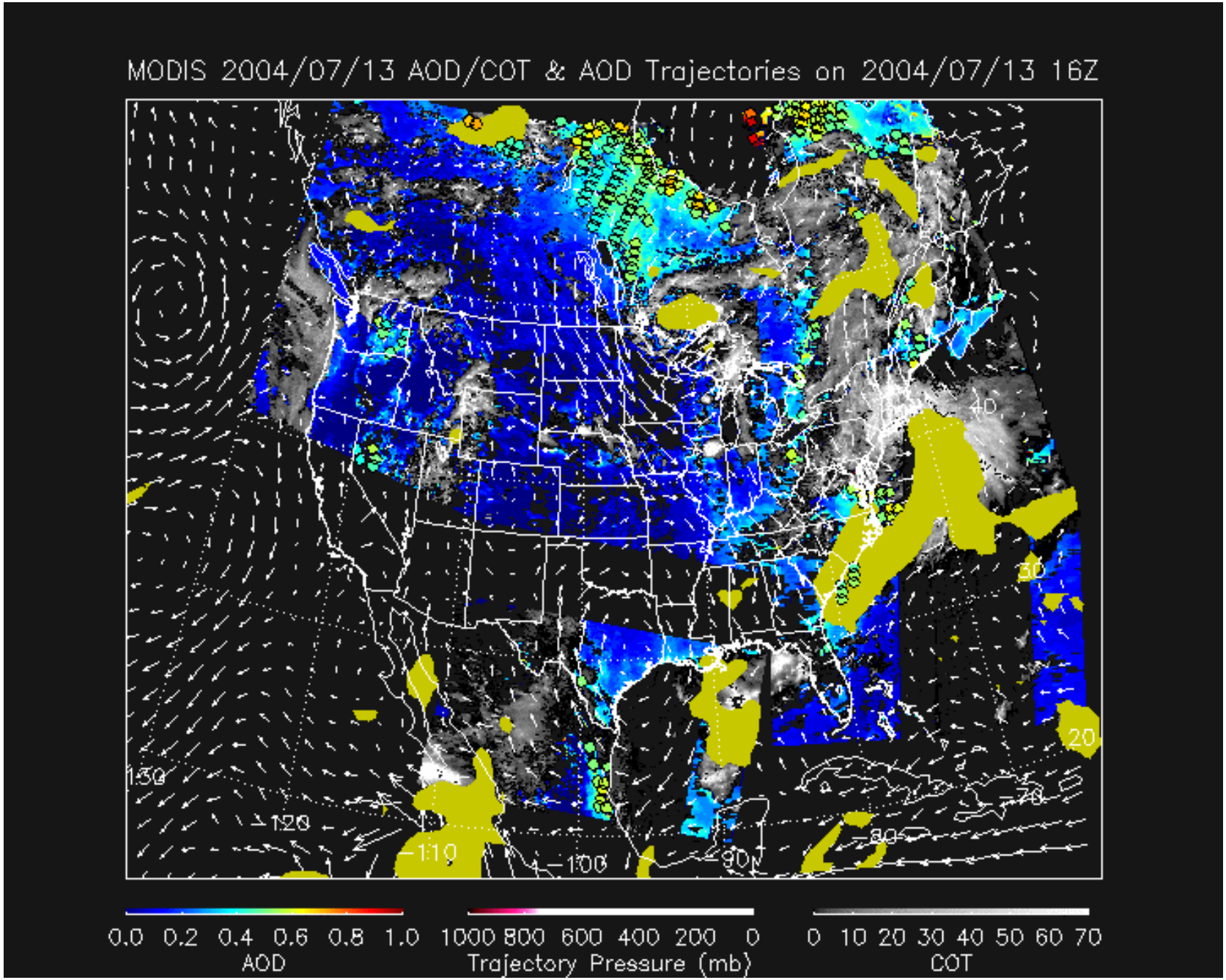
Forecast Trajectories for MODIS Aerosol Optical Depth, Cloud Optical Thickness and 48 hour Air Parcel

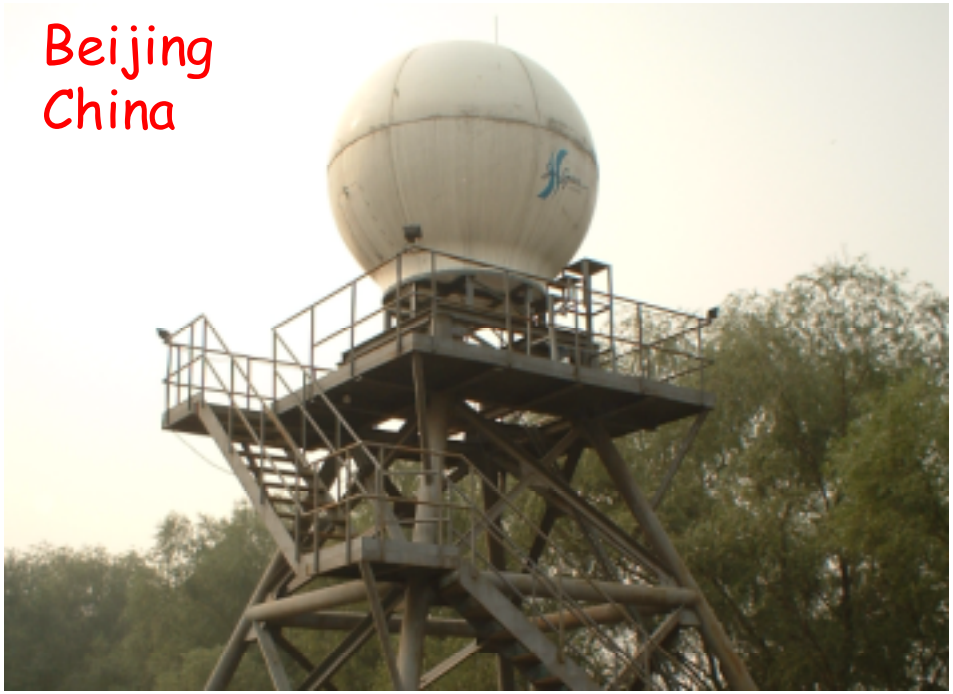


Regional Summary Plots of MODIS Aerosol Optical Depth and Cloud Optical Thickness



IDEA Aerosol Trajectory Forecast: 13 July 2004

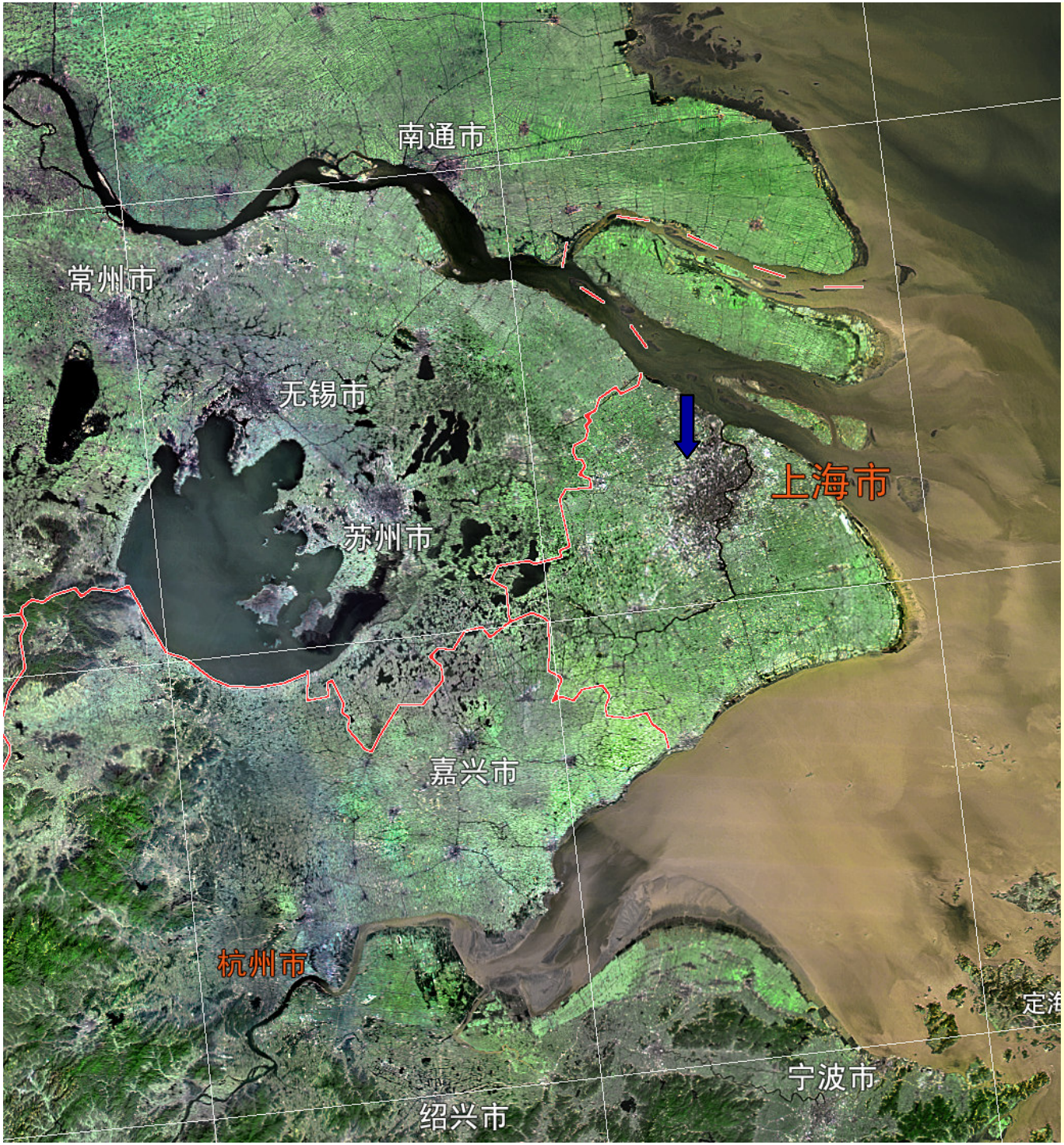



Beijing
China

Moscow
Russia

Wisconsin
USA

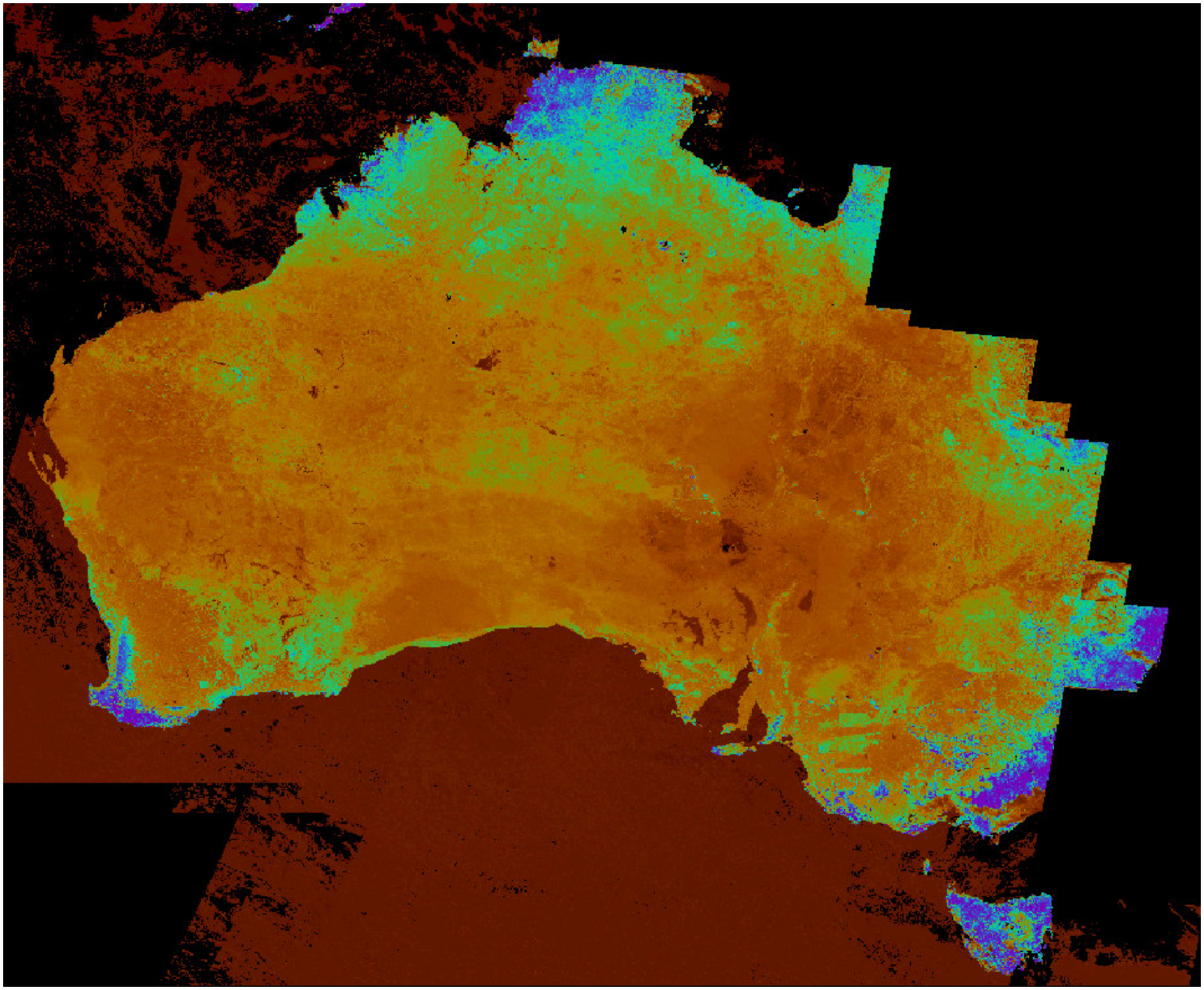
Benevento
Italy



MODIS view of Shanghai

The 3 channel composition image of ch1/ch4/ch3. . The blue arrow points Shanghai city district.

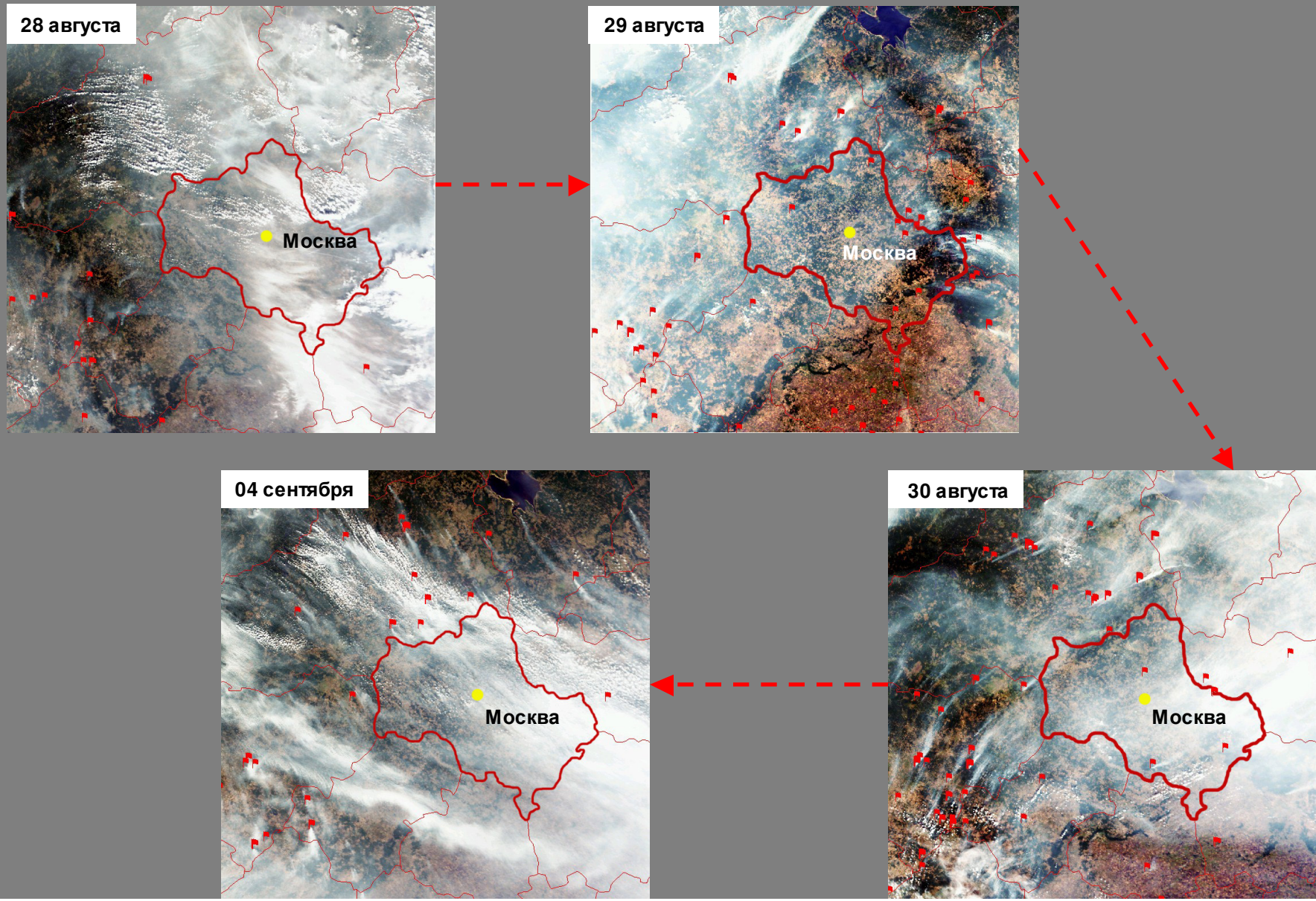
Terra MODIS NDVI composite (WASTAC Australia)



СканЭкс
ИНЖЕНЕРНО-ТЕХНОЛОГИЧЕСКИЙ ЦЕНТР

Мониторинг лесных пожаров в Московской обл. летом 2002 г. по данным MODIS

Wild fires detection near Moscow by MODIS data in summer 2002



Future IMAPP applications

AIRS Atmospheric Profile Retrieval:

- L2 products – *First release by end of July 2004*
  - T/q retrievals, Total Precipitable Water Vapor
  - Skin Temperature
  - Ozone Profiles, Total Column Ozone
  - Surface Emissivity, Surface Reflectivity
- AMSU Precipitation
- Combined MODIS/AIRS products

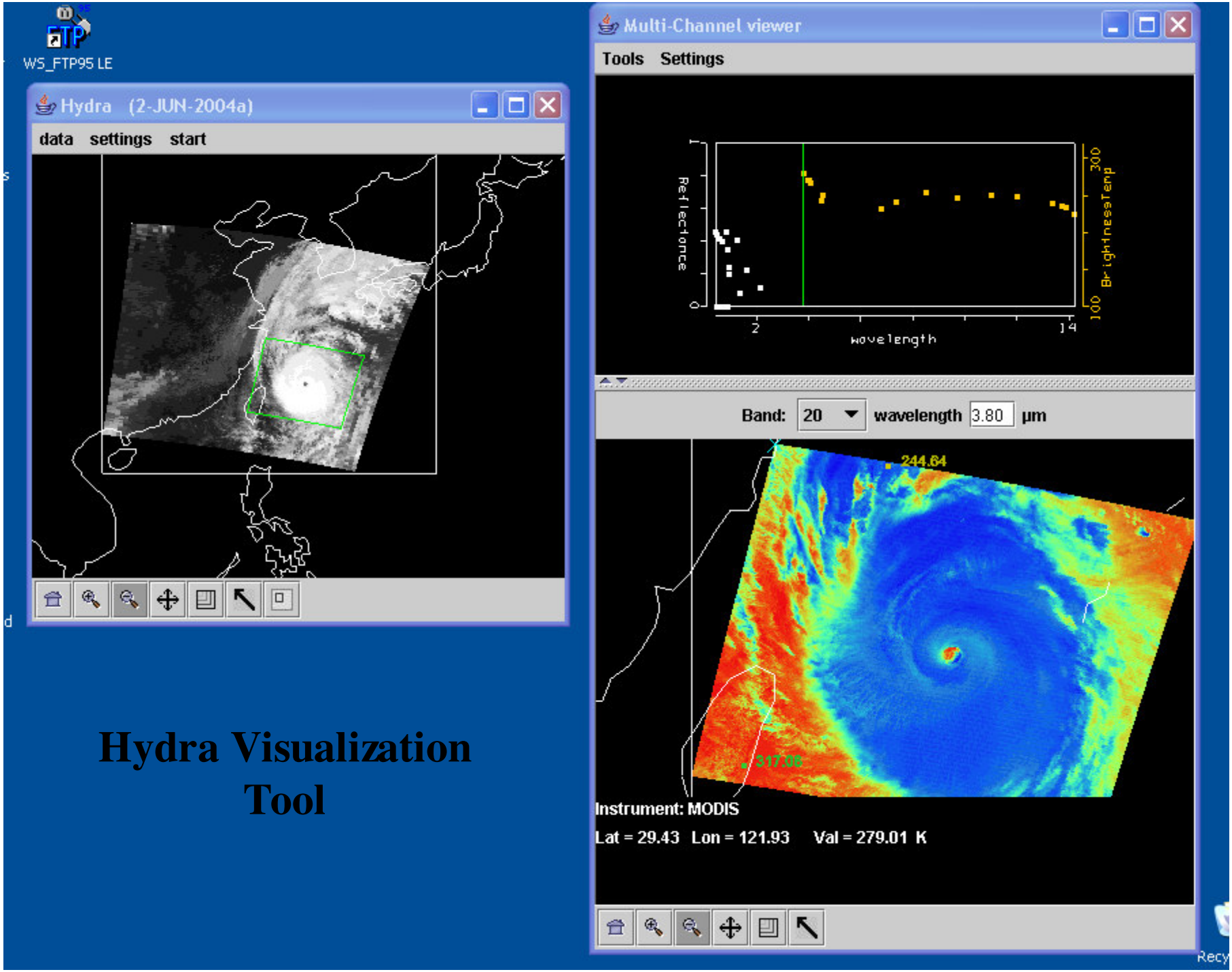
MODIS Level 2 products:

- Aerosol Optical Depth – *release by end of July 2004*
- Land Surface Reflectance
- Suspended Sediment Concentration
- Cloud Optical Properties
- Scene Classification
- Snow Cover/Lake Ice

Future IMAPP applications (Continued)

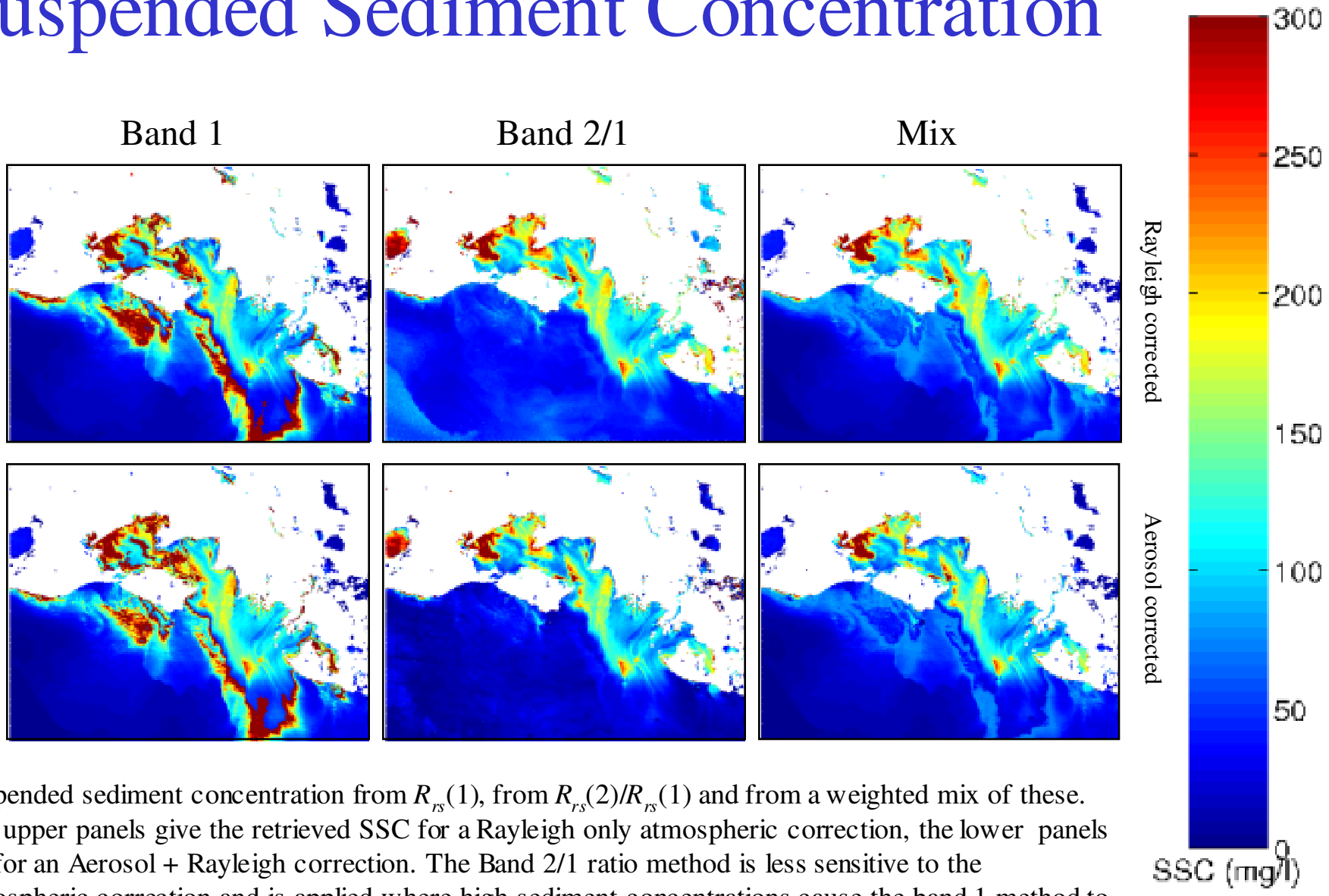
Utilities:

- Java application for visualizing L1B and L2 products (*Hydra*)
- Data servers to share data across the network
  - DODS server
  - ADDE server
- Utilities to collocate MODIS/AIRS pixels
- Destriping algorithm
- Corrected reflectance tutorial



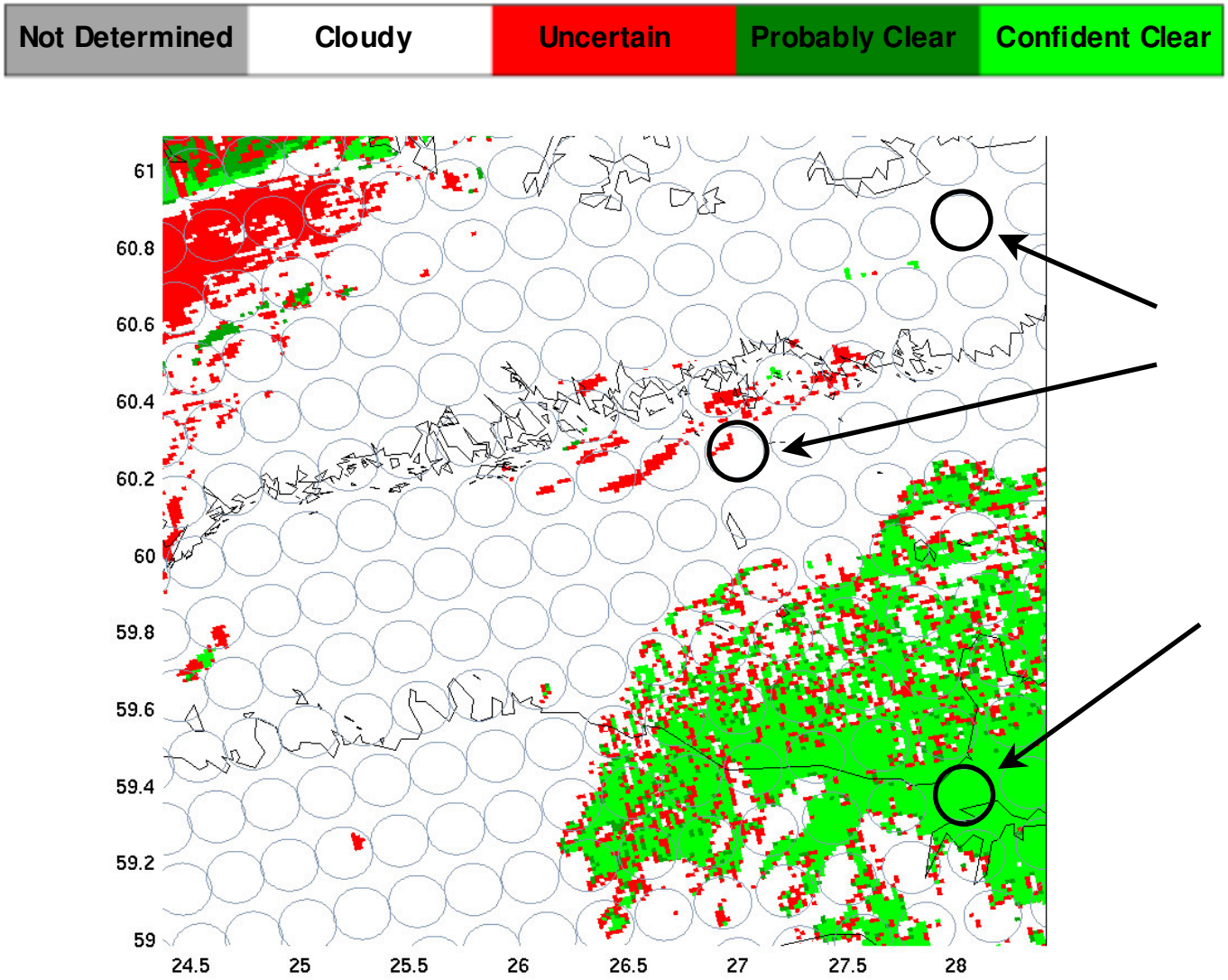
Hydra Visualization Tool

Suspended Sediment Concentration



Suspended sediment concentration from $R_{rs}(1)$, from $R_{rs}(2)/R_{rs}(1)$ and from a weighted mix of these. The upper panels give the retrieved SSC for a Rayleigh only atmospheric correction, the lower panels are for an Aerosol + Rayleigh correction. The Band 2/1 ratio method is less sensitive to the atmospheric correction and is applied where high sediment concentrations cause the band 1 method to lose precision. The weighted mix is one approach to fix this.

AIRS Clear Flag from MODIS cloud mask



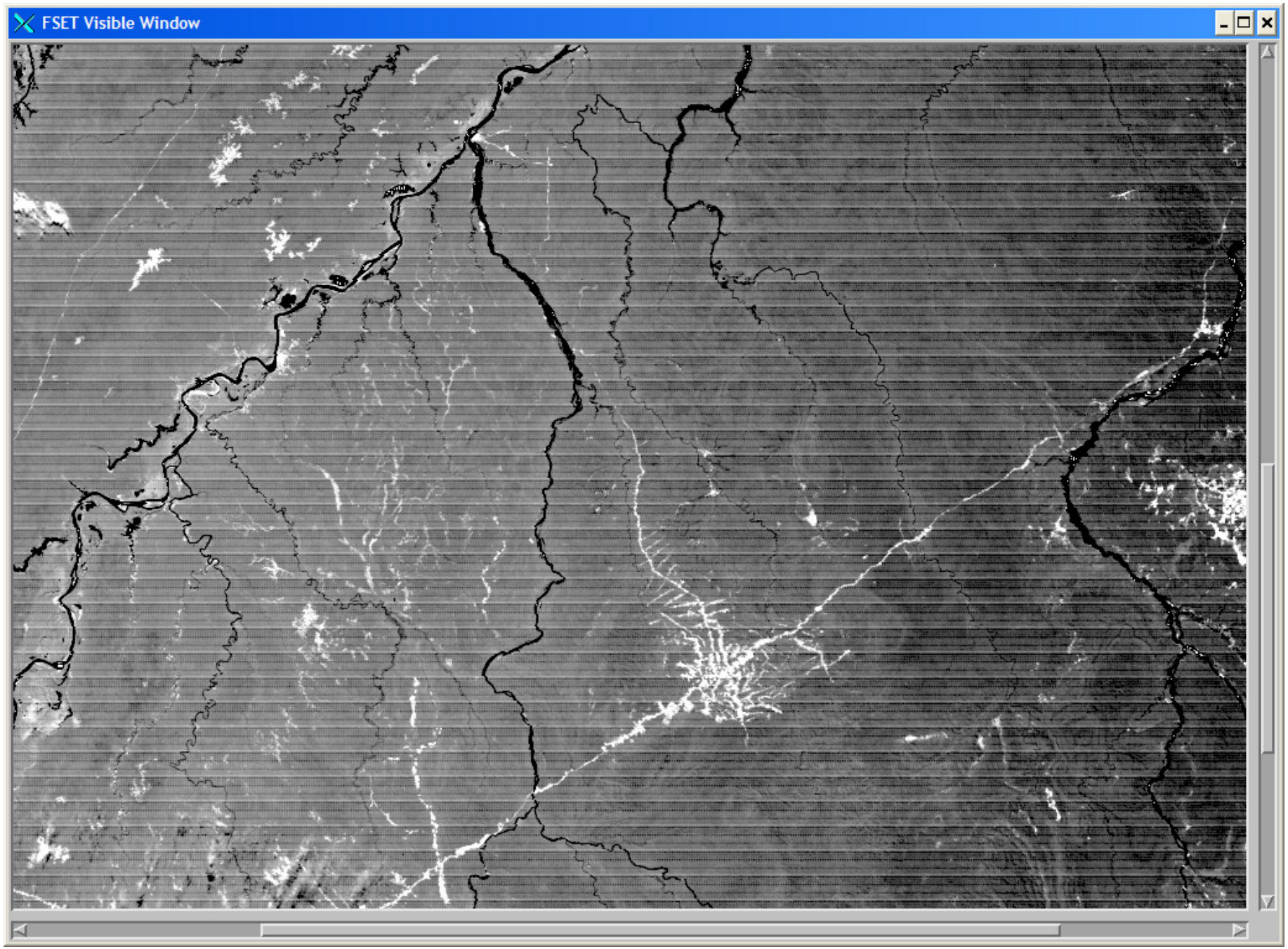
Terra MODIS Band 7 (2.1 micron) 500 meter Destriping Test Images

MOD02HKM.A2002171.1425.004.2003117083053.hdf

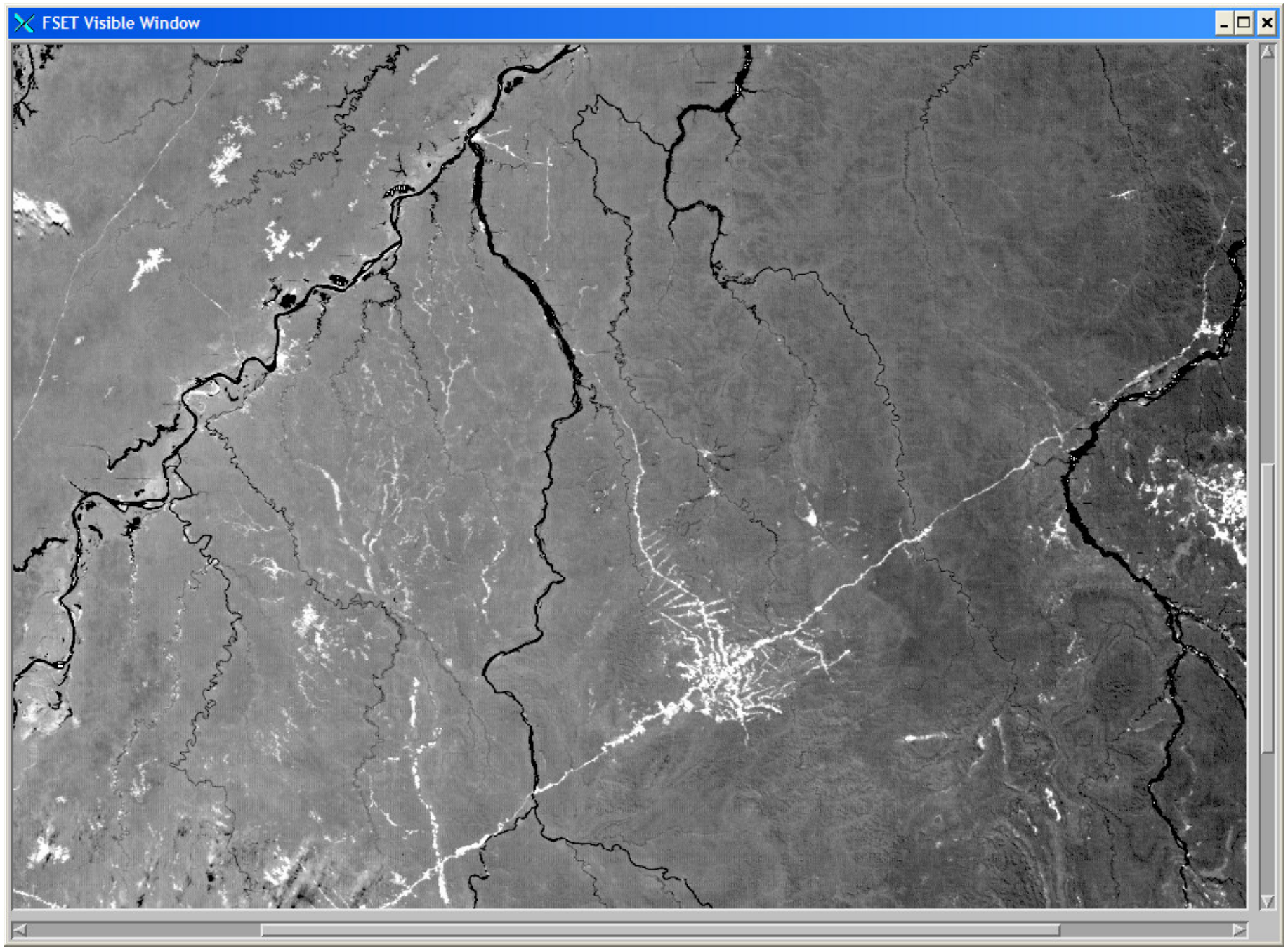
Liam Gumley, Univ. of Wisconsin-Madison

2004/06/23

Band 7 scaled integers from MOD02HKM: Raw



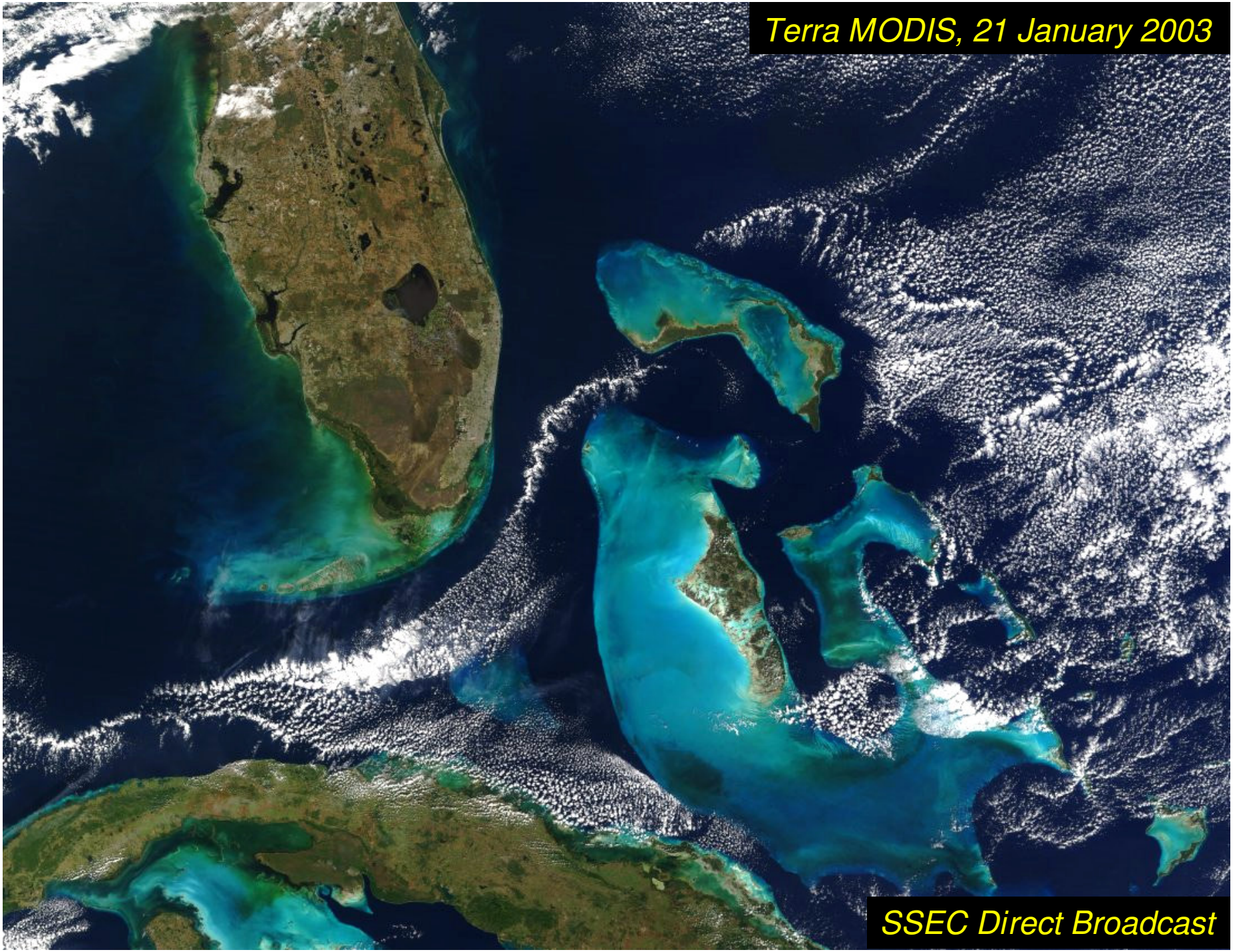
Band 7 scaled integers from MOD02HKM: Destriped



Creating Reprojected True Color MODIS Images: A Tutorial

Liam Gumley,
Space Science and Engineering Center, Univ. of Wisconsin.

Jacques Descloitres and Jeff Schmaltz,
NASA GSFC MODIS Rapid Response System.


Terra MODIS, 21 January 2003
SSEC Direct Broadcast

Where to Get the Tutorial

Tutorial document (PDF), source code, sample data:

ftp://origin.ssec.wisc.edu/pub/IMAPP/MODIS/TrueColor/