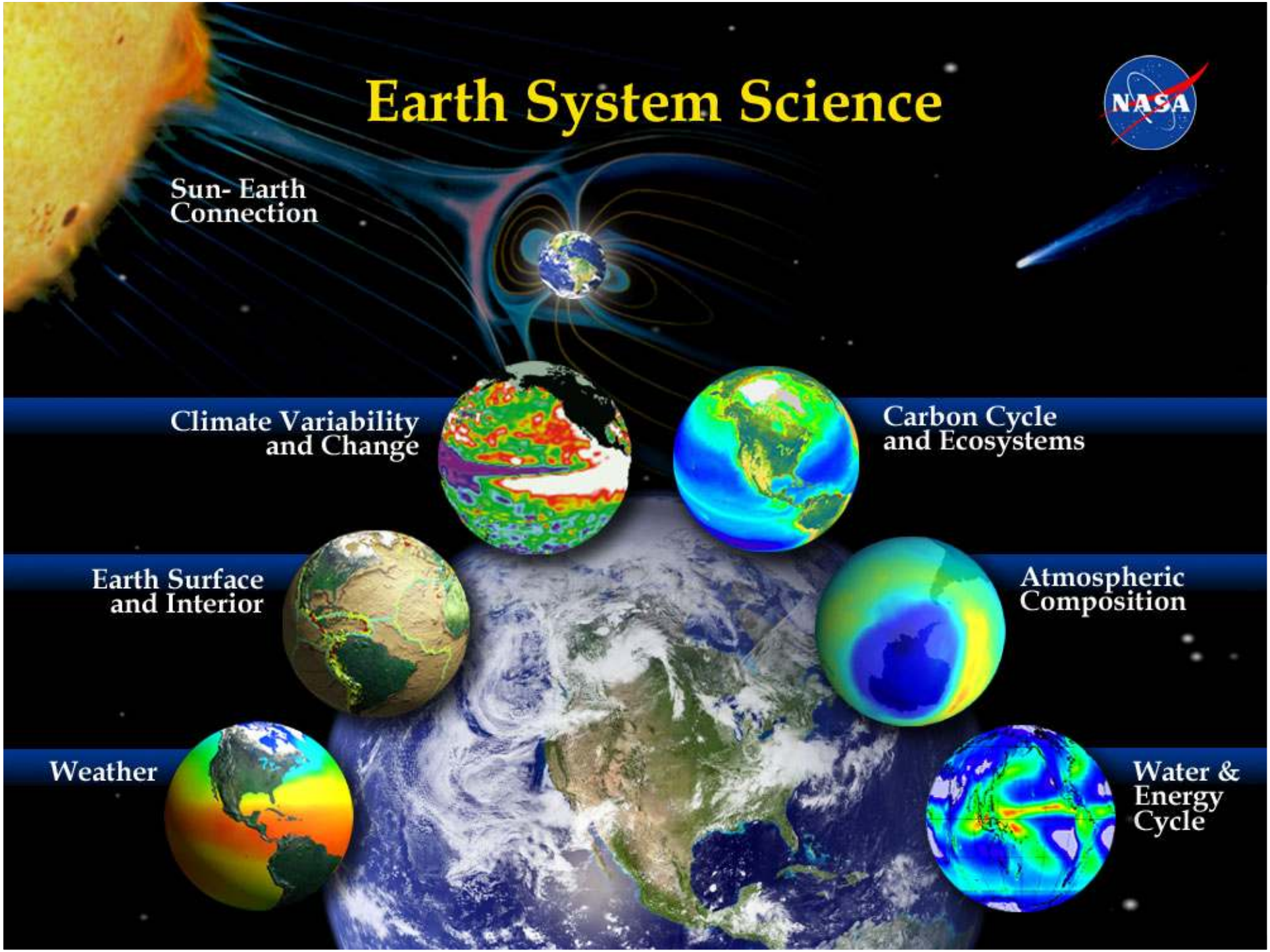
Decision Support through Earth Science Research Results

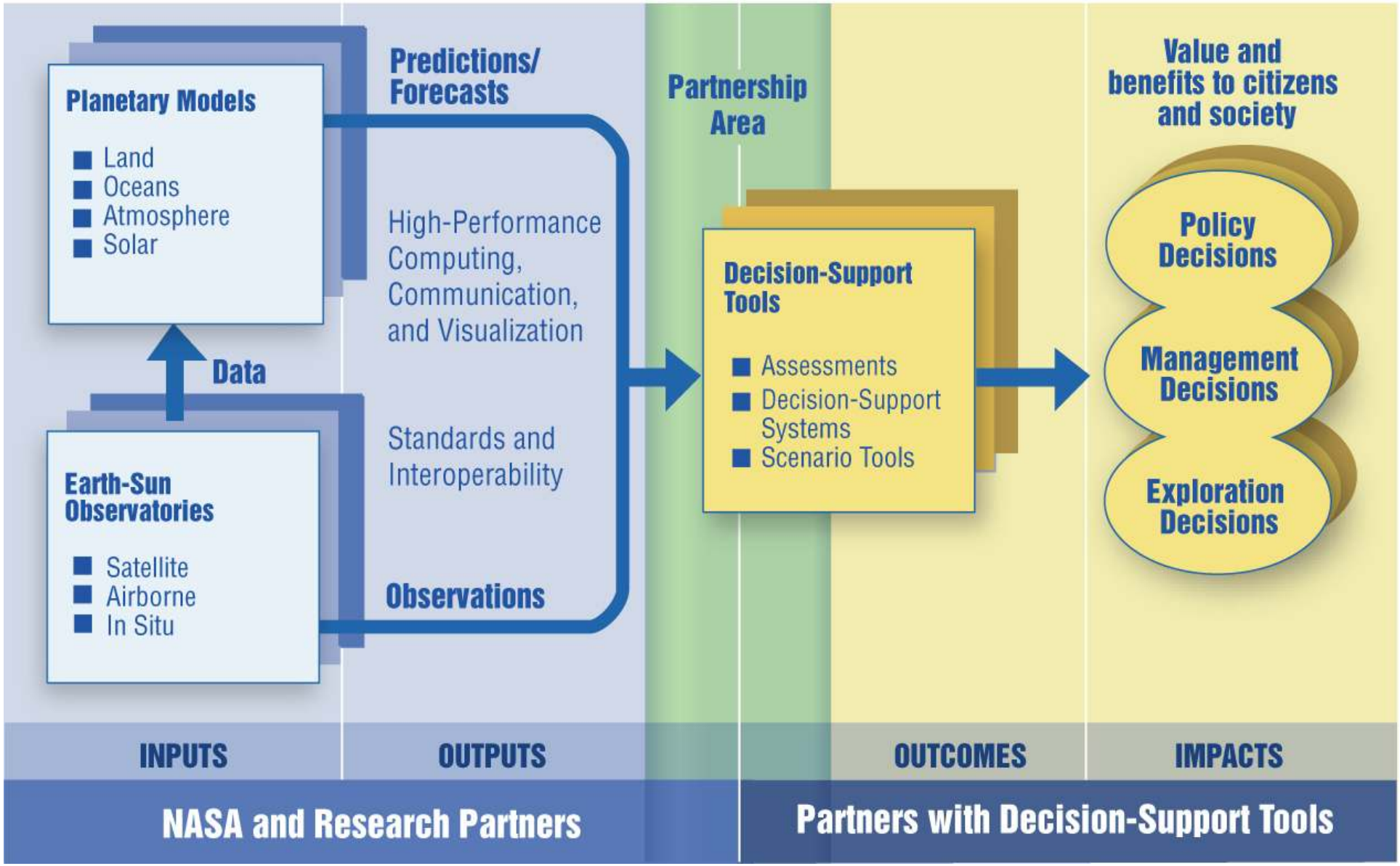
MODIS Science Team Meeting
January 4-6, 2006

Ronald J. Birk, Program Director
NASA Applied Sciences Program

"Extending the societal and economic benefits of NASA research in Earth-Sun science, information, and technology …"


Earth System Science
NASA
Sun- Earth Connection
Climate Variability and Change
Carbon Cycle and Ecosystems
Earth Surface and Interior
Atmospheric Composition
Weather
Water & Energy Cycle

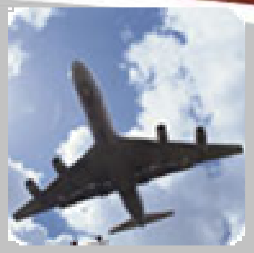
Integrating Knowledge, Capacity and Systems into Solutions



Applications of National Priority

Agricultural Efficiency

Air Quality



Aviation

Carbon Management

Coastal Management

Disaster Management

Ecological Forecasting

Energy Management

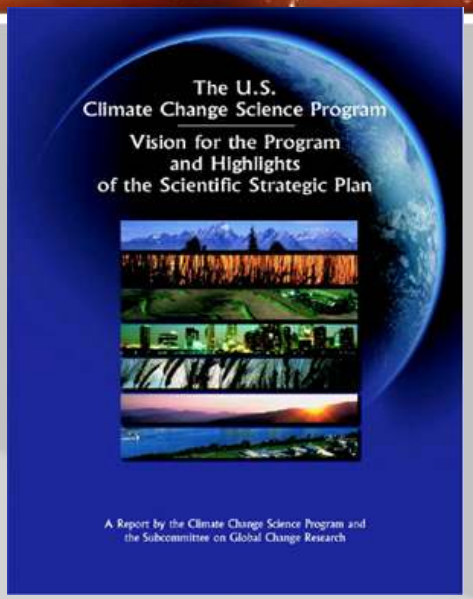
Homeland Security

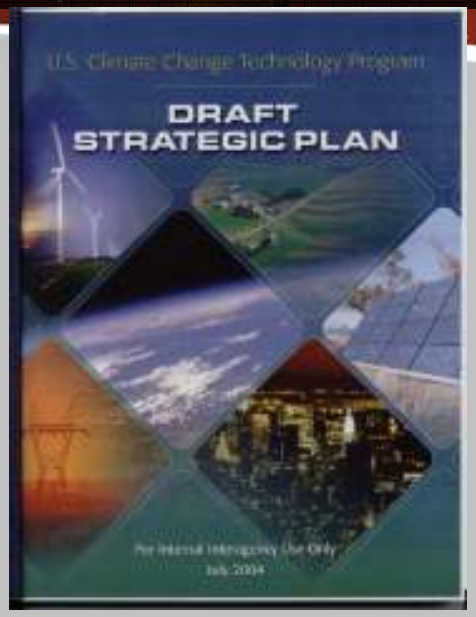
Invasive Species

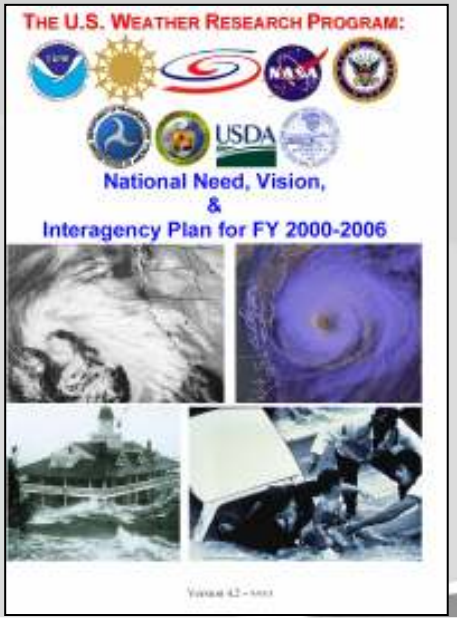
Public Health

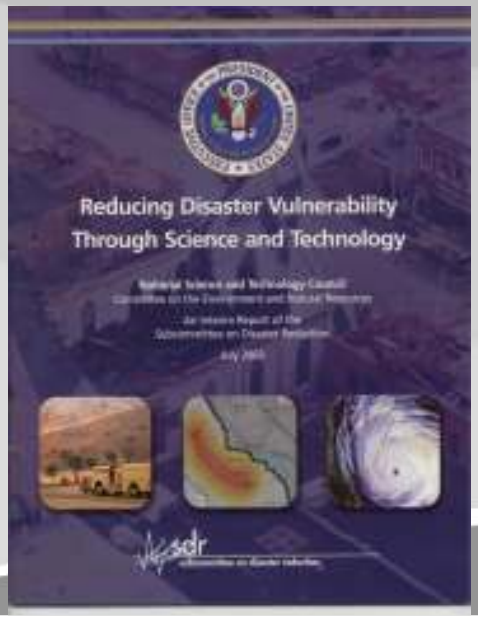
Water Management

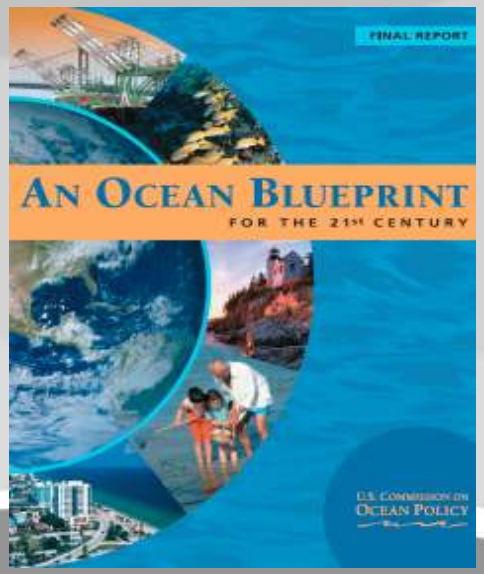
U.S. Plans for Climate, Earth Observations, Weather, Oceans, Disasters, …











Integrated Earth Observation System (IEOS) Near Term Opportunities

A. Data Management System for Earth Observations

B. Improved Observations for Disaster Warnings

C. Global Land Observation System

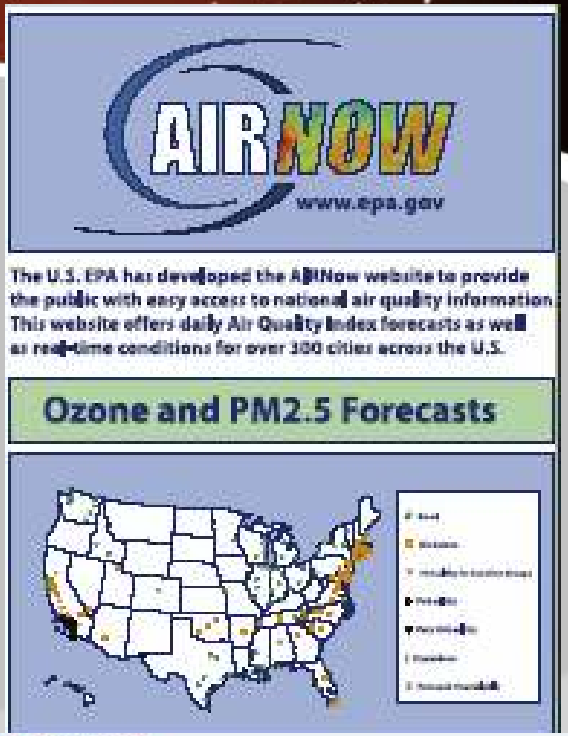
D. Sea Level Observation System

E. National Integrated Drought Information System

F. Air Quality Assessment and Forecast System

Air Quality

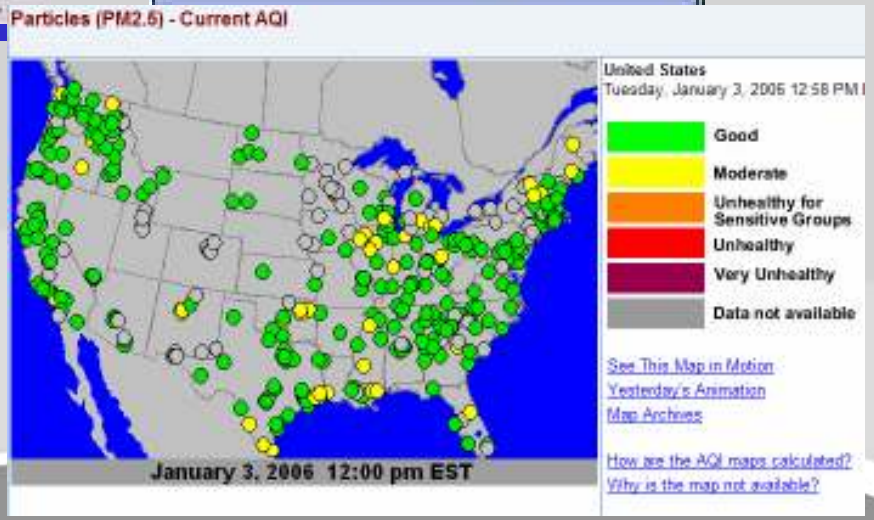
EPA AIRNow



AIR QUALITY INDEX

www.epa.gov/airnow

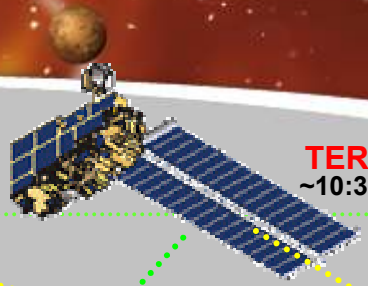
- Good
- Moderate
- Unhealthy for Sensitive Groups
- Unhealthy
- Very Unhealthy
- Hazardous



EPA AIRNow Use of NASA MODIS Data

AQUA-1 MODIS
~1:30 local overpass

Direct Broadcast



TERRA MODIS
~10:30 local overpass

Terra & Aqua Satellite Direct Broadcast of MODIS instrument data via commercially available ground station

Products (Near Real Time)

DB Aerosol Optical Depth (MOD04_L2)
DB Cloud Optical Thickness (MOD06_L2)

Products
Aerosol Optical Depth (MOD04_L2)
Cloud Optical Thickness (MOD06_L2)

NASA GFSC DACC

NASA GFSC Science Team

Products
Algorithms

SSEC/CIMSS Univ. of Wisc.Madison (MIPPS)

NOAA OAR/ARL

Products
EDAS Forecast Data

NASA LaRC

Products
MODIS/AIRNow Data Fusion
Site Static Data

US EPA AIRNow DMC

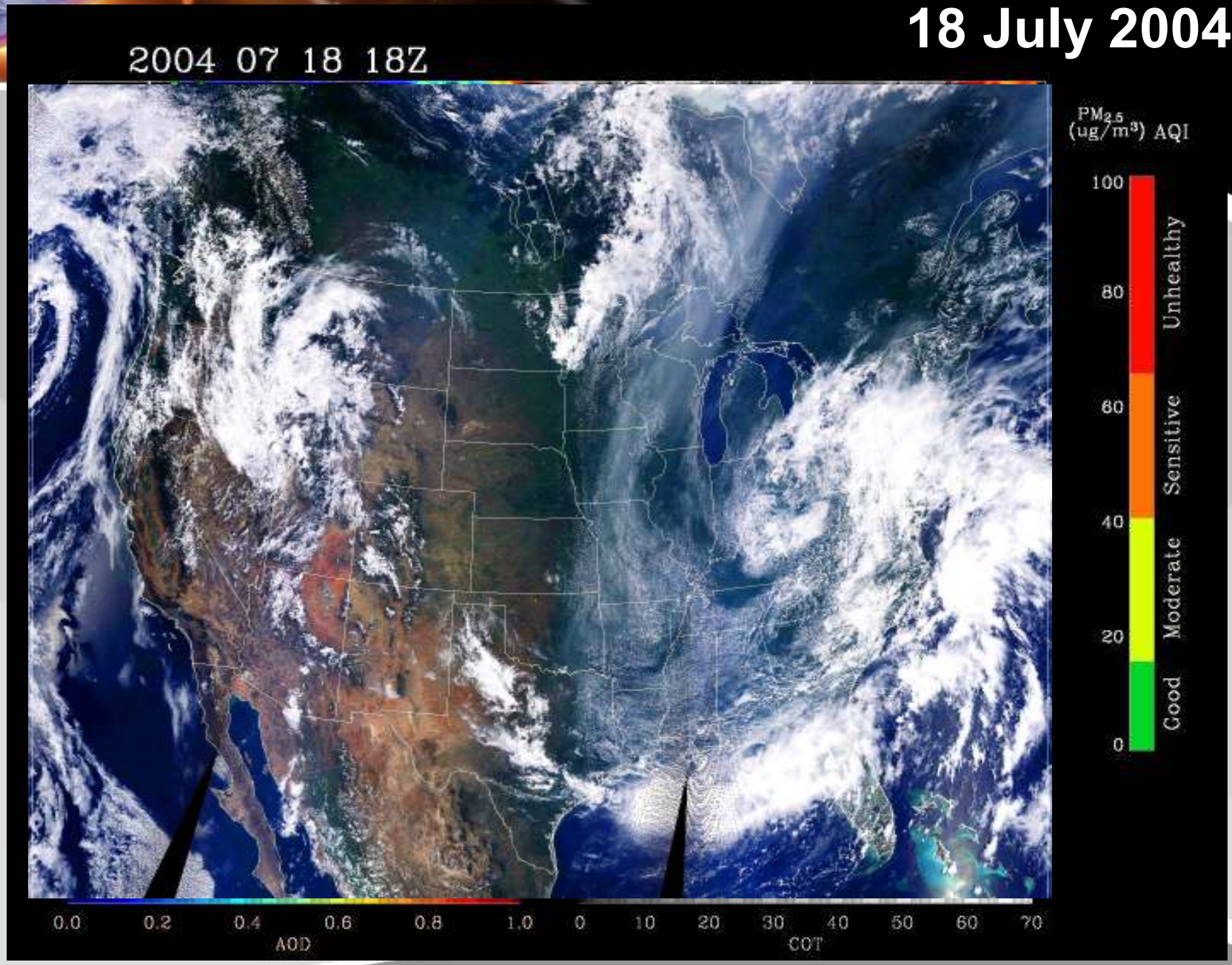
Products
AIRNow Hourly $PM_{2.5}$ Data

AIRNow Forecasters

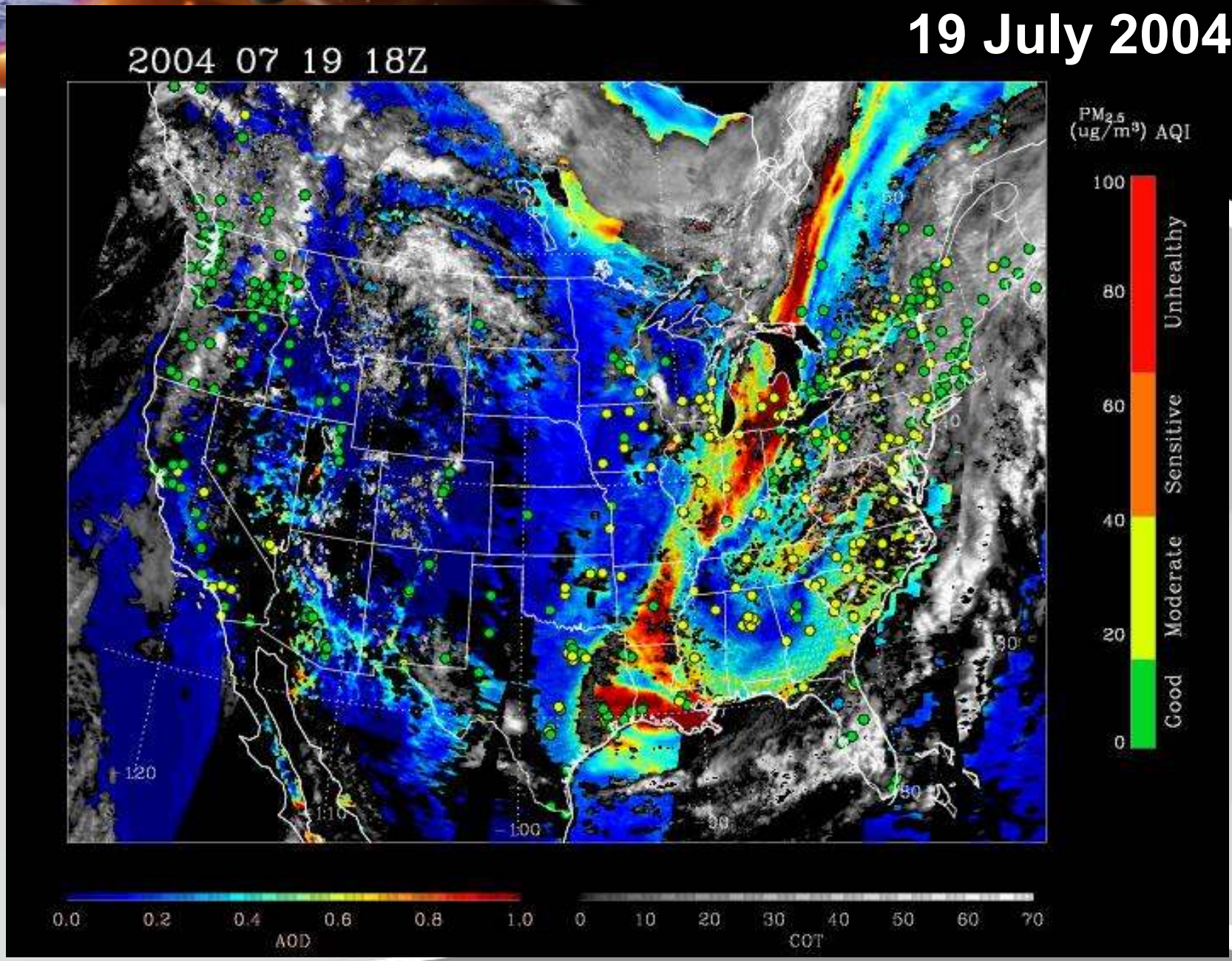
State & Local

Canadian Providences

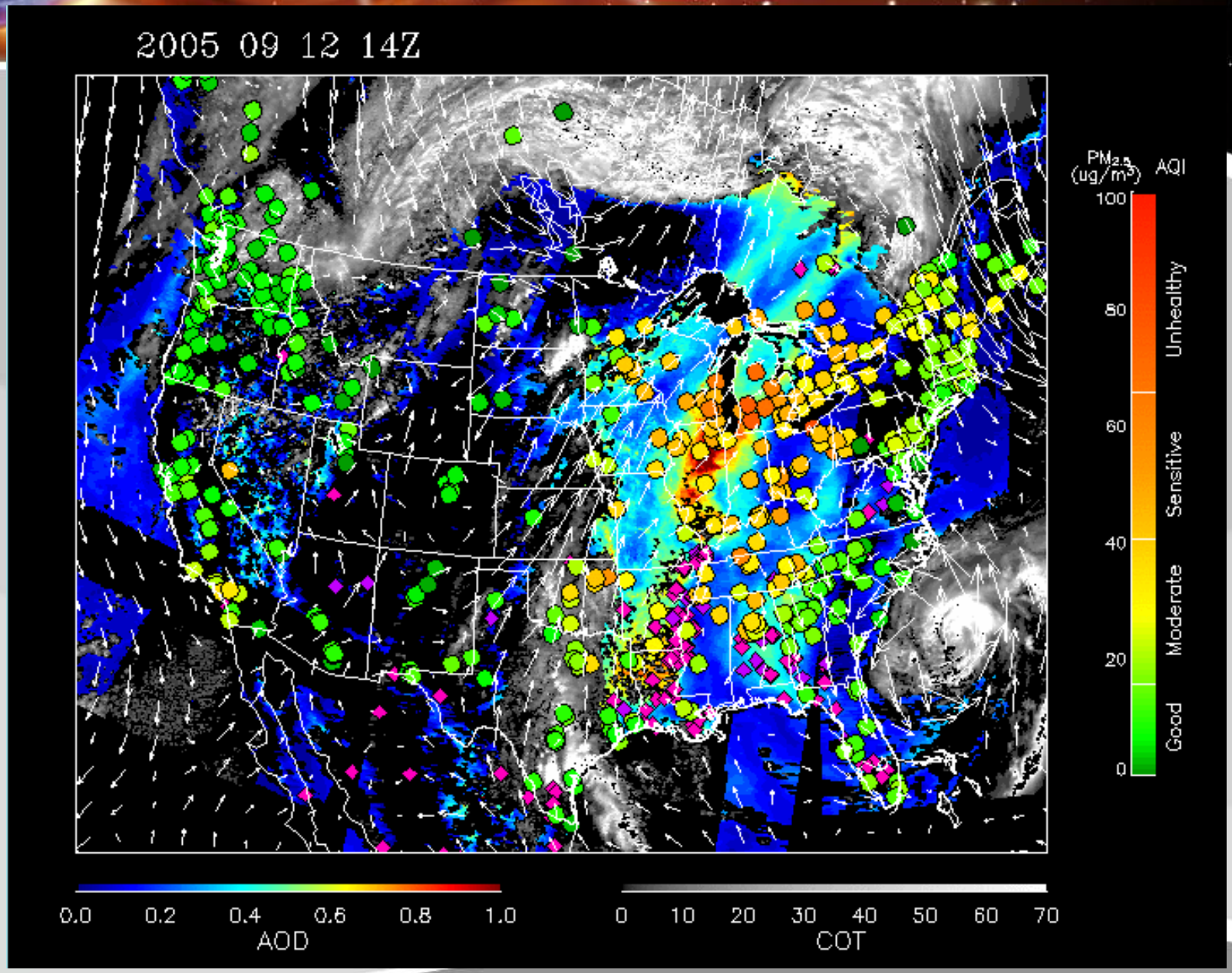
Smoke from Alaskan/Yukon Fires
18 July 2004



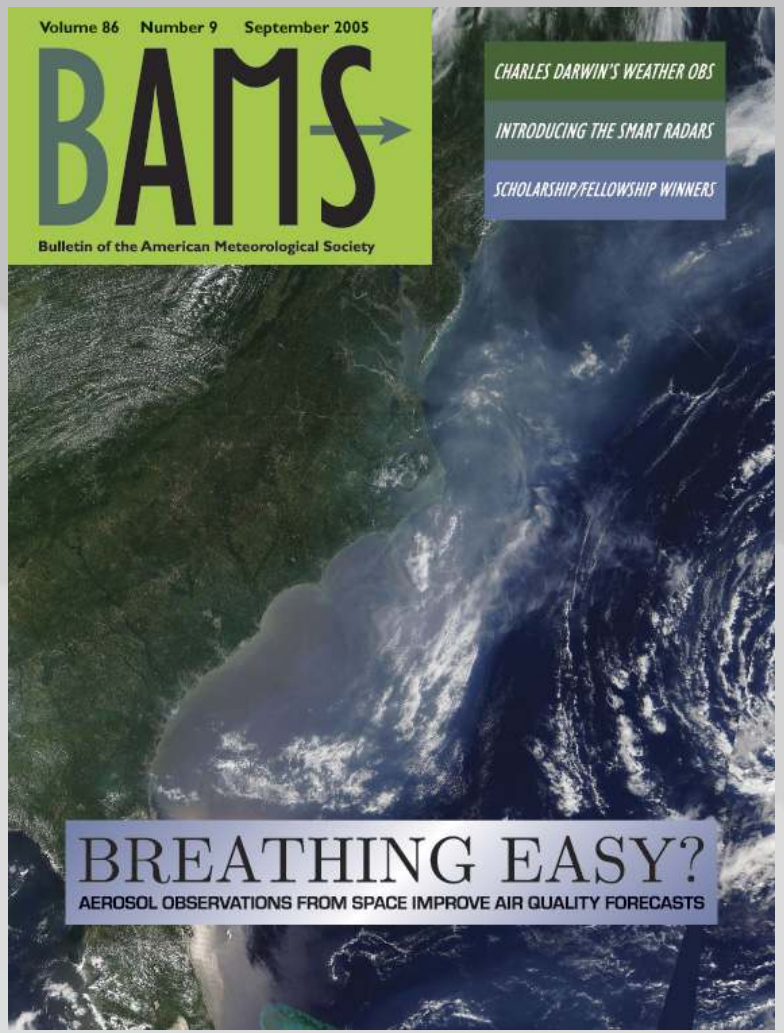
Smoke from Alaskan/Yukon Fires
19 July 2004



2005 Air Pollution Season



Air Quality Forecasting



"Improving National Air Quality Forecasts with Satellite Aerosol Observations"

BAMS, Sept. 2005 (86: 1249-1261)

J. Al-Saadi, J. Szykman, R. B. Pierce, C. Kittaka, D. Neil, D. A. Chu, L. Remer, L. Gumley, E. Prins, L. Weinstock, C. MacDonald, R. Wayland, F. Dimmick, J. Fishman

BLUESKYRAINS.ORG

Bluesky Output Trajectories

Data Portrayal Time

Sep | 19 | 4 pm

2003 | MDT

-3HR | -HR | Apply Time | +HR | +3HR

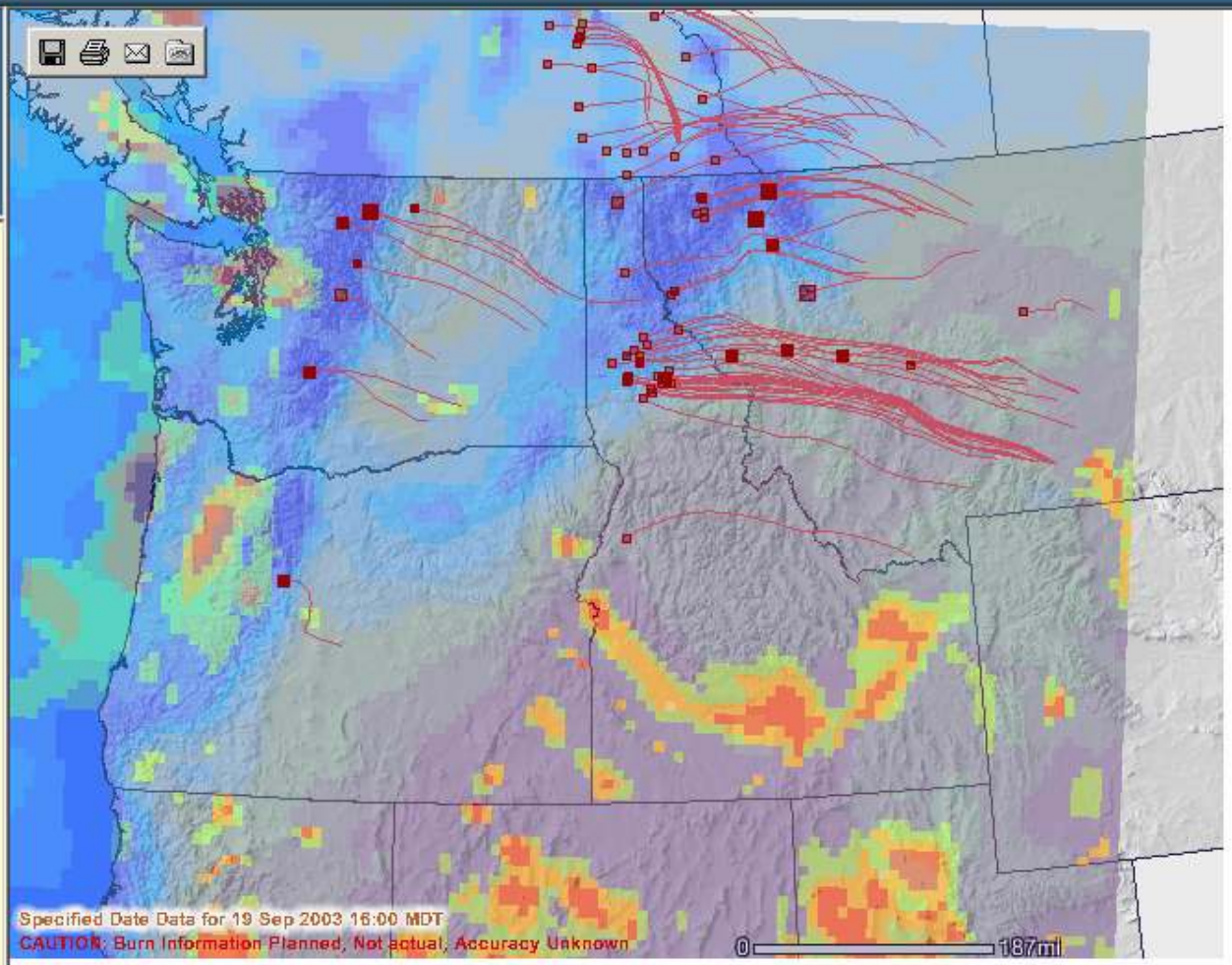
Map Data Layers

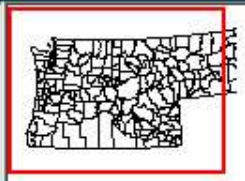
Redraw Map

- [x] Burn Information
- [ ] Meteorology
- [ ] Air Emission Sources
- [ ] Receptors
- [x] Base Map Data

Data Layer Help

- A closed layer group, click to open.
- An open layer group, click to close.
- A layer contained within a folder or group.
- A single layer not contained within a group.
- Hidden group/layer, click to make visible.
- Visible group/layer, click to hide.
- Visible layer, but not at this map scale.
- Some layers visible in this group, click to make all visible.
- Inactive layer, click to make active for identifies.
- Layer is active layer for identifies and queries.





Map Legend

Burn Locations
- 0 - 100 Acres
- 100 - 1000 Acres
- >1000 Acres

Burn Traj Hourly Pts
0 2 4 6 8 10 12

Burn Traj Lines

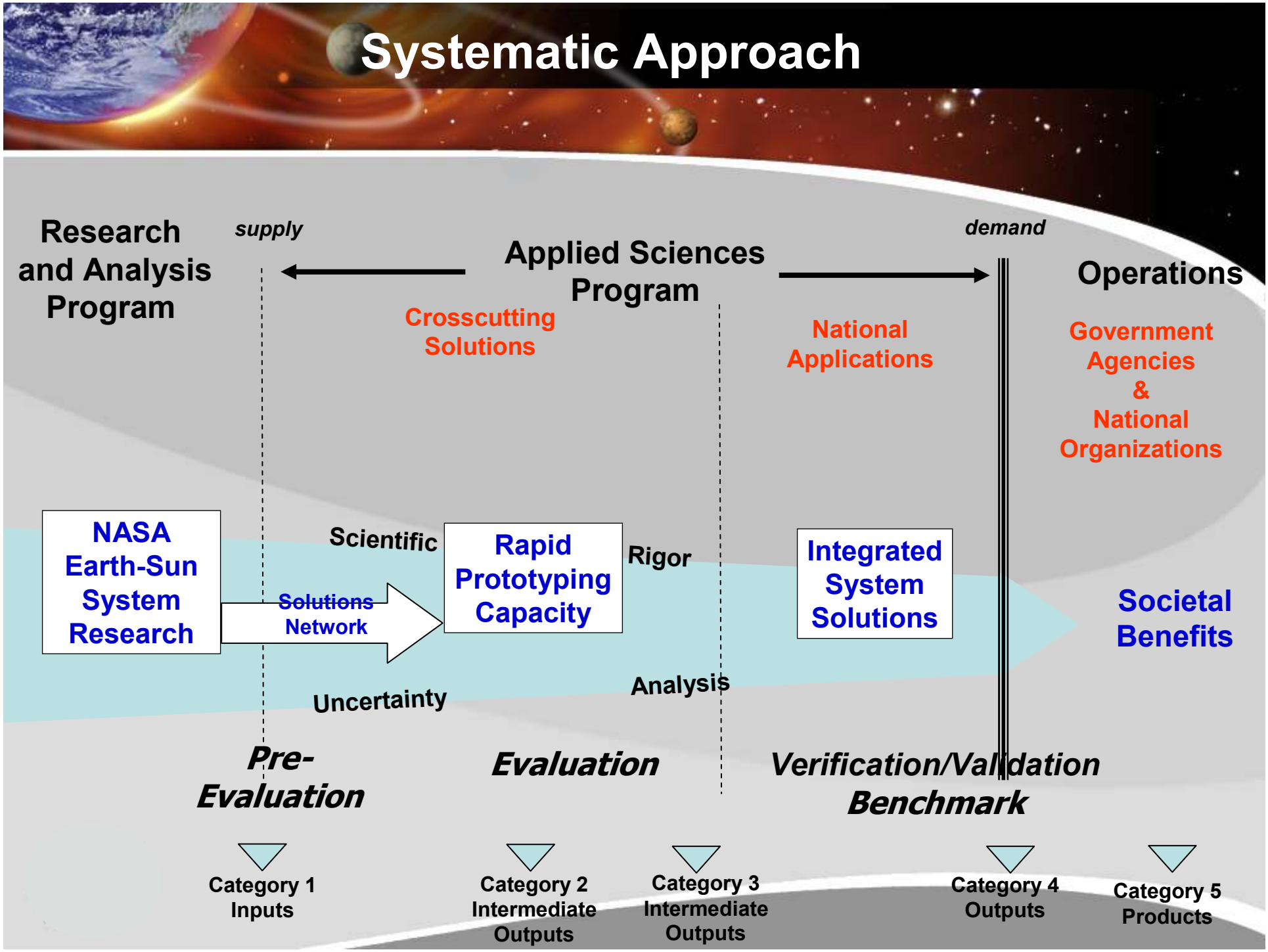
Def Traj Hourly Pts
0 2 4 6 8 10 12

Default Traj Lines

Predicted PM2.5
5 15 40 >65
Low Mod High

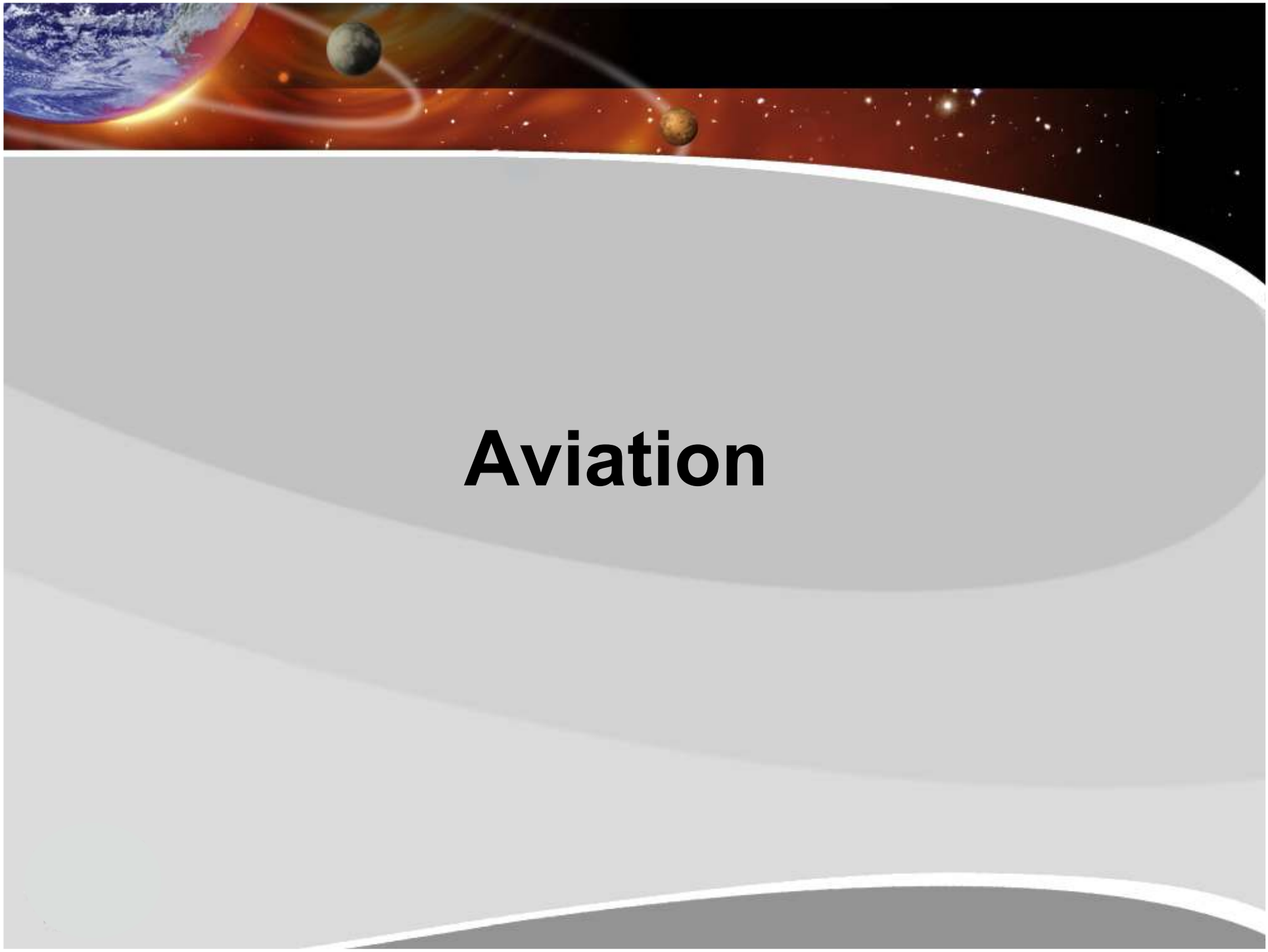
Redraw Map | Zoom In | ZoomOut | Pan | Full Map | Identify | Links | Sel Rect | Sel Poly | Clear Select | Query | Print | Download

Systematic Approach

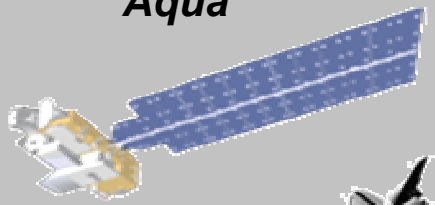


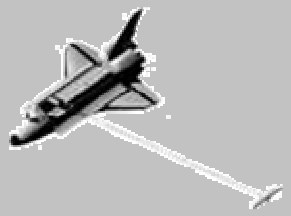
Systematic Approach

- **Evaluation** of potential capacity for NASA research results to contribute to partnering agency decision support tools
- Formulation of architecture for configuration of an integrated system solution
- **Verification** that components could be physically connected into system configuration
- **Validation** of science and technology performance of the system through rigorous analysis of flow through of science data products in the integrated system
- **Benchmarking** of performance of the integrated system solution outputs in terms of value to decision makers.


Aviation

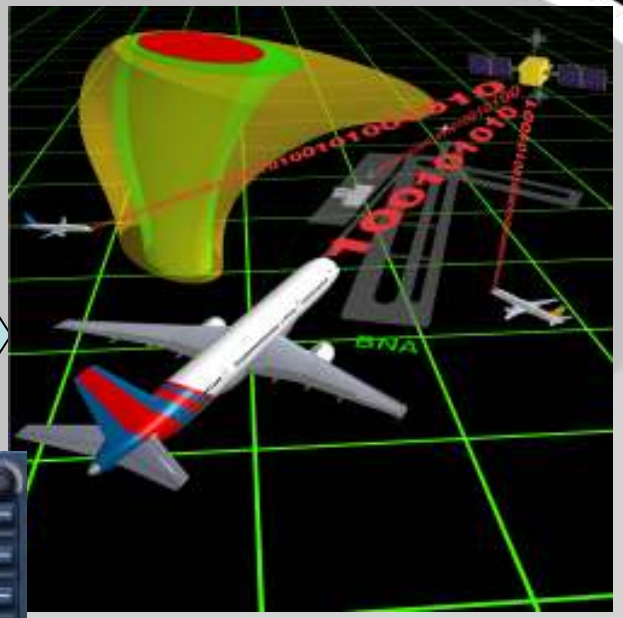
Aviation





Downlink

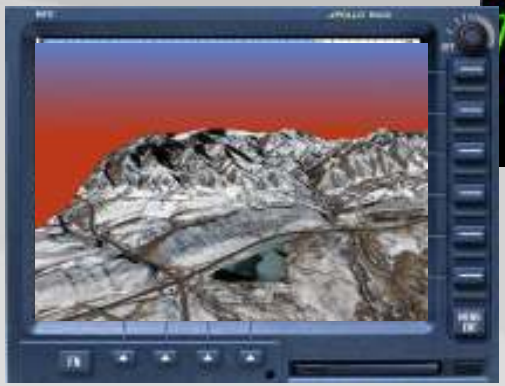
Societal Benefits



Digital Airspace for National Airspace System

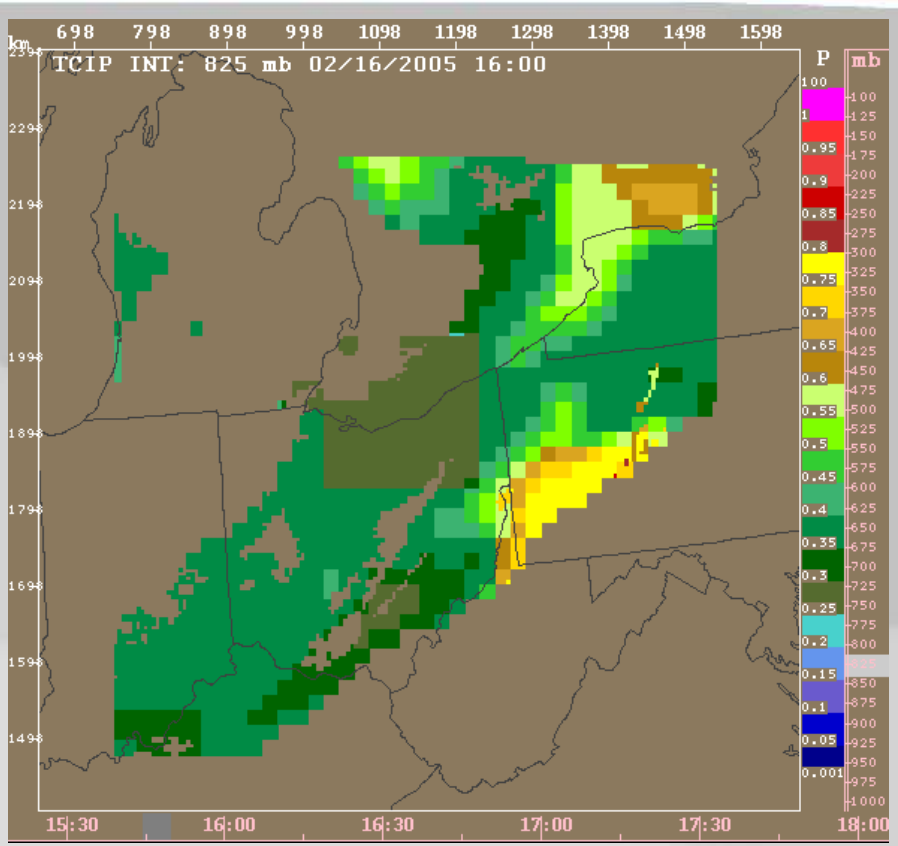
EOSDIS & DAACs

Exploitation



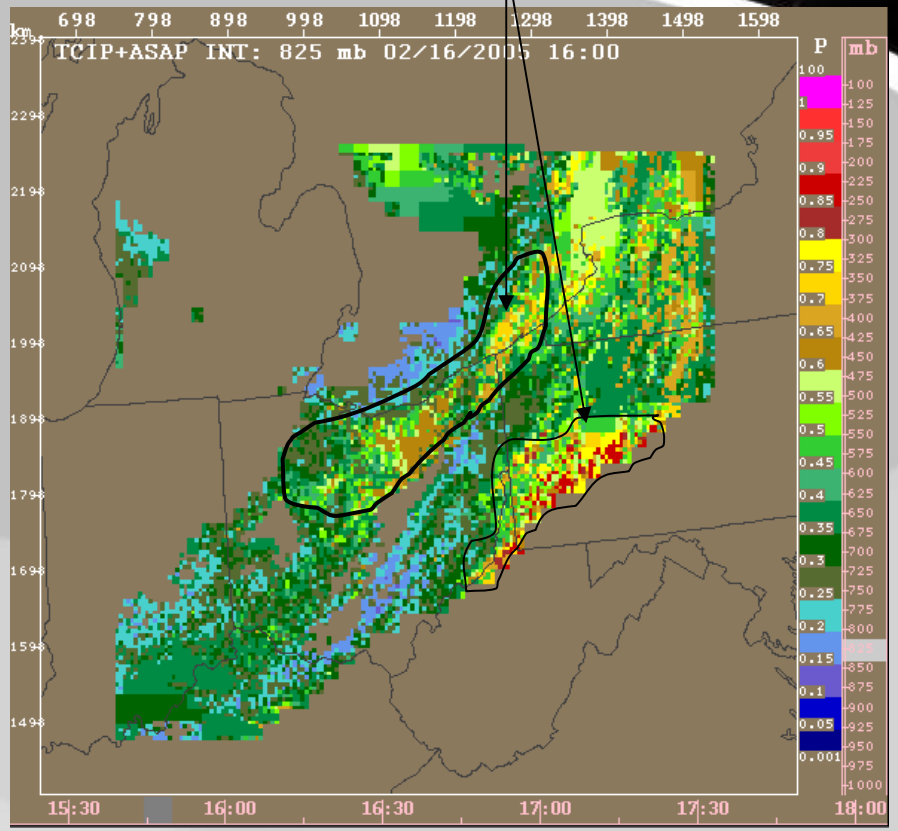
Synthetic Vision System display

Current Icing Potential (CIP) Icing Severity Index



Original estimate at 825 mb. Severity index increases from bottom to top of scale. Areas outside the colored pixels have negligible icing potential at this level. (16 Feb 2005)

Areas of high LWP

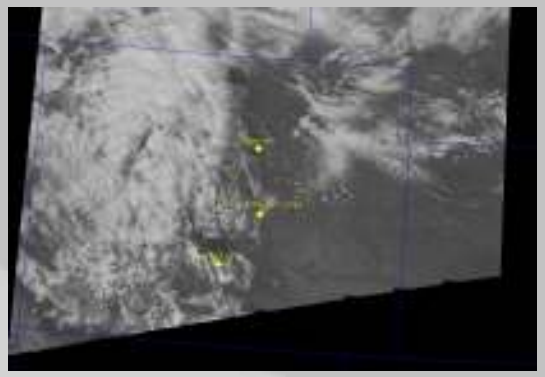


Modified by inclusion of satellite-derived phase and liquid water path products from GOES, AVHRR, and NASA MODIS. Note improved spatial resolution and increased values of severity index corresponding to high LWP. (16 Feb 2005)

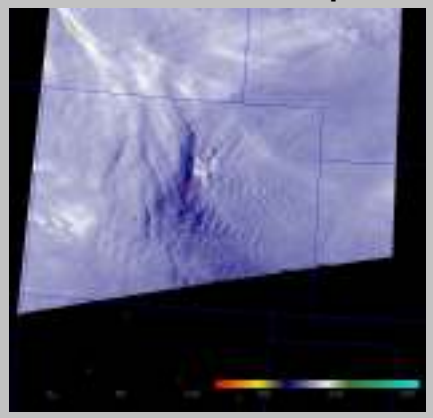
Enhancement of Turbulence Products through Satellite Observations

CIT and Mountain Wave Identification Algorithms to be tested and implemented in the GTG.

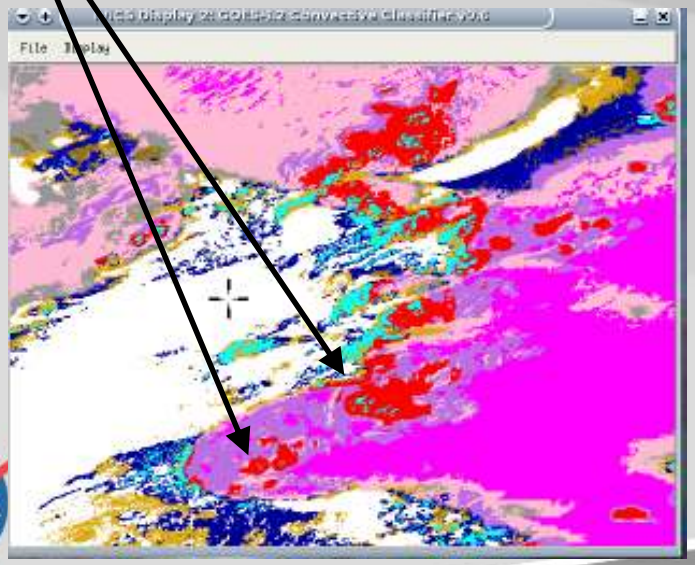
MODIS Visible Image over Colorado Front Range

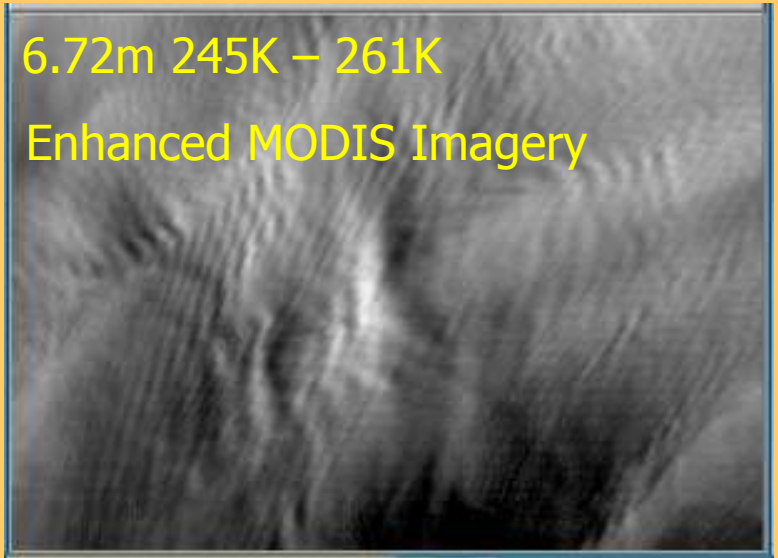


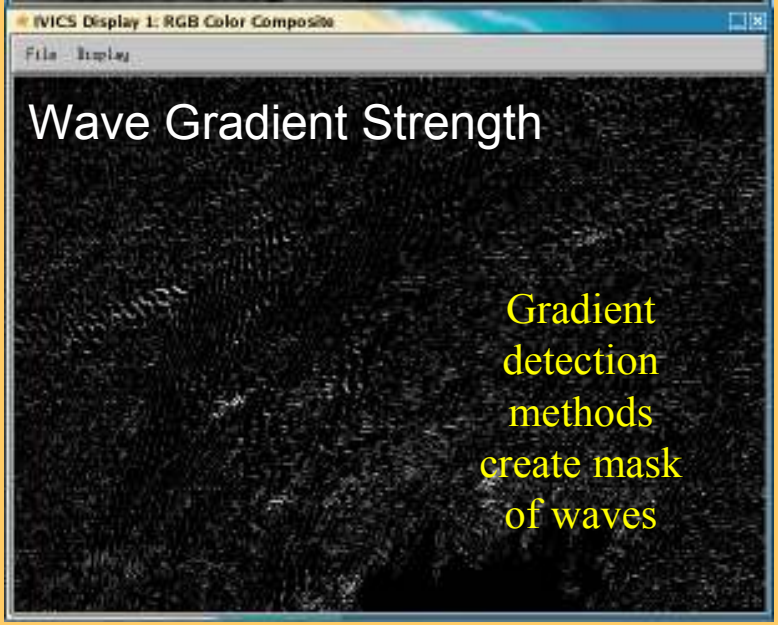
MODIS Water Vapor Image With Turbulence Reports



Overshooting Cumulus: CIT Signature



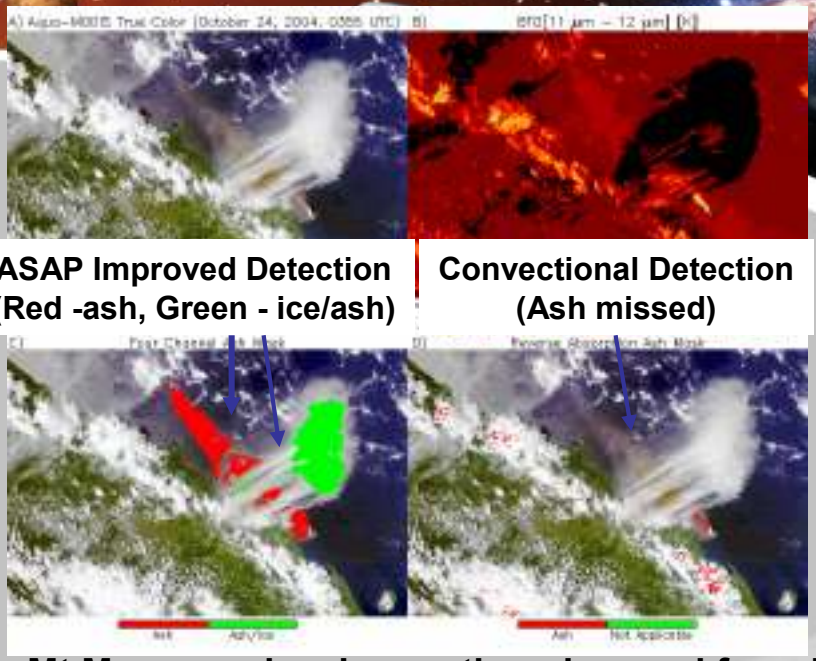




Volcanic Ash Detection and Height Estimates from Satellite Observations

From: FAA Aviation Safety Journal Vol. 2 (3)

Re-analyzed Mt Spur volcanic eruption observed from NOAA-11 in August 1992 indicating improved detection (implemented in research mode in NOAA CLAVR-X tool used at the Washington VAAC) compared to conventional reverse absorption methodology



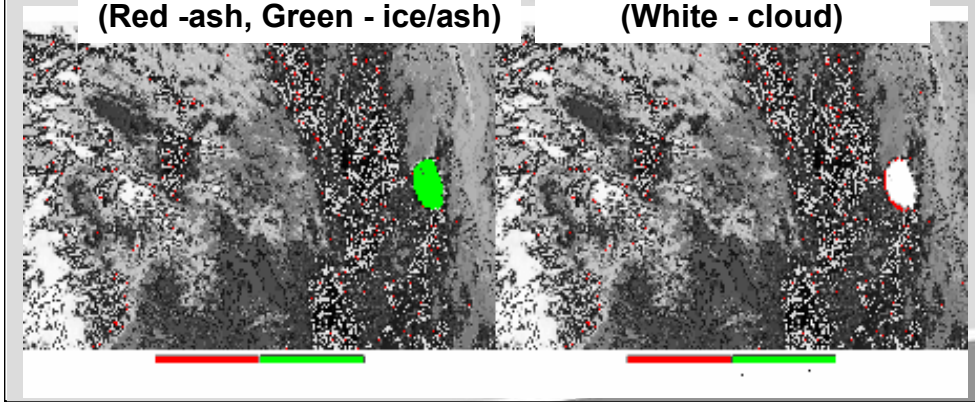
ASAP Improved Detection (Red -ash, Green - ice/ash)

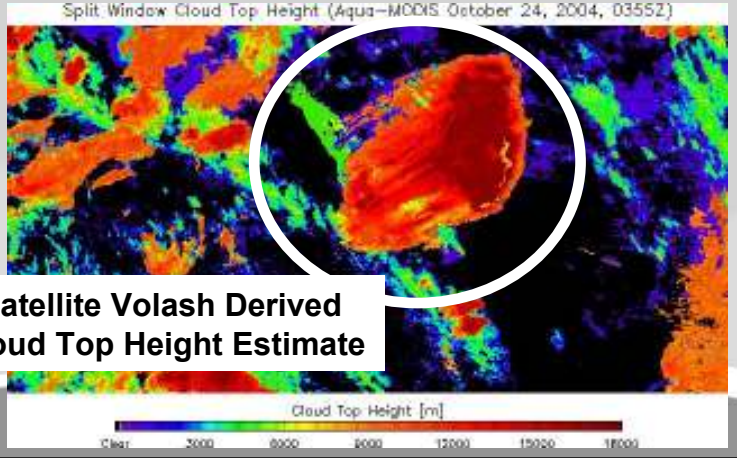
Convectional Detection (Ash missed)

Mt Manam volcanic eruption observed from NASA MODIS on 24 October 2004 in a more difficult tropical environment (above).

ASAP Improved Detection (Red -ash, Green - ice/ash)

Convectional Detection (White - cloud)

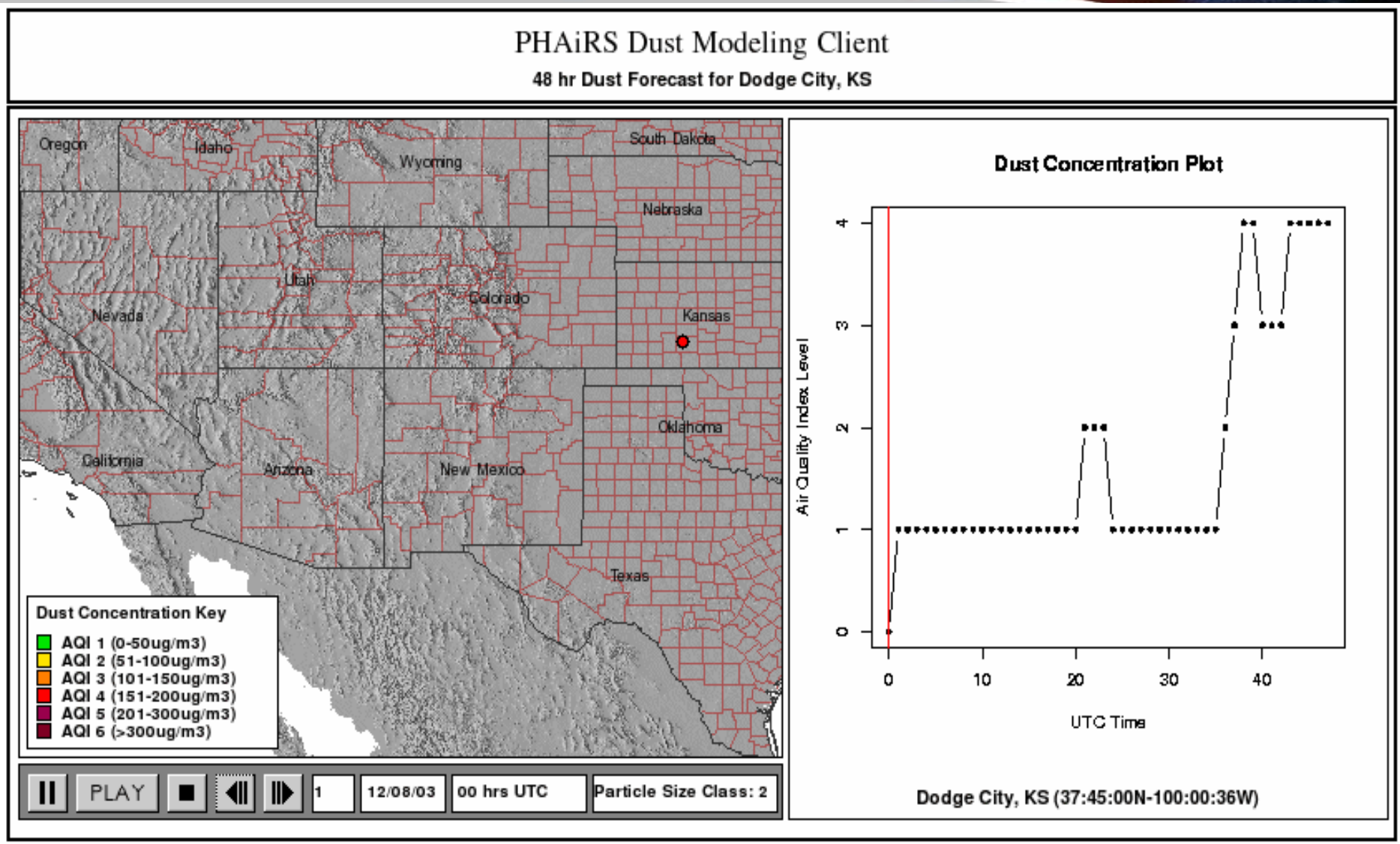




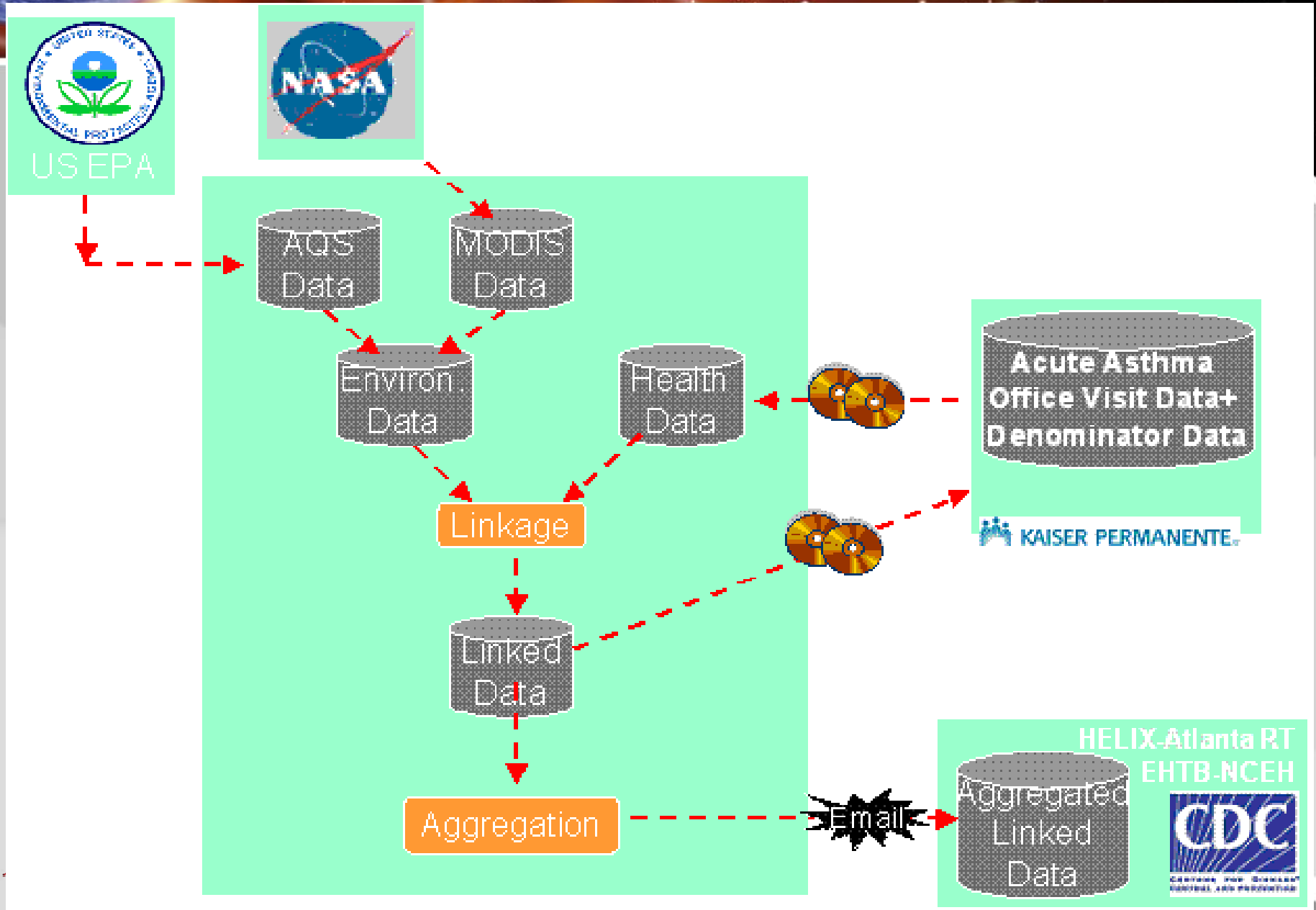
Satellite Volash Derived Cloud Top Height Estimate

Public Health

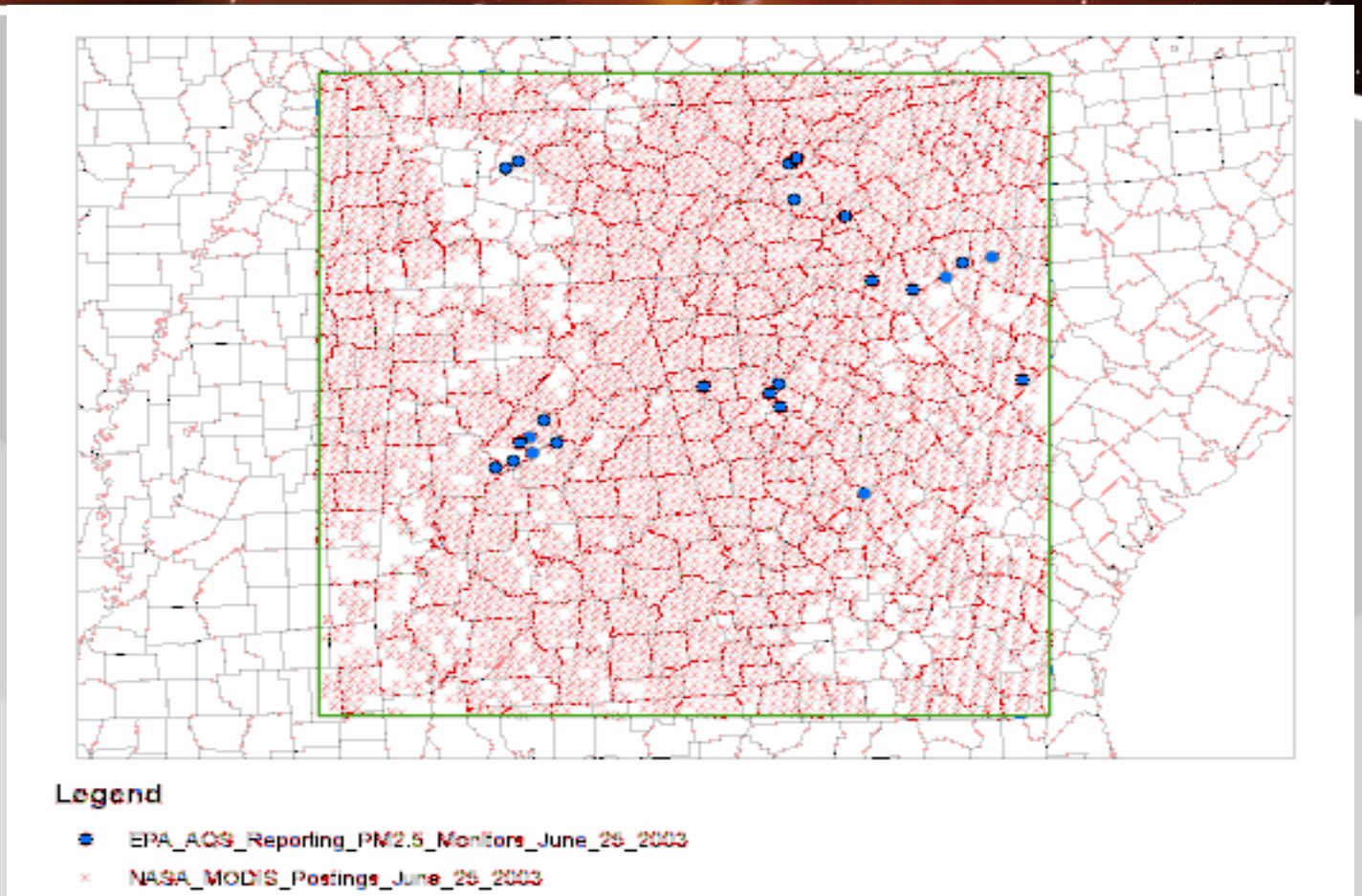
Enhancing Decision Support Tools



EPHTN/HELIX wiring diagram



Contribution of NASA MODIS Observations

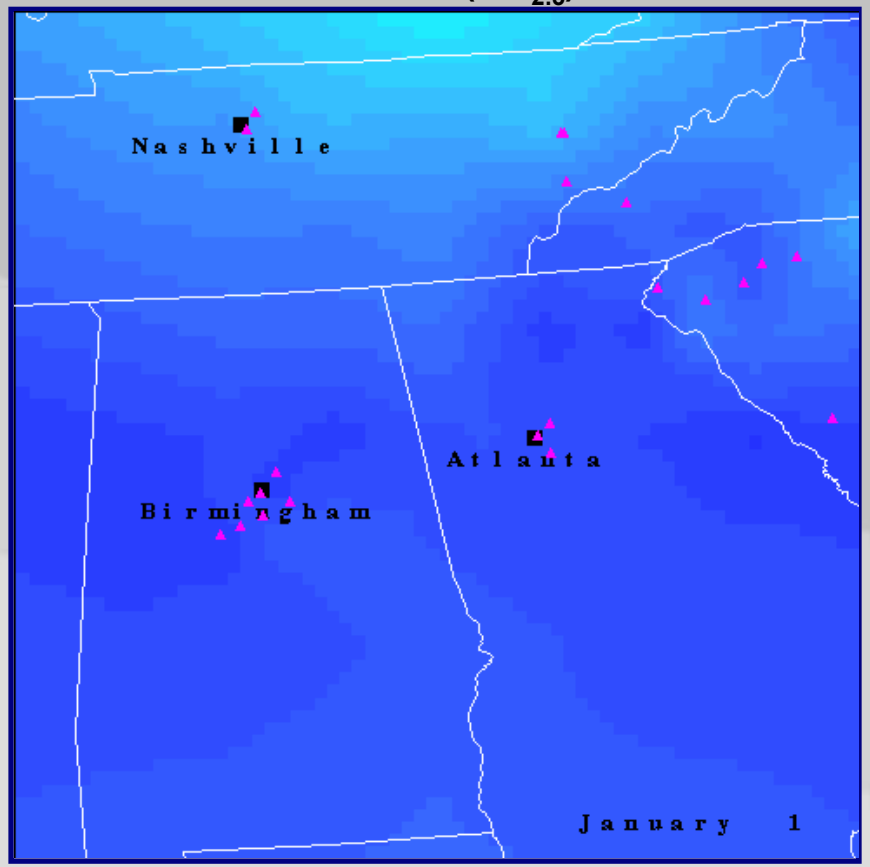


The integration of NASA Earth science satellite observations, model predictive capabilities, and technology enhances the value of public health decision support. NASA MODIS aerosol optical depth observations are combined with EPA monitoring data to create more representative $PM_{2.5}$ products.

Environmental Public Health Tracking Network (EPHTN)
Health and Environment Linked for Information Exchange (HELIX - Atlanta)

v. April 2005

Particulate Matter ($PM_{2.5}$) in 2003



NASA and the CDC are partners in linking environmental and health observations to enhance public health surveillance through the Environmental Public Health Tracking Network (EPHTN)/HELIX-Atlanta project.

The integration of NASA earth science satellite observations, model predictive capabilities, and technology enhances the value of public health decision support. In the future, NASA MODIS aerosol optical depth observations will be combined with EPA monitoring data to create more representative particulate matter (PM) products.

Additional Earth science satellite observations, such as ozone and surface temperature, will also be used to enhance the EPHTN.

CDC Contact
Amanda Sue Niskar, DrPH, RN
Science Development Team Leader
National Environmental Public Health Tracking Program
Centers for Disease Control & Prevention
1600 Clifton Rd, NE, MS E19
Atlanta GA 30333

NASA Program Contact
John A Haynes, Program Manager
Public Health Application,
Applied Sciences Program
NASA Headquarters MS 5L79
Washington DC 20546-0001

Data from scattered EPA monitoring sites were used to make daily surfaces of particulate matter (PM) concentrations. High concentrations of PM are associated with adverse health reactions, eg. respiratory and cardiovascular problems.

High : 50 $\mu g/m^3$

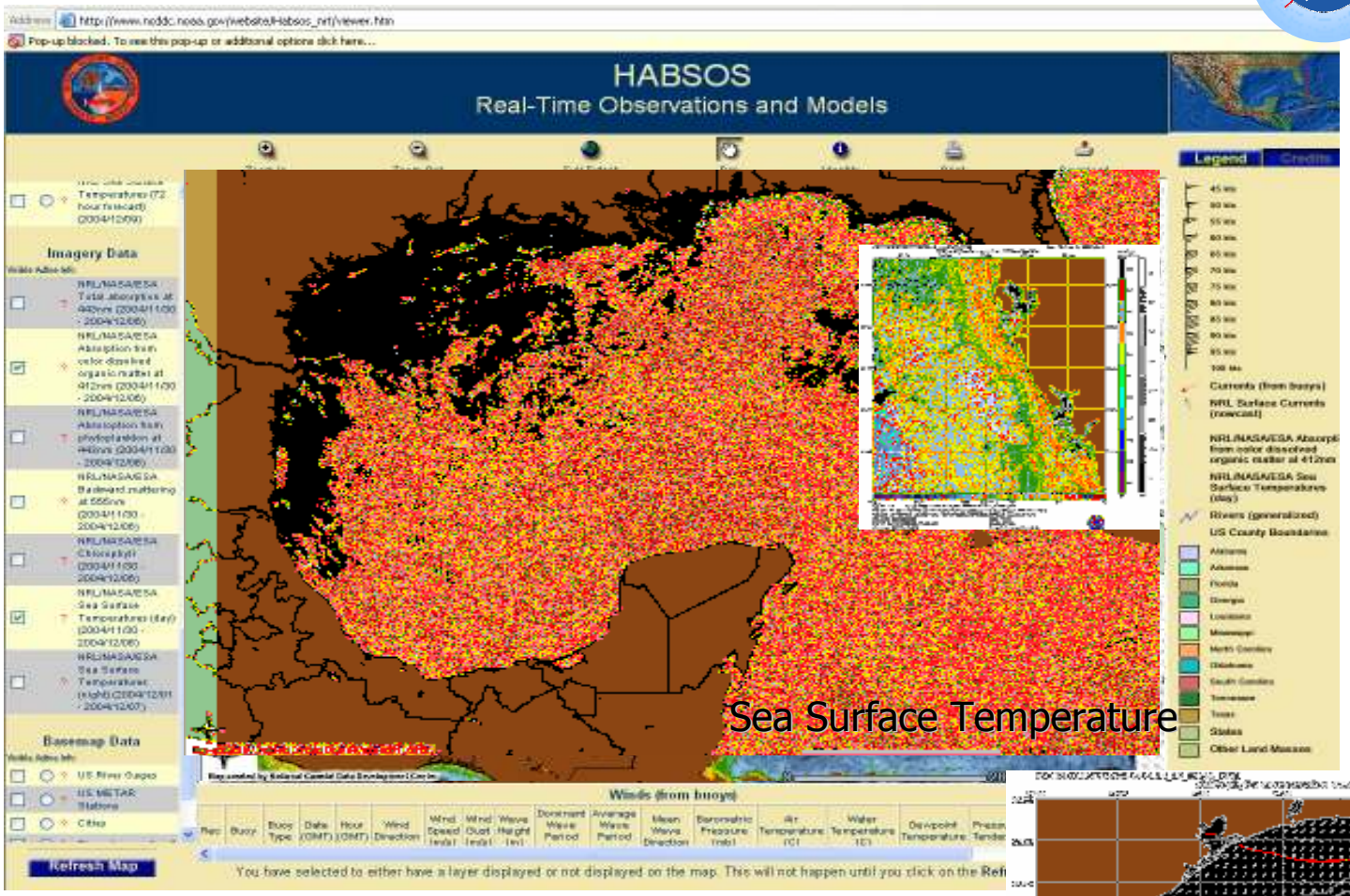
Low : 0 $\mu g/m^3$

▲ EPA sites

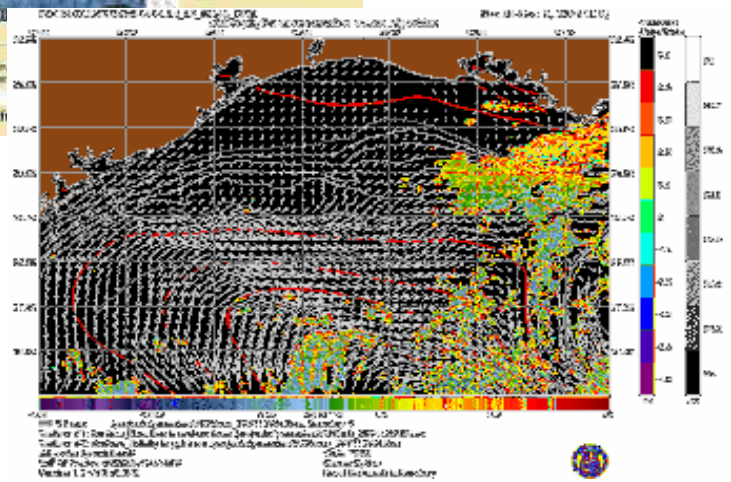
Technical Contacts: Doug Rickman (doug.rickman@nasa.gov)
Dale Quattrochi (dale.quattrochi@nasa.gov)

Coastal Management

MODIS Products used in Real-Time Coastal Observing Systems

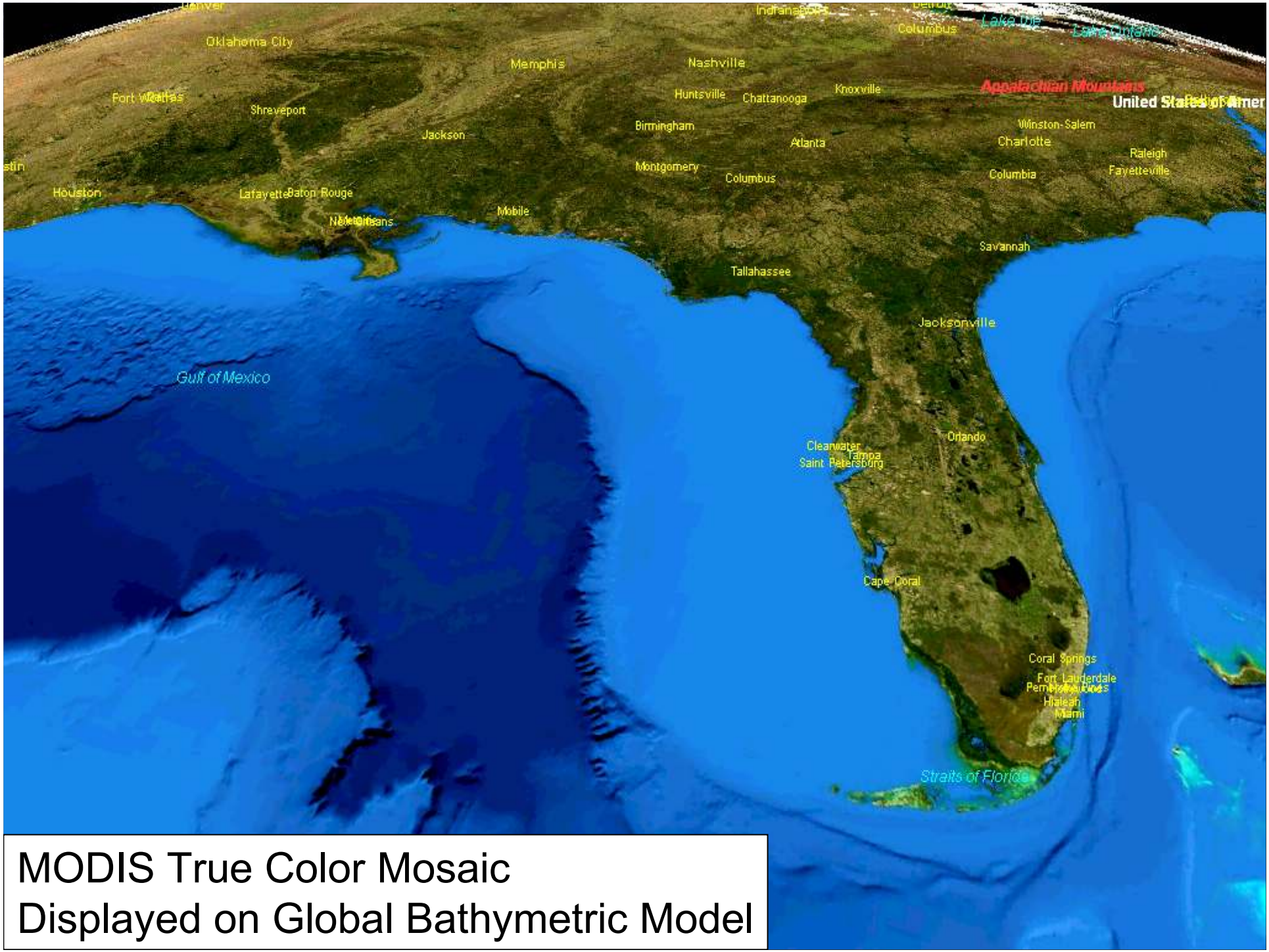


Fusing MODIS Products With Physical Models
- Ocean
- Atmos.



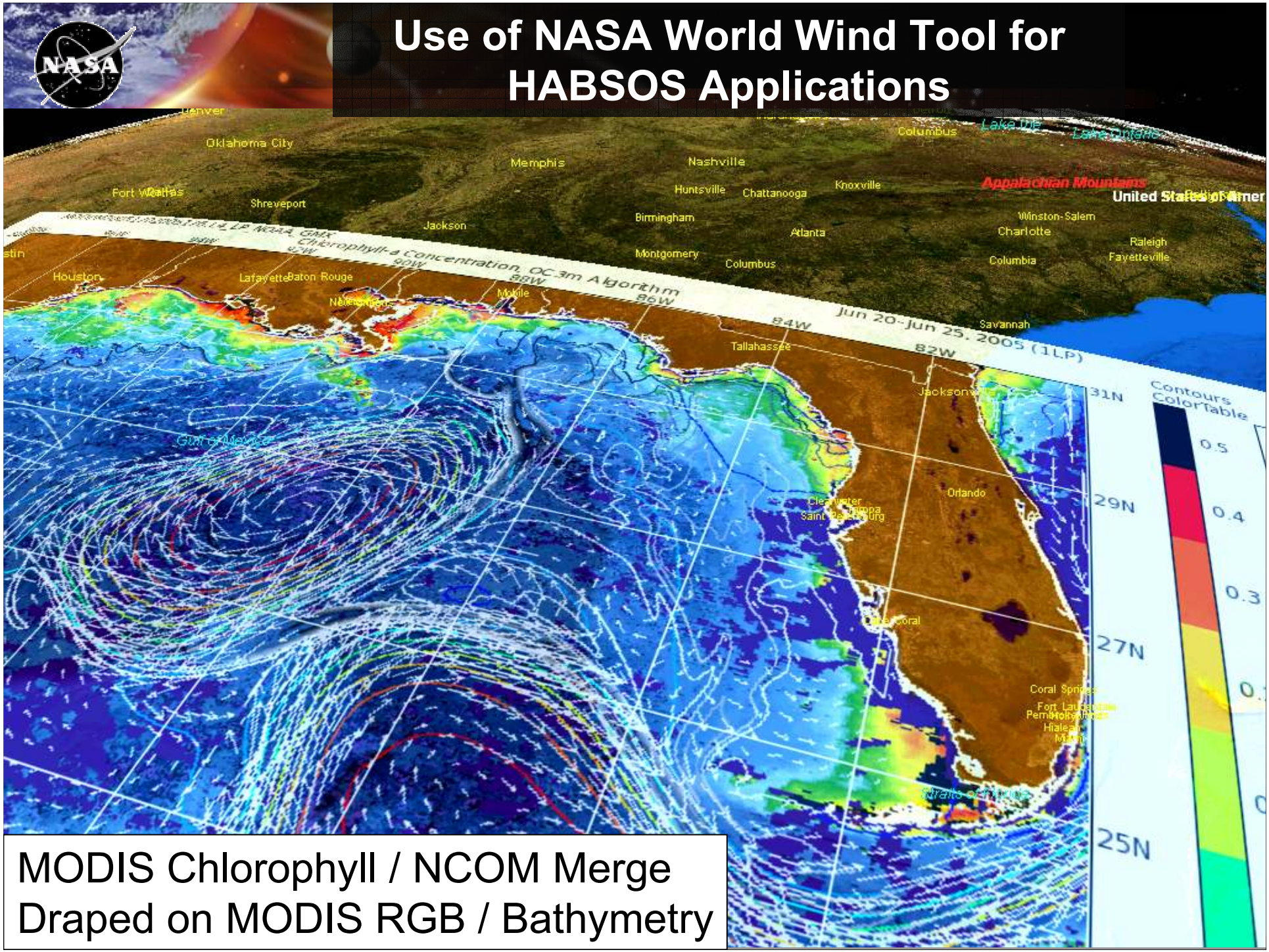
Providing Initialization Validation

Defining Biological Response

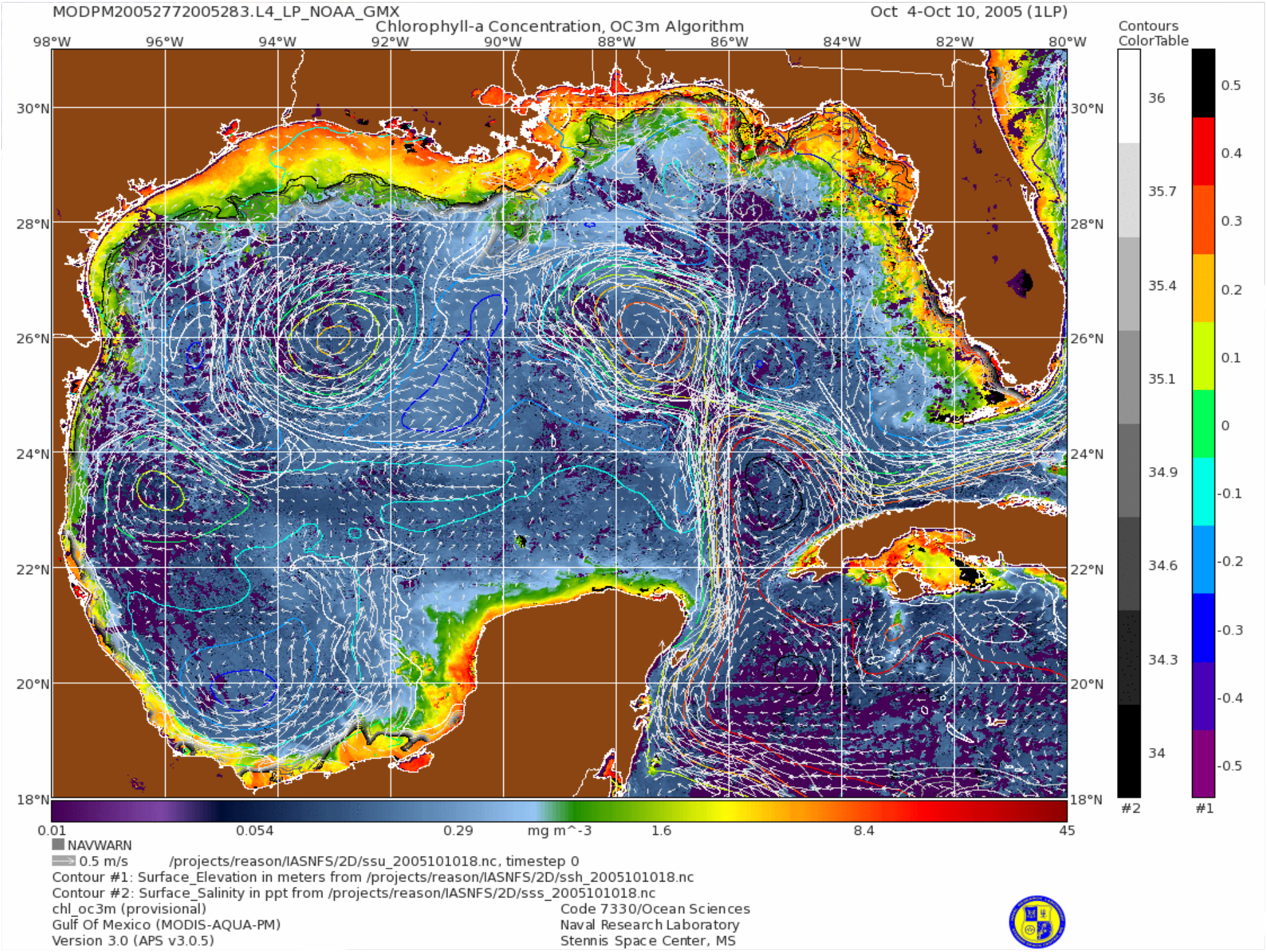


MODIS True Color Mosaic
Displayed on Global Bathymetric Model

Use of NASA World Wind Tool for HABSOS Applications



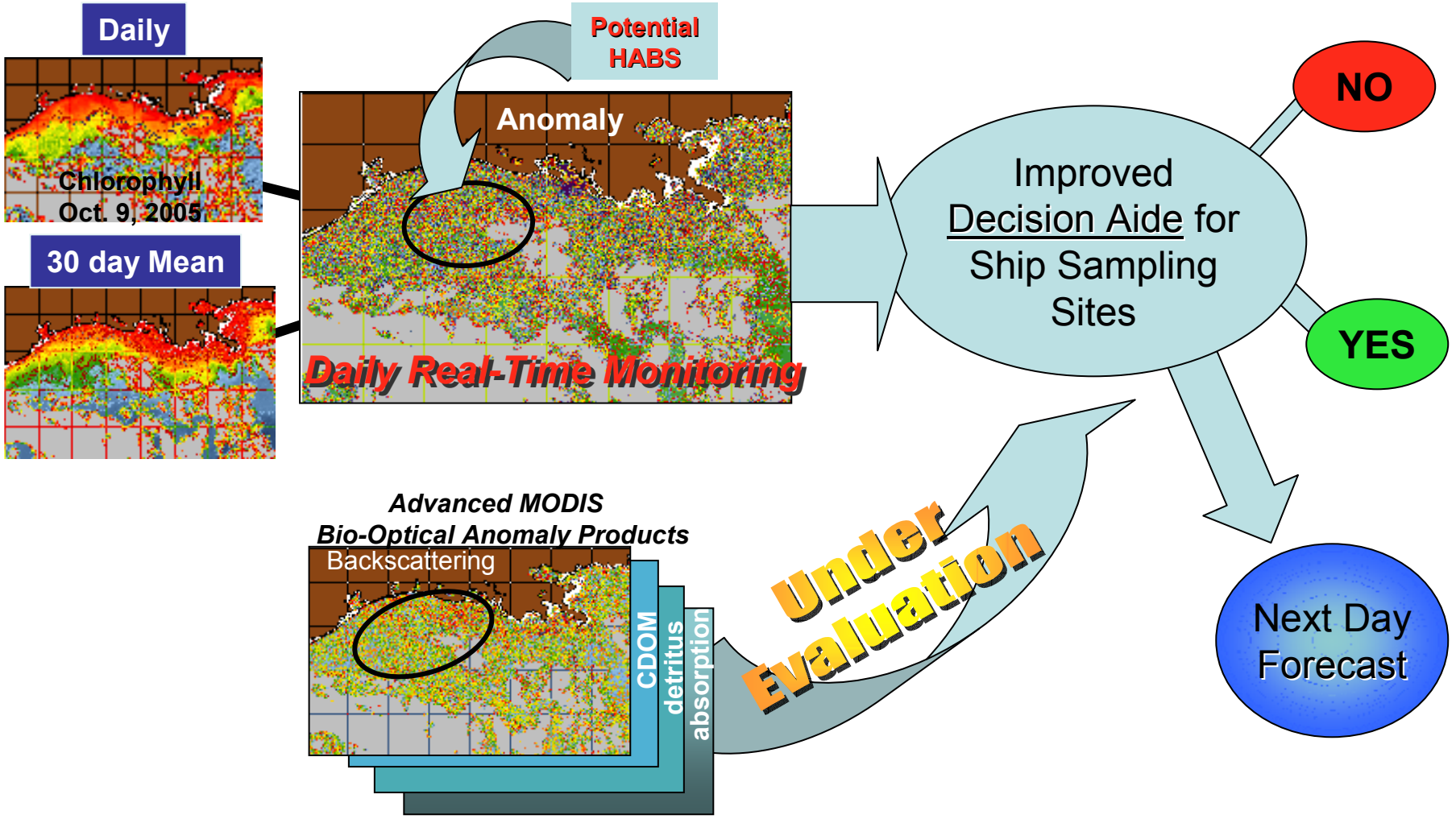
MODIS Chlorophyll / NCOM Merge
Draped on MODIS RGB / Bathymetry


MODPM20052772005283.L4_LP_NOAA_GMX
Oct 4-Oct 10, 2005 (1LP)
Chlorophyll-a Concentration, OC3m Algorithm
98°W
96°W
94°W
92°W
90°W
88°W
86°W
84°W
82°W
80°W
30°N
28°N
26°N
24°N
22°N
20°N
18°N
Contours
ColorTable
36
35.7
35.4
35.1
34.9
34.6
34.3
34
#2
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
#1
0.01
0.054
0.29
mg m^-3
1.6
8.4
45
NAVWARN
0.5 m/s /projects/reason/IASNFS/2D/ssu_2005101018.nc, timestep 0
Contour #1: Surface_Elevation in meters from /projects/reason/IASNFS/2D/ssh_2005101018.nc
Contour #2: Surface_Salinity in ppt from /projects/reason/IASNFS/2D/sss_2005101018.nc
chl_oc3m (provisional)
Gulf Of Mexico (MODIS-AQUA-PM)
Version 3.0 (APS v3.0.5)
Code 7330/Ocean Sciences
Naval Research Laboratory
Stennis Space Center, MS

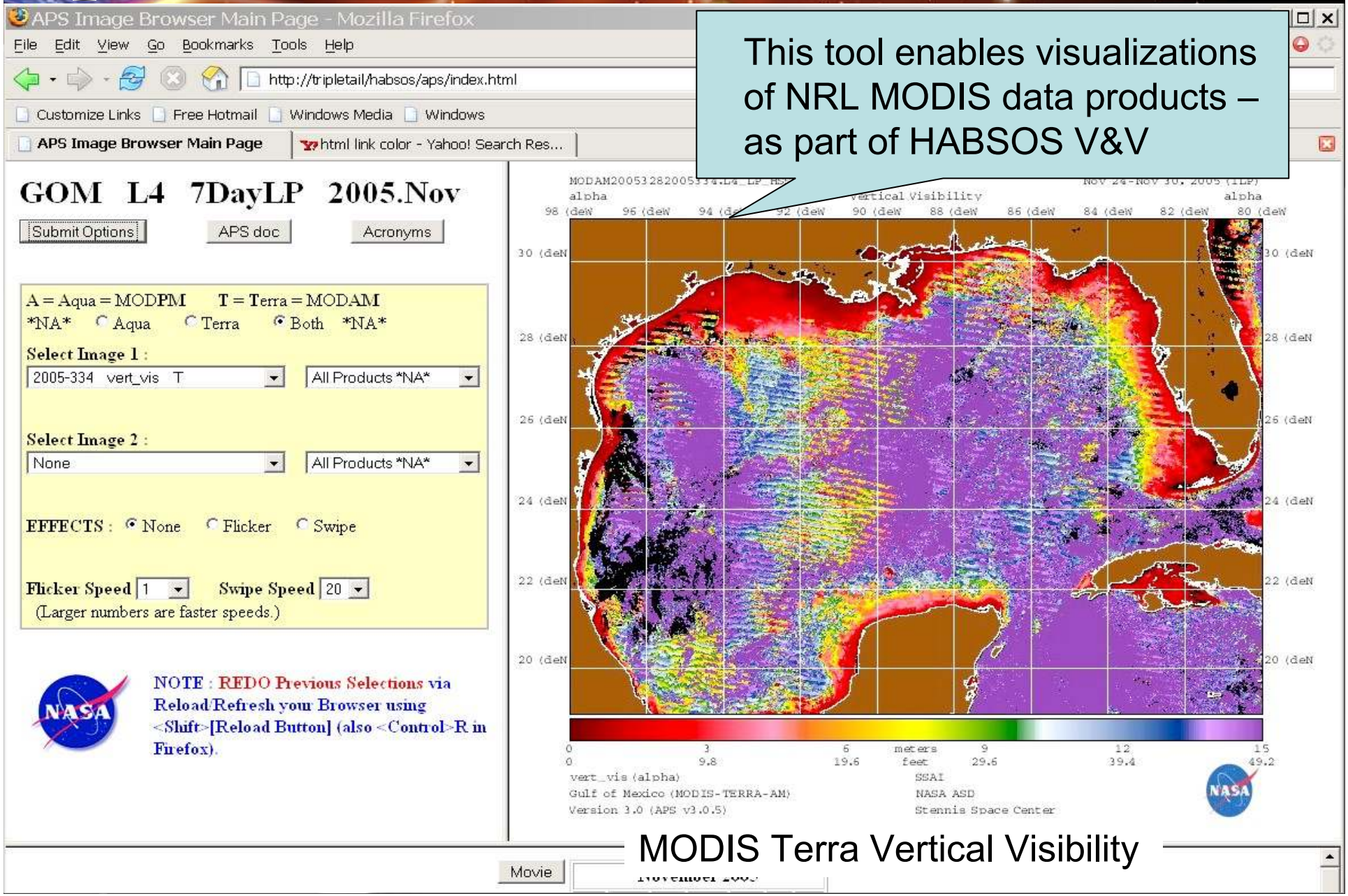
Harmful Algal Bloom (HAB) Monitoring

Targeting - Possible HARMFUL from non-HARMFUL ALGAL
Supporting Ship Sampling regions measurement programs
Assessing Size, Location and Movement of "Bloom"

MODIS PRODUCTS



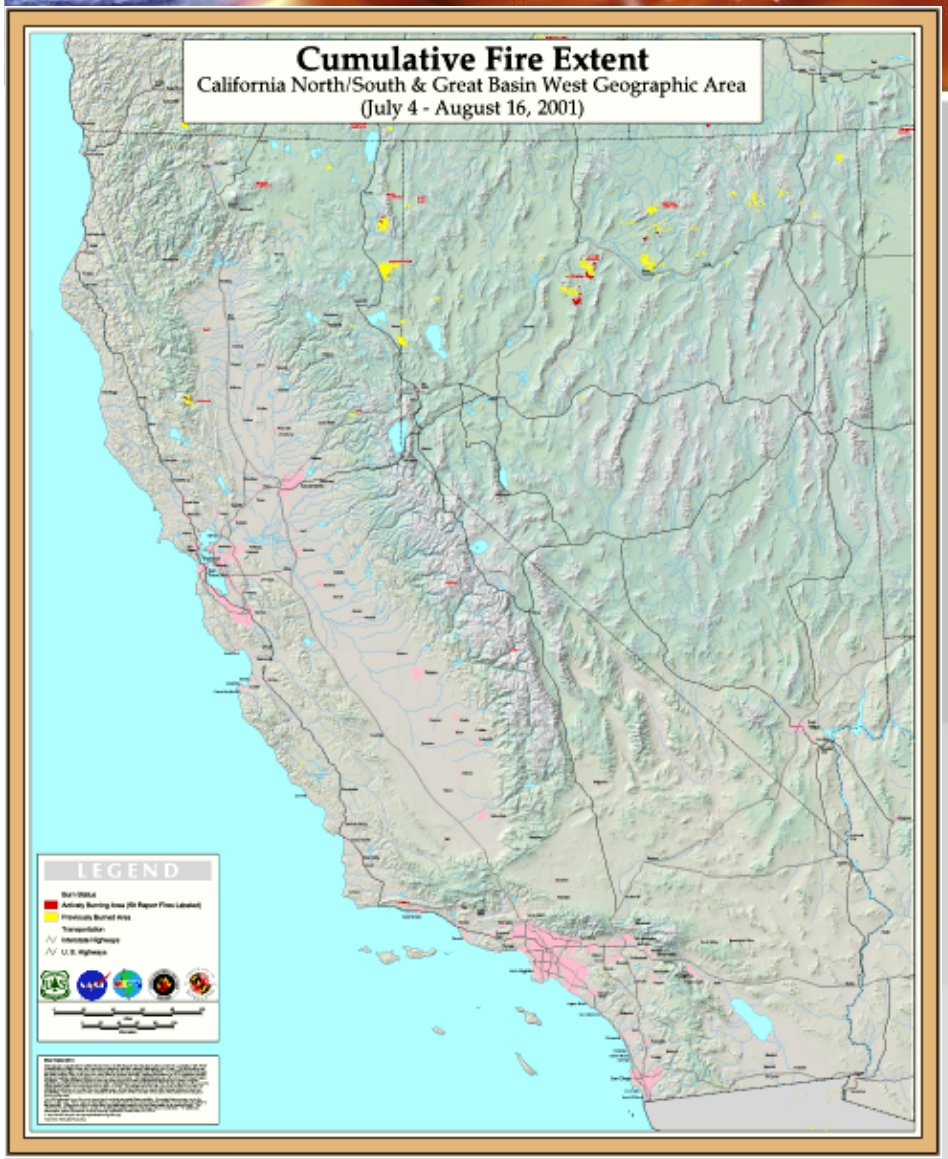
Example Coastal Rapid Prototyping Tools

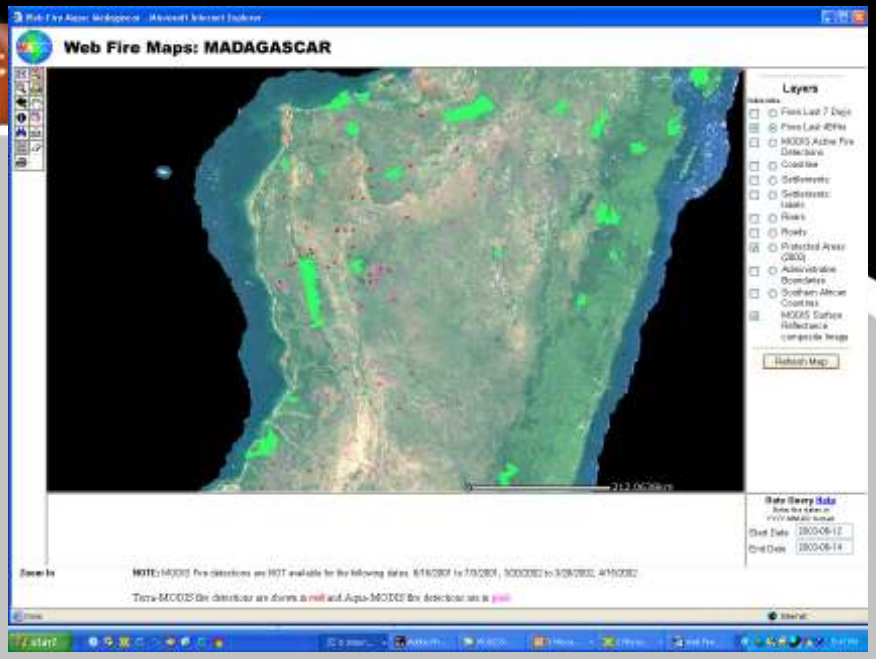


This tool enables visualizations of NRL MODIS data products – as part of HABSOS V&V

MODIS Terra Vertical Visibility

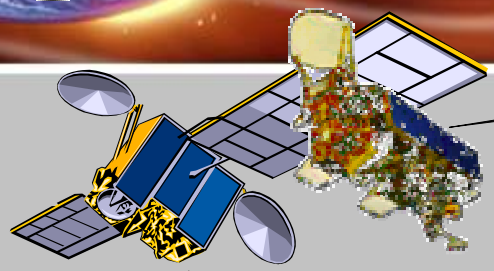

Disaster Management





Active Fire in RED **Previously Burned in YELLOW**

Rapid Response Systems Architecture



Terra & Aqua

Direct Broadcast
Receiving Station

L1B Data

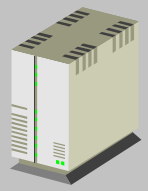
T+30min

USDA Forest Service
Remote Sensing
Application Center

Active Fire Maps
http://activefiremaps.fs.fed.us
Three times per day

Backup Feed
L1B Data

EDOS



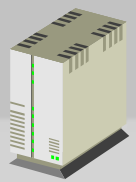
Rapid Response System
NASA/GSFC

Active Fire
Locations

T+5hrs

Burn Severity Maps
Handcrafted Imagery

Active Fire Locations
Selected Imagery

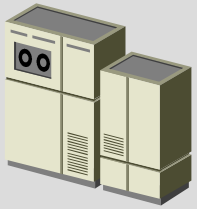


University of Maryland
Geography Dept

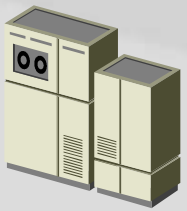
Active Fire
Locations
GOFC Fire Partners

MODIS
L0 Data

T+2-5hrs



GES DAAC
NASA/GSFC



NOAA

T+5hrs

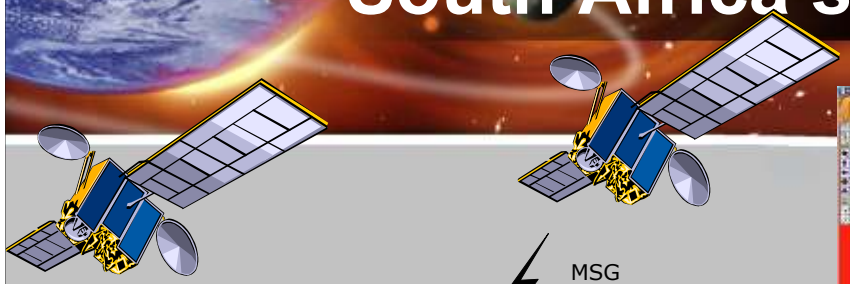
Active Fire and
Corrected Reflectance
http://rapidfire.sci.gsfc.nasa.gov
MODIS home page
http://modis.gsfc.nasa.gov

Web Fire Maps and Fire
Feature Server
http://firemaps.geog.umd.edu

NASA Earth
Observatory
http://earthobservatory.nasa.gov

March 2005

South Africa's Fire Early Warning System



Terra and Aqua

MSG

Direct Broadcast Receiving Station Satellite Application Centre (SAC) South Africa

Direct Broadcast Receiving Station National Weather Service South Africa

Advanced Fire Information System (AFIS) http://wamis.co.za

Real-time feed

End users

- ESKOM
- Disaster Management Unit
- Weather Service
- Forest Department

Rapid Response System SAC(CSIR) MODIS Fire-Algorithm

Weather Service, South Africa MSG Fire-Algorithm (Philip Frost)

GeoDatabase

E-mail Alerts

Rapid Response System SMS/Text messages

SAC

Active Fire Locations (Text files)

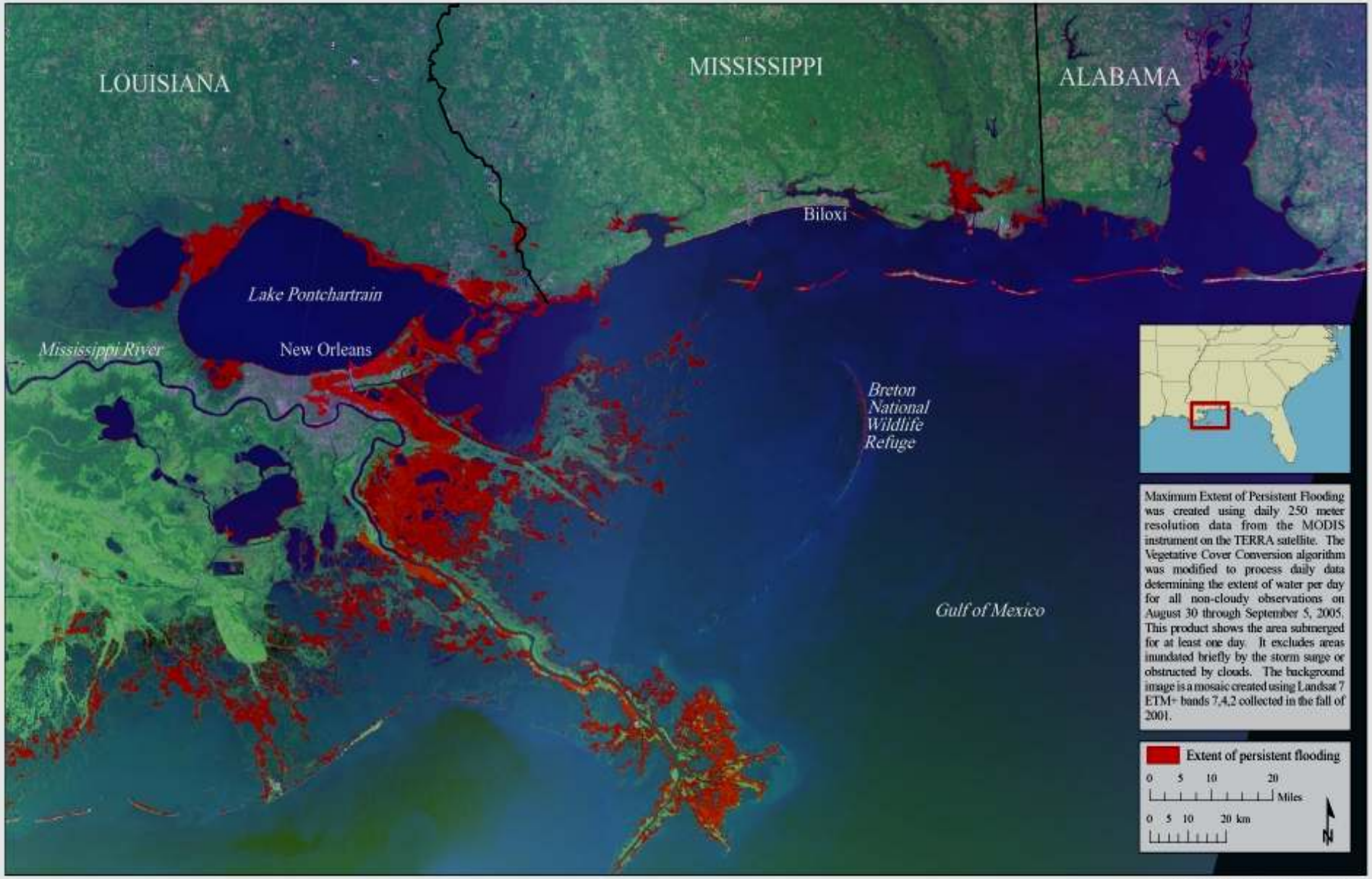
University of Maryland

GeoDatabase Web Fire Mapper (http://maps.geog.umd.edu)

Web Fire Mapper maps.geog.umd.edu

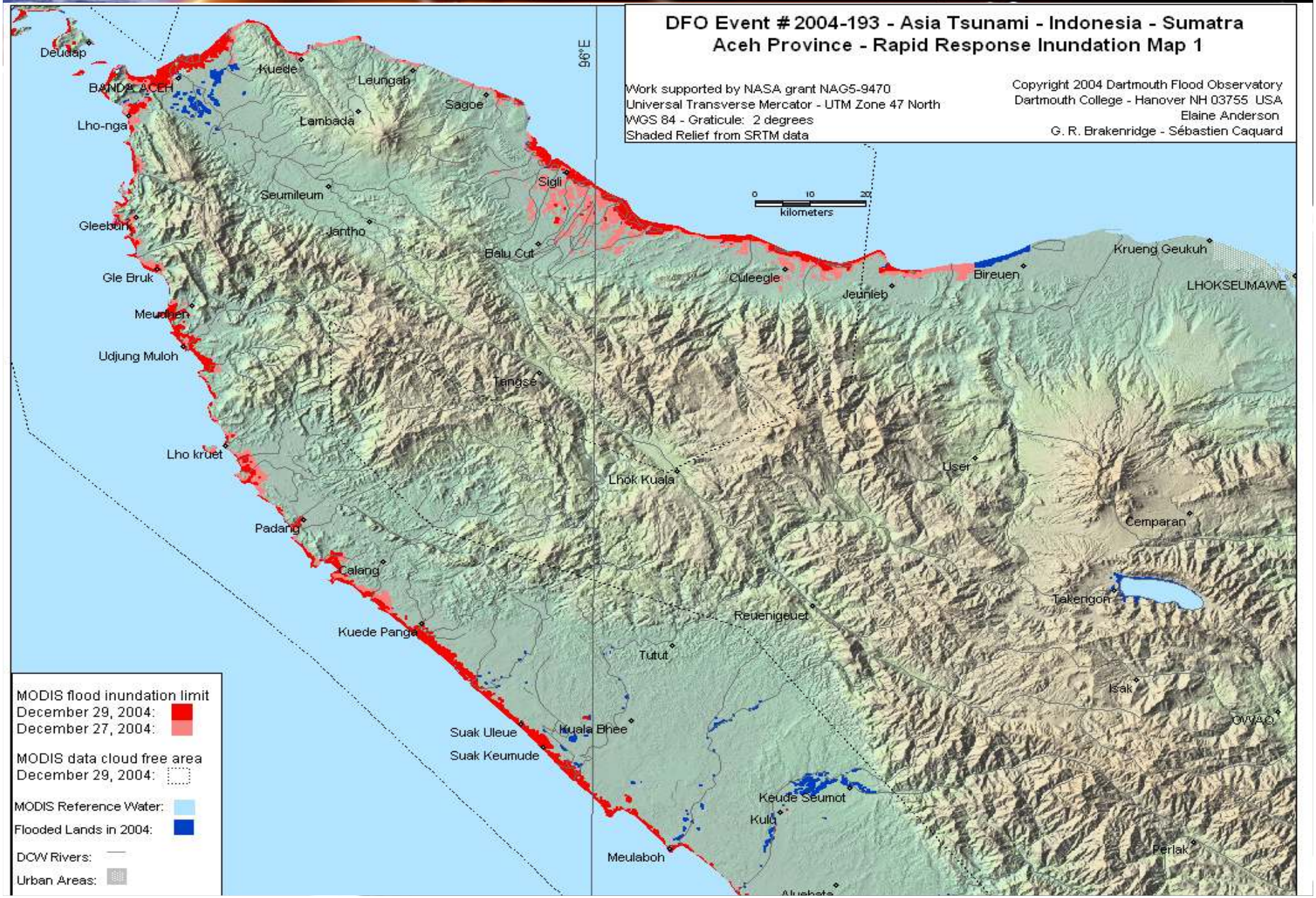
Maximum Extent of Persistent Flooding Caused by Hurricane Katrina

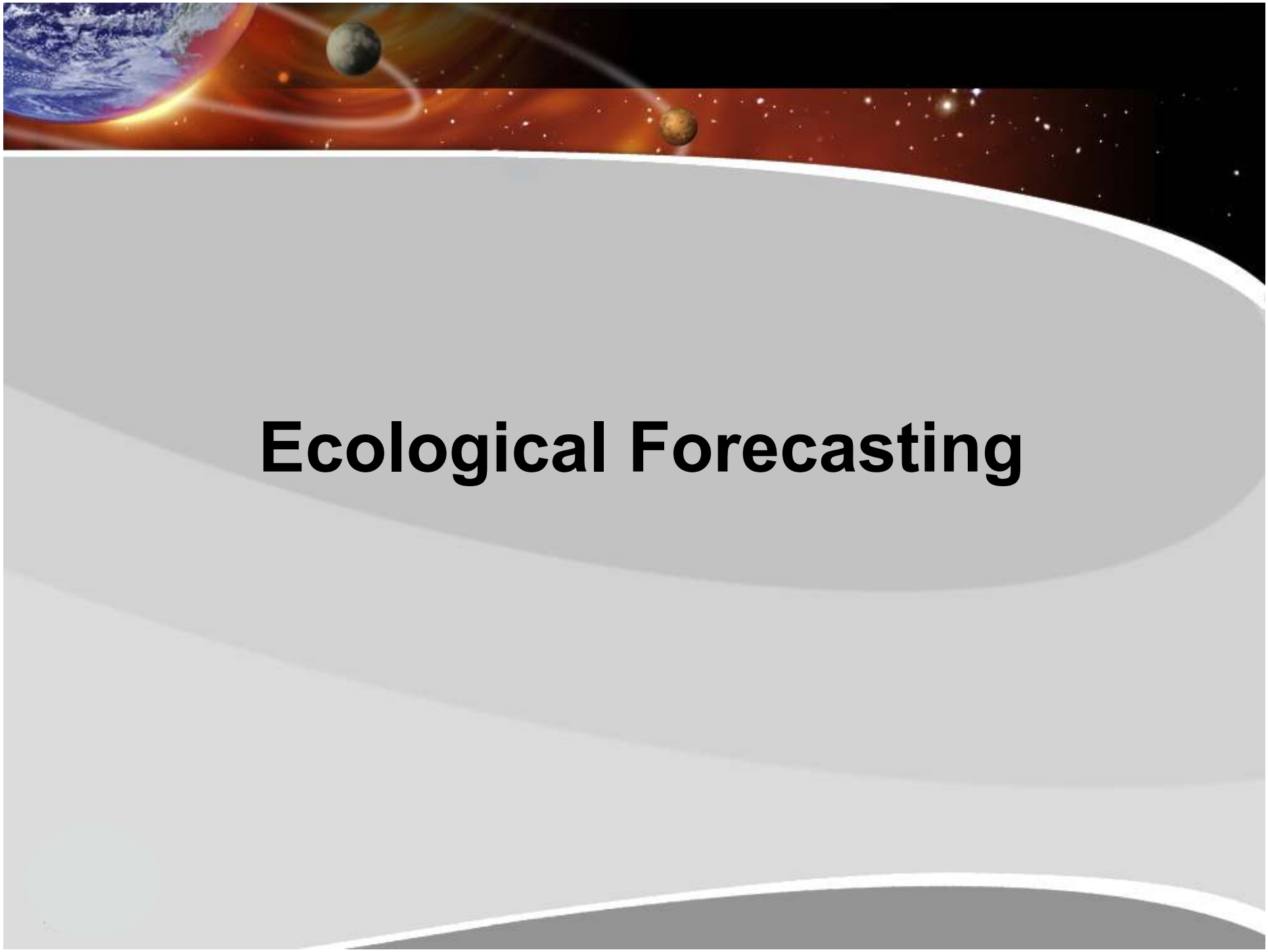
Mark Carroll, Charlene DiMiceli, Robert Sohlberg, and John Townshend
University of Maryland, Department of Geography



Cartographic Design and Presentation by Karl Wurster

Disaster Management





Ecological Forecasting

Ecosystems Forecasting

Terra

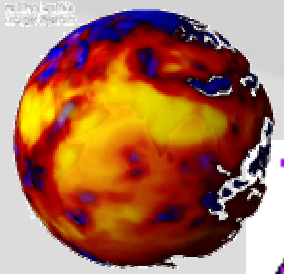
SRTM

Tasking

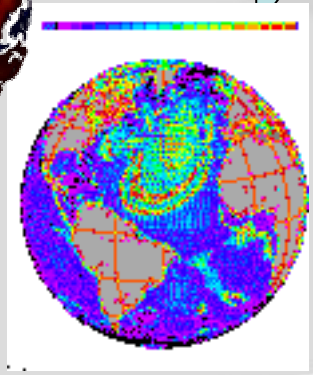
Data Processing &
Mission Control

Public Access

Processing



Exploitation

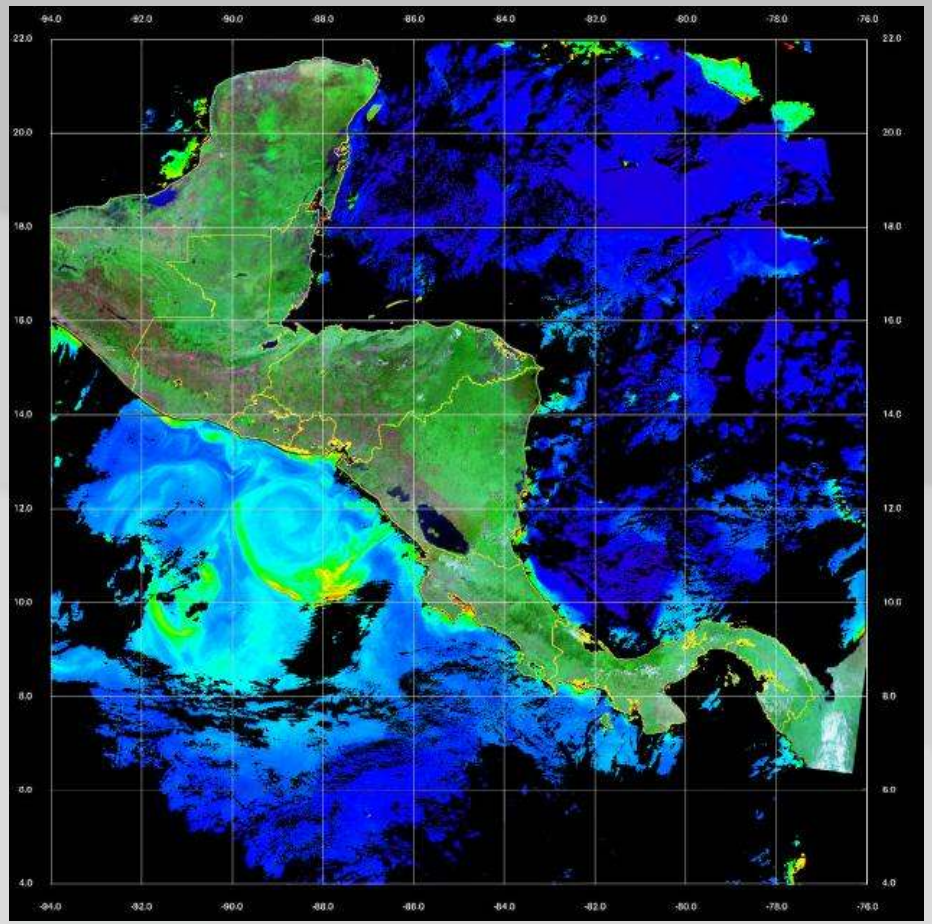


EOSDIS Science Data Systems

SIAM-SERVIR
Center in Panama City

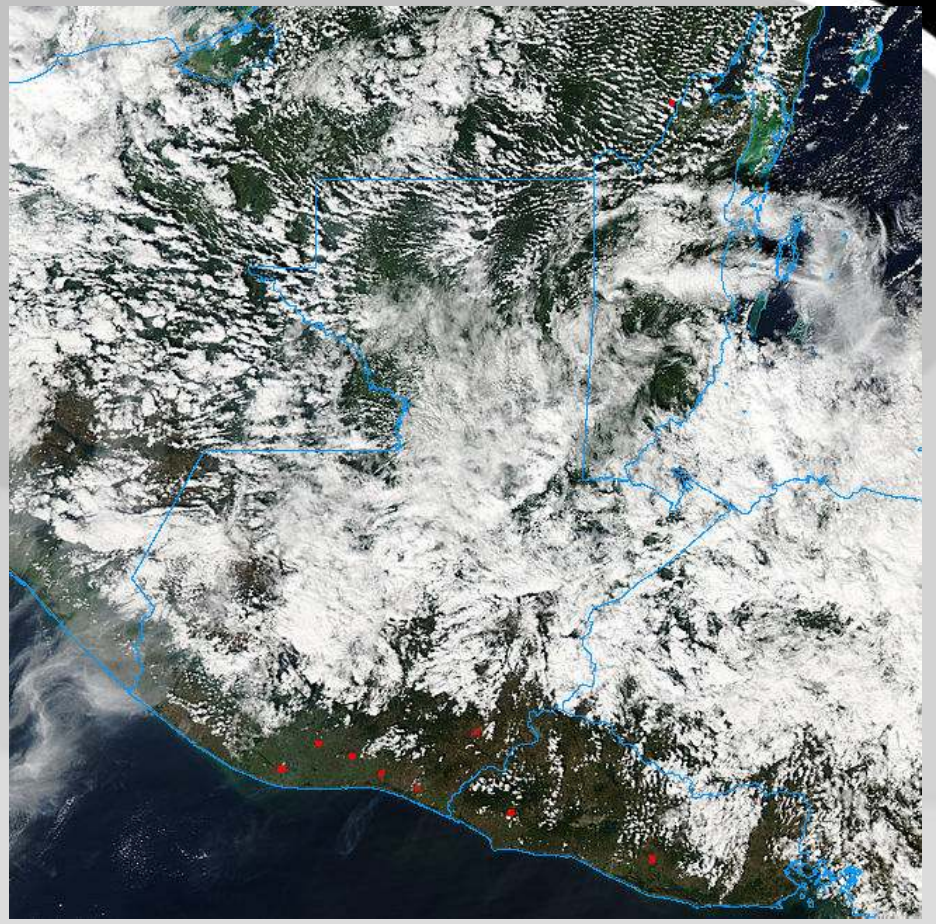
MODIS & SERVIR

Red Tide Mapping



12/19/05 MODIS Aqua Image of chlorophyll a concentration

Fire Rapid Response



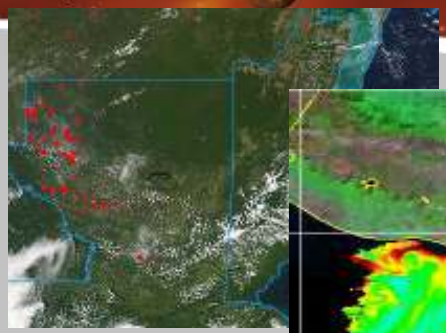
12/19/05 MODIS Aqua Guatemala Subset of SERVIR Fire Rapid Response System

SIAM-SERVIR

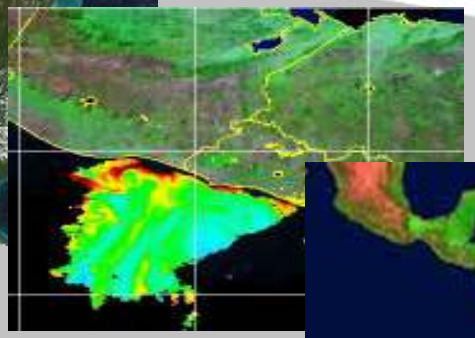
An Environmental Monitoring and Decision Support System for Central America

Aqua

Terra



Fires



Red Tide

Land Cover/Use/Change

Data ingest from EOS and Central America sources

Web Server at NSSTC

Environmental Monitoring and Decision Support Products

SERVIR Node at NSSTC

Landsat
SRTM
IKONOS

SERVIR Node Panama City, Panama

Central American Officials, Researchers, Educators, etc.

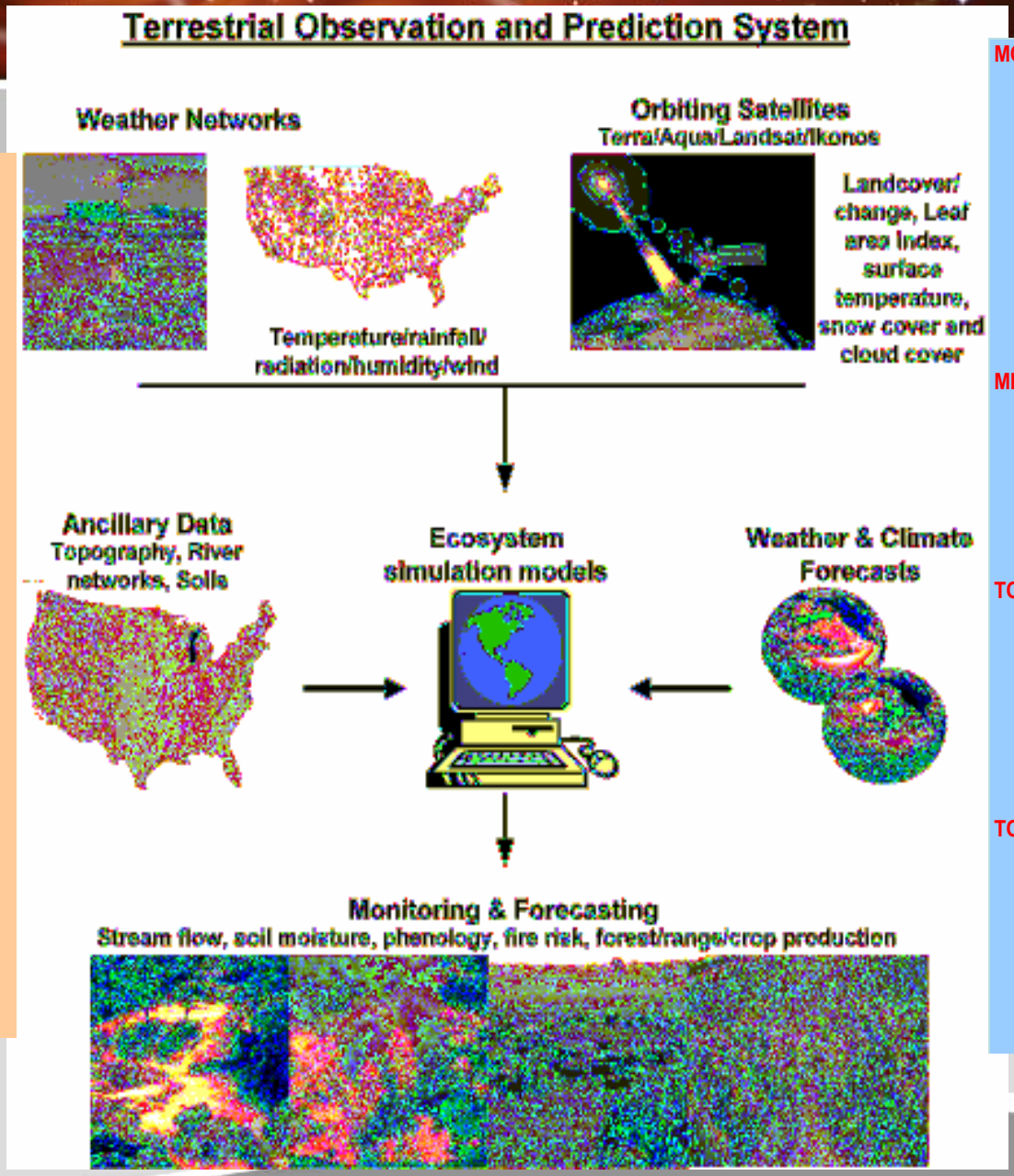
Results

Emergency Response
Policy Changes
Corridor Preservation
Species Preservation
Sustained Development
Better Living Conditions

TOPS

TOPS Architecture

- **Simulation Models**
  Biospheric models for ecological monitoring & forecasting
- **IMAGEbot Planner**
  Optimizes data processing plans & retrieves appropriate data for analyses
- **Causal Discovery**
  Autonomous analysis of data for discovery of novel causal models; integrated with TOPS for model validation



MODIS PRODUCTS (8 days/Annual)

1 LAI
2 FPAR
3 GPP/NPP*
4 LST-TERRA/AQUA
5 NDVI
6 EVI
7 LANDCOVER/Cont Fields*
8 ALBEDO
9 SNOW
10 FIRE

METEOROLOGY (Daily)

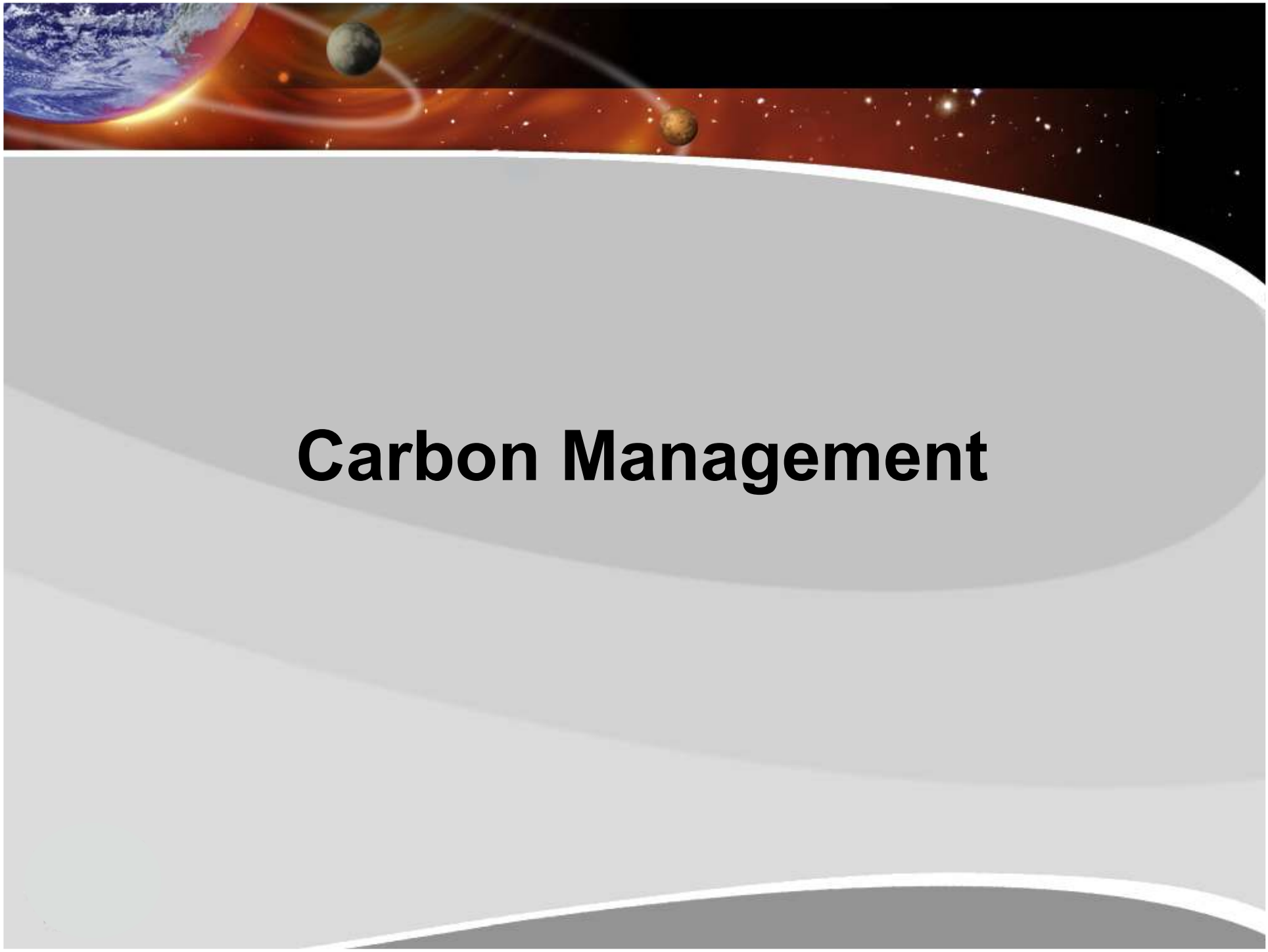
11 MAX TEMPERATURE
12 MIN TEMPERATURE
13 RAINFALL
14 SOLAR RADIATION
15 DEW POINT/VPD
16 DEGREE DAYS

TOPS-NOWCASTS (daily)

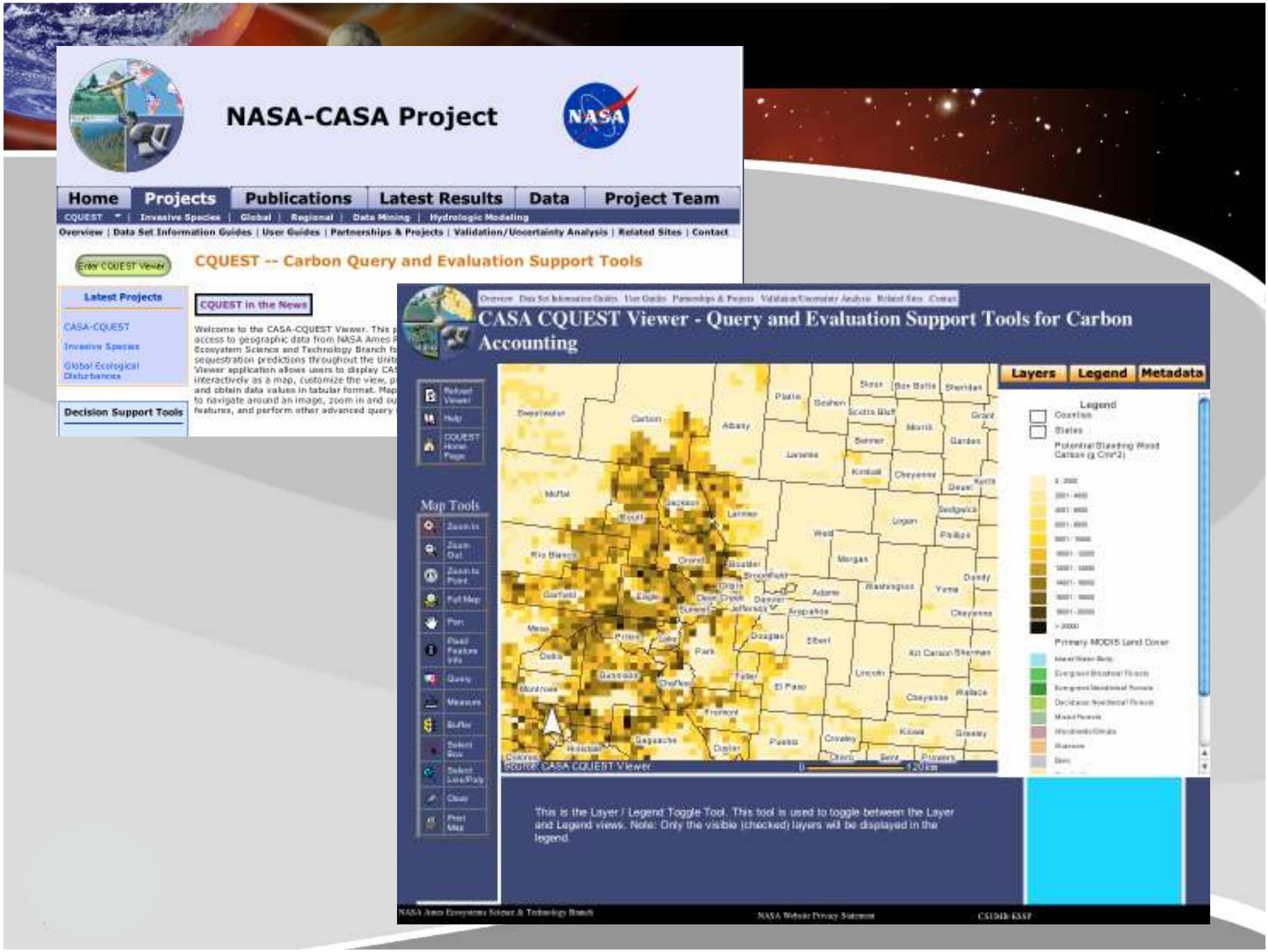
17 TOPS-SNOW
18 TOPS-SOIL MOISTURE
19 TOPS-ET
20 TOPS-OUTFLOW
21 TOPS-GPP/NPP
22 TOPS-PHENOLOGY
23 TOPS-VEG STRESS

TOPS-FORECASTS (5 days to 180 days)

24 BGC-LAI/PHENOLOGY
25 BGC-SOIL MOISTURE
26 BGC-OUTFLOW
27 BGC-ET
28 BGC-VEG STRESS
29 BGC-SNOW
30 BGC-GPP/NPP



Carbon Management

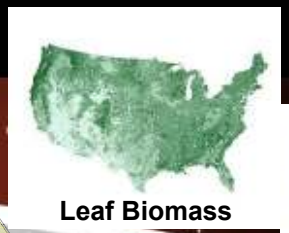

NASA-CASA Project
NASA
Home
Projects
Publications
Latest Results
Data
Project Team
CQUEST | Invasive Species | Global | Regional | Data Mining | Hydrologic Modeling
Overview | Data Set Information Guides | User Guides | Partnerships & Projects | Validation/Uncertainty Analysis | Related Sites | Contact
Enter CQUEST Viewer
CQUEST -- Carbon Query and Evaluation Support Tools
Latest Projects
CASA-CQUEST
Invasive Species
Global Ecological Disturbance
Decision Support Tools
CQUEST in the News
CASA CQUEST Viewer - Query and Evaluation Support Tools for Carbon Accounting
Layers
Legend
Metadata
Map Tools
Zoom In
Zoom Out
Pan
Query
Measure
Buffer
Clear
Legend
Counties
States
Primary MODIS Land Cover
This is the Layer / Legend Toggle Tool. This tool is used to toggle between the Layer and Legend views. Note: Only the visible (checked) layers will be displayed in the legend.
NASA Ames Ecosystem Science & Technology Branch
NASA Website Privacy Statement

CASA CQUEST

NASA / NGA SRTM Elevation

NASA MODIS Products

Decision Support Tool for Carbon Accounting



Leaf Biomass

Cropland NPP

VEMAP & Daymet (UMT) Climate data

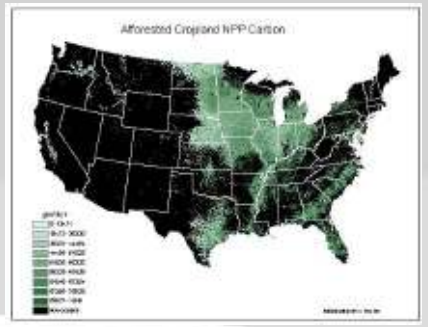
Inputs include continental-scale land cover, NDVI, FPAR, elevation, soils, and climate data …

User Defined Profile
- Region of Interest
- Time Frame
- Biophysical
- Management
- Climate Scenario

Output: landscape-to continental scale predictive maps of above and below ground distributions of sequestered carbon for different climate scenarios

http://geo.arc.nasa.gov/website/cquestwebsite

Carbon Sequestration Predication



USFS Forest Inventory and Analysis Data

Yale/UW Landscape Management System

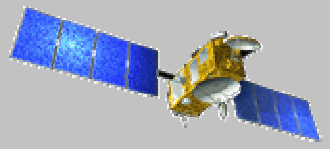
Cropland Afforestation Prediction

Multi-scale Validation Information

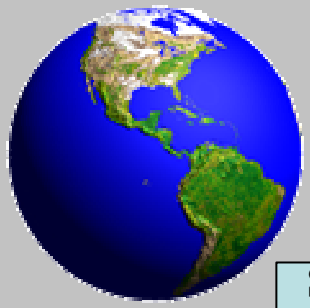
Agricultural Efficiency

Agriculture Efficiency

Jason



Terra

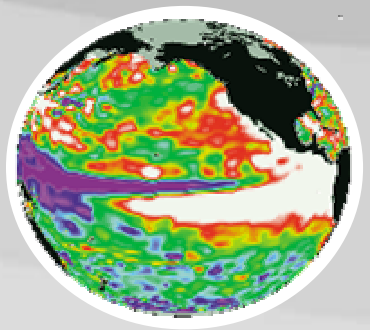


Societal Benefits

Downlink

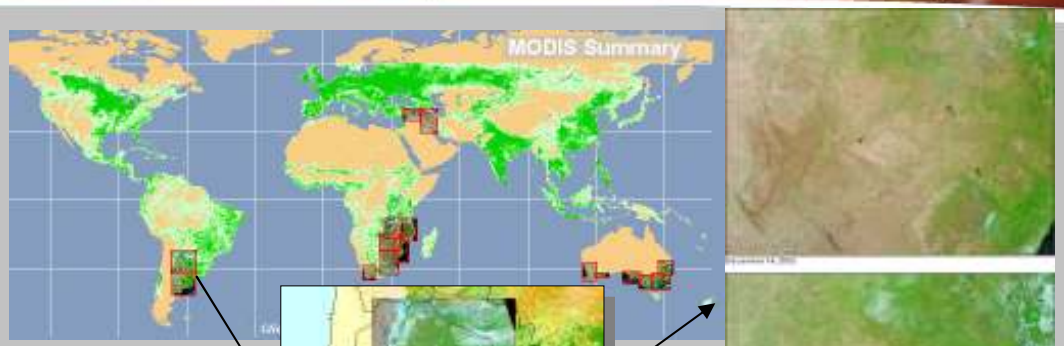
EOSDIS & DAACs

Exploitation



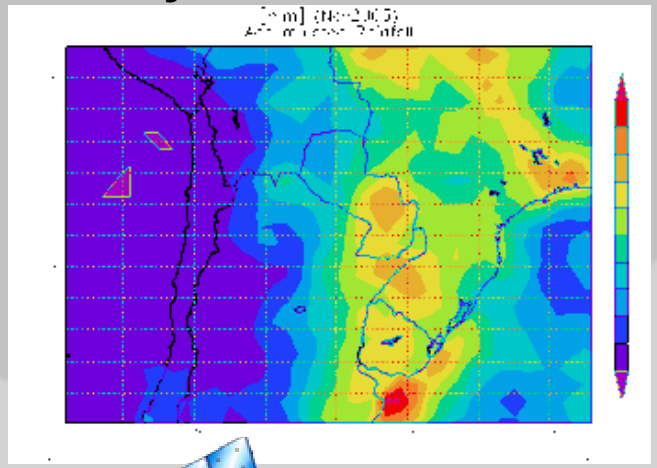
CADRE:
USDA Decision Support System for Global Crop Production Assessments

Applying NASA Research Results for improving Crop Production Assessment



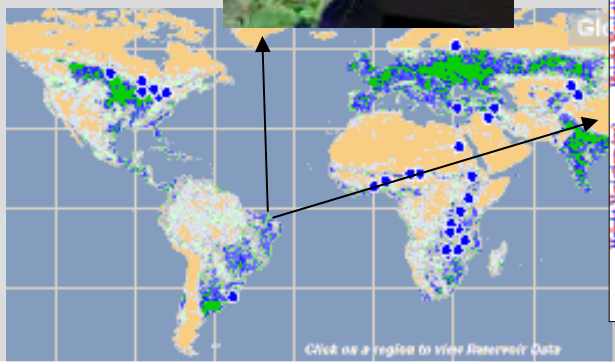
MODIS Rapid Response products provide timely looks at crop condition

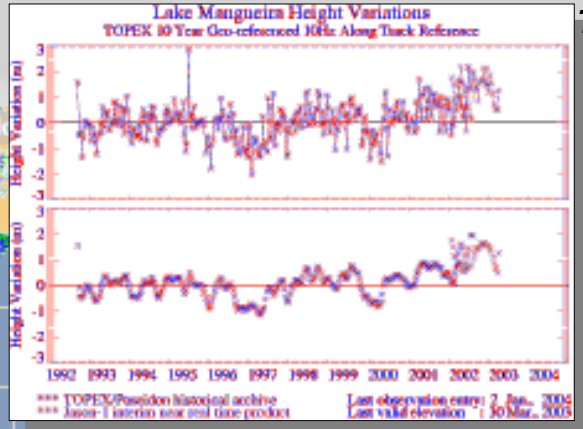
EOS products
Productivity modeling (FAS)
WAOB Estimates
Policy/Resource Decisions



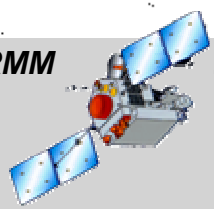
Jason

TOPEX and JASON-1 products provide lake level data in critical irrigated areas





TRMM



TRMM products provide better data on available water

USDA

UNIVERSITY OF MARYLAND

NASA

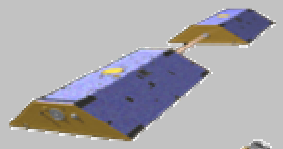
Water Management

Water Management

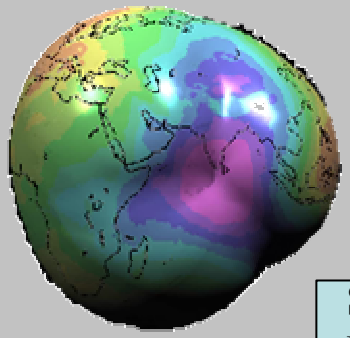
Bureau of Reclamation

USGS
science for a changing world

GRACE



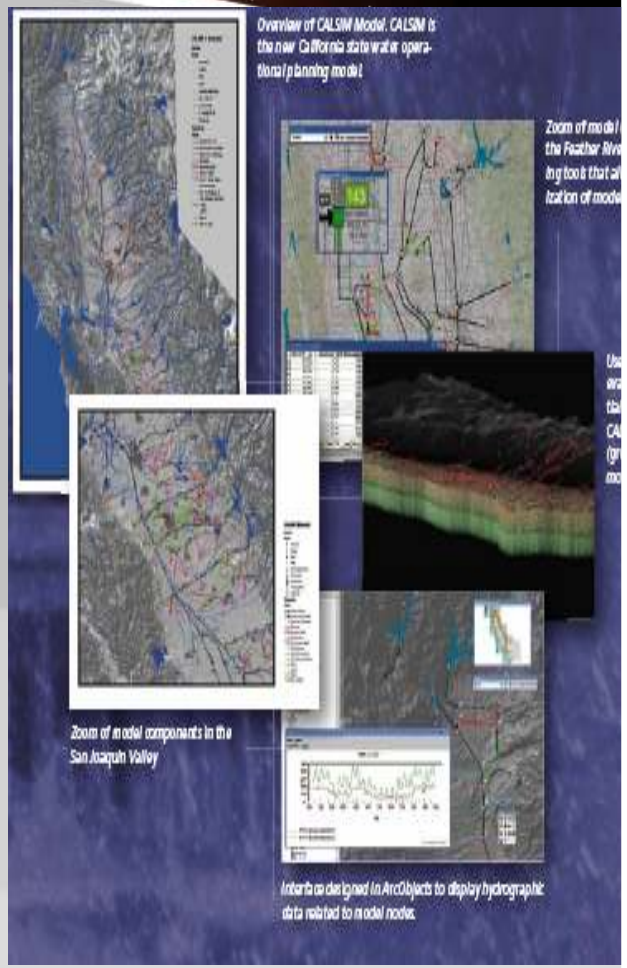
Terra



Processing

Societal Benefits

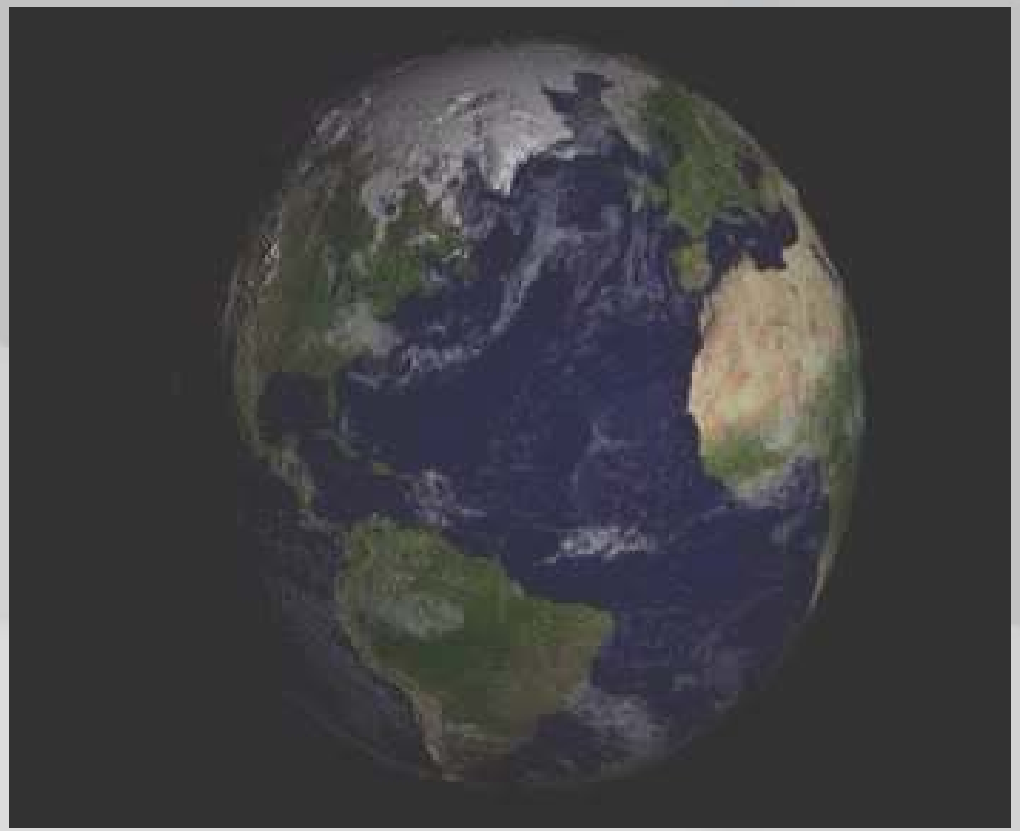
Exploitation



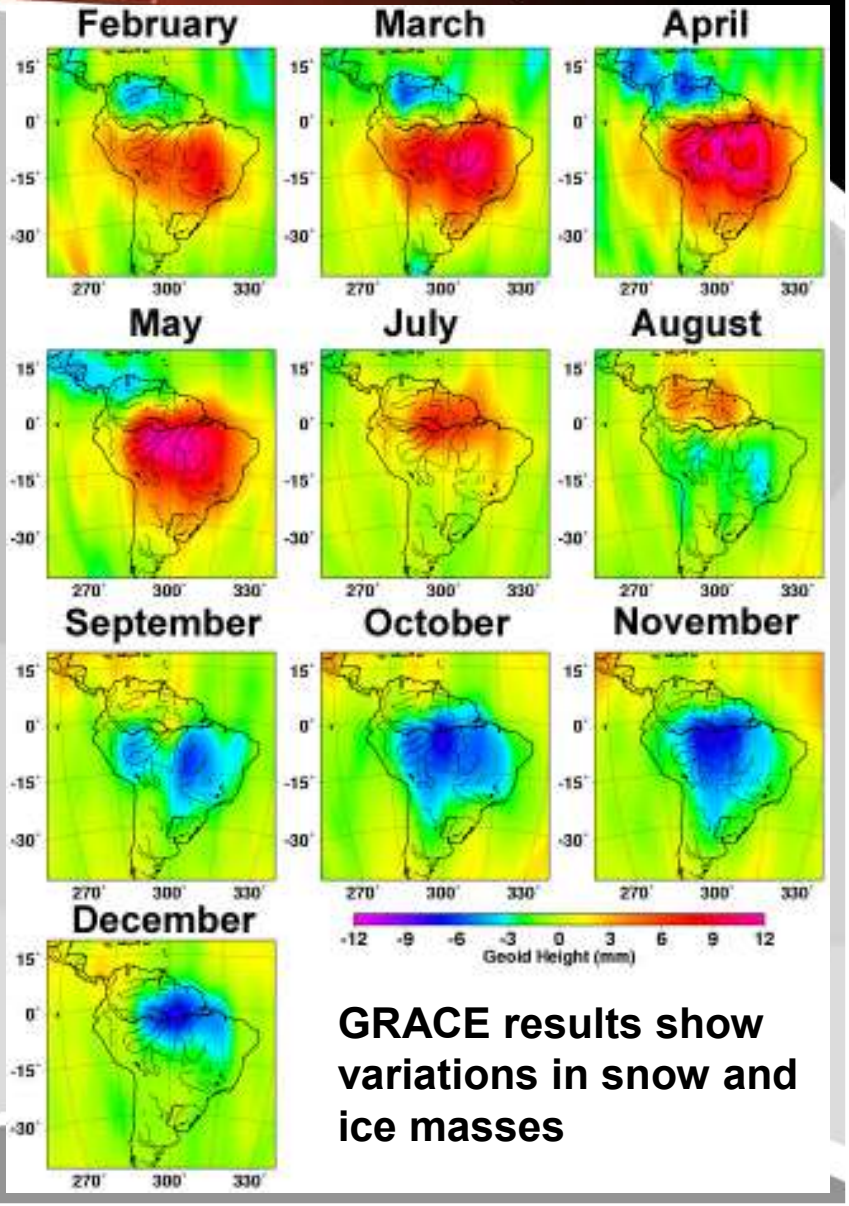
EOSDIS & DAACs

Riverware & AWARDS

Evaluating the use of Water Cycle Research Results



Variation in global snow cover for the period from 2001- 2002 derived from NASA observations



GRACE results show variations in snow and ice masses

DEVELOP Program

DEVELOP - MODIS Usage

Oklahoma Disaster Management – MODIS Water Vapor – MOD 05 (FY04)

The Oklahoma Disaster Management team used water vapor data from the MODIS Terra instrument in conjunction with vertical column data from the Lidar Atmospheric Sensing Experiment (LASE) to demonstrate water vapor density and distribution.

Alabama Air Quality – MODIS Thermal Data – MOD 11 (FY03-FY04)

The Alabama Air Quality team used thermal data from the MODIS Terra instrument to identify thermal differences between urban areas and the cooler, surrounding rural areas.

Tennessee Air Quality – MODIS Aerosol Optical Thickness – MOD 04 (FY05)

The Tennessee Air Quality team is using aerosol optical thickness data from the MODIS Terra instrument to compare with model output from the Community Multiscale Air Quality Modeling System.

Louisiana Homeland Security – MODIS Land Cover – MOD 12 (FY05)

The Louisiana Homeland Security team used land cover data from the MODIS Terra instrument to determine usage characteristics to determine a point source for a chemical release.

Utah Invasive Species – MODIS NDVI – MOD 13 (FY05)

The Utah Invasive Species team used Normalized Difference Vegetation Index derived from the MODIS Terra instrument in conjunction with field measurements to model cheatgrass cover across years starting in 2000 and to evaluate Utah State University's model process.

Challenges on the Way Ahead

- Systematically transitioning appropriate NASA research results to be adopted into operational systems to serve society
- Characterizing uncertainty in model forecasts for weather, climate, and natural hazards
- Benefiting from increased computing and modeling capacity to handle volume and range of data from NASA observatories
- Adopting the use of the Federal Enterprise Architecture Framework
- Evolving an Earth-Sun System Gateway portal to provide interoperability and access between research results and integrators


Earth-Sun System Gateway
National Aeronautics and Space Administration
Visit Interoperable Gateway
Sea Surface Temperature
Clouds During Hurricane Isabel
Atmospheric Water Vapor
AMSR-E
SCIENCE FOCUS AREAS
NATIONAL APPLICATIONS
MODELS
EARTH OBSERVATIONS
CARBON
WATER
CLIMATE
ATMOSPHERE
WEATHER
SURFACE
EARTH-SUN SYSTEM

Benchmark Reports

http://aiwg.gsfc.nasa.gov

MODIS-related

USDA Production Estimates and Crop Assessment Division DSS Assimilation, Sept. 2005.

Application of Earth Science Satellite Observations to Improve Environmental Public Health Surveillance Systems, Sept. 2005

AQI - Application of Satellite Data for Forecasting Particle Pollution, Nov. 2003

RSVP Benchmark Report for Public Health, Sept. 2005

Aviation Current Icing Potential, July 2005

Initialization of the NCEP Eta/NAM Model DST with Uncoupled NLDASE Land Surface States, Sept. 2005

Border Security Decision Support System Driven by Remotely Sensed Data Inputs, Sept. 2005

Air Quality – Surface Characteristics, Sept. 2005

Diver Visibility with Navy/NRL, 2004

Non-MODIS

Globally Assimilated Lateral Boundary Conditions to Improve CMAQ Ozone Estimates, Sept. 2005

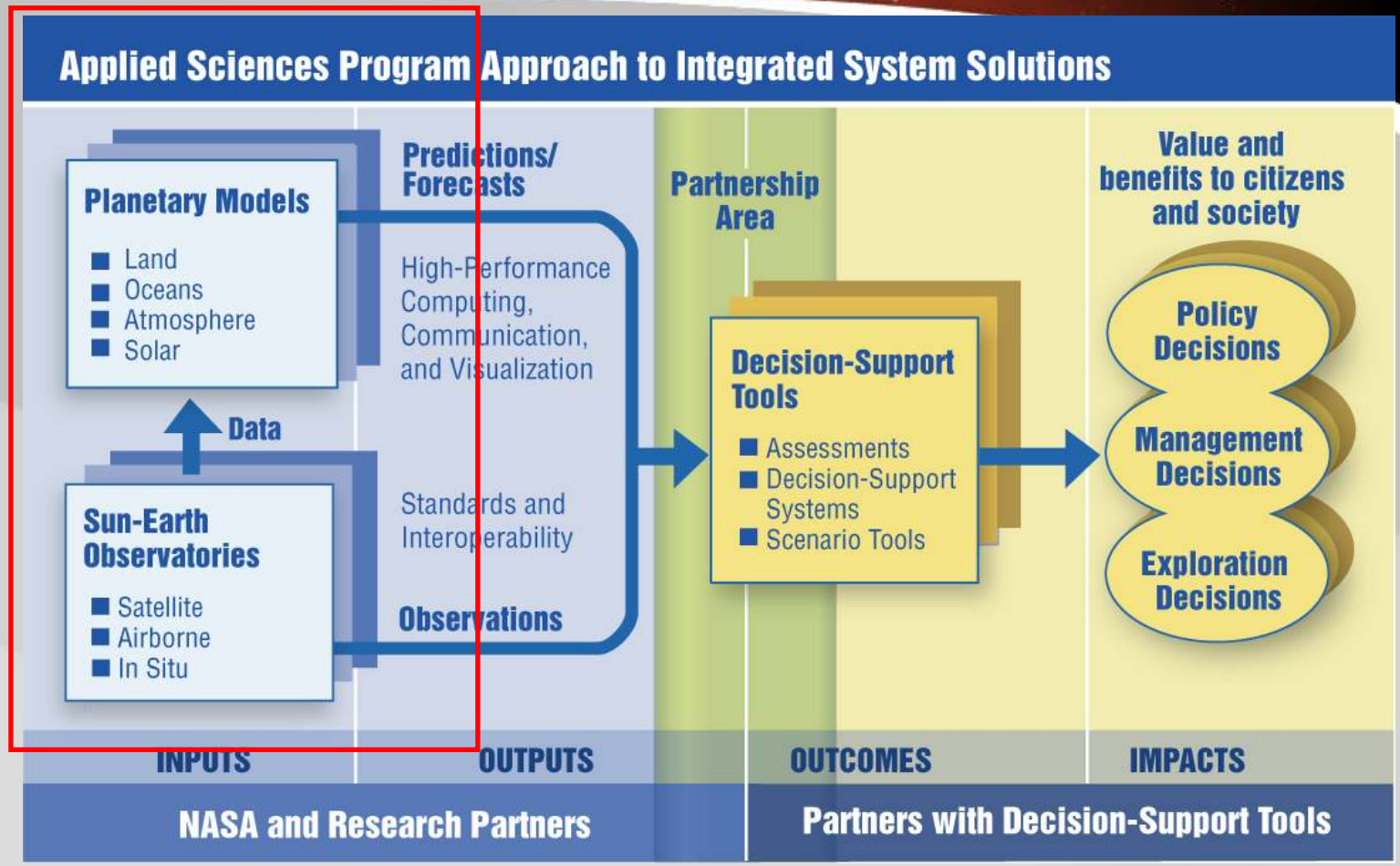
Reports @ http://aiwg.gsfc.nasa.gov

- Evaluation reports for
  - TOPS (Ecological Forecasting)
  - Land-Air Connections (Air Quality)
  - CREWS, GNOME, HABSOS and Sediment Management (Coastal Management)
- V&V report for
  - HABSOS (Coastal Management)

Applied Sciences Solicitations

Decisions CAN & ROSES A.24

Solutions Networks: Proposals to link Earth science organizations & mine results



Integrated System Solutions: Proposals to Link End-to-End

Decisions CAN & ROSES A.24

Decisions CAN

Total Step-2 Full Proposals: 172

Awards: 24 proposals (18 projects)

Agriculture Efficiency	23
Air Quality	11
Aviation	12
Carbon Management	7
Coastal Management	18
Disaster Management	52
Ecological Forecasting	29
Energy Management	2
Homeland Security	7
Invasive Species	10
Public Health	11
Water Management	22
Solutions Networks	15

MODIS – By far the most often mentioned sensor.

ROSES A.24

Total Step-2 Full Proposals: 98

Awards: April 2006

Agriculture Efficiency	10
Air Quality	17
Aviation	7
Carbon Management	1
Coastal Management	17
Disaster Management	15
Ecological Forecasting	9
Energy Management	3
Homeland Security	4
Invasive Species	4
Public Health	5
Water Management	16
Solutions Networks	6

*** Preliminary/approximate numbers. ***

Numbers include proposals serving more than one application.

Current and Future Solicitations

Decisions CAN	(Awards 6/05)	Runs FY05-FY08
ROSES 2005	(Awards 3/06)	Runs FY06-FY09
ROSES 2006	No solicitation planned	
ROSES 2007	(Awards 10/07)	Runs FY08-FY10
ROSES 2008	(Awards 10/08)	Runs FY09-FY11
ROSES 2009	(Awards 10/09)	Runs FY10-FY12
ROSES 2010	(Awards 10/10)	Runs FY11-FY13

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Questions

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SMD Earth Science Division

Websites:

http://science.hq.nasa.gov/earth-sun/applications/

http://aiwg.gsfc.nasa.gov/

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- Decisions CAN Reviewer