



To Understand and Protect Our Home Planet: An Introduction to the NASA Applied Sciences Public Health Program

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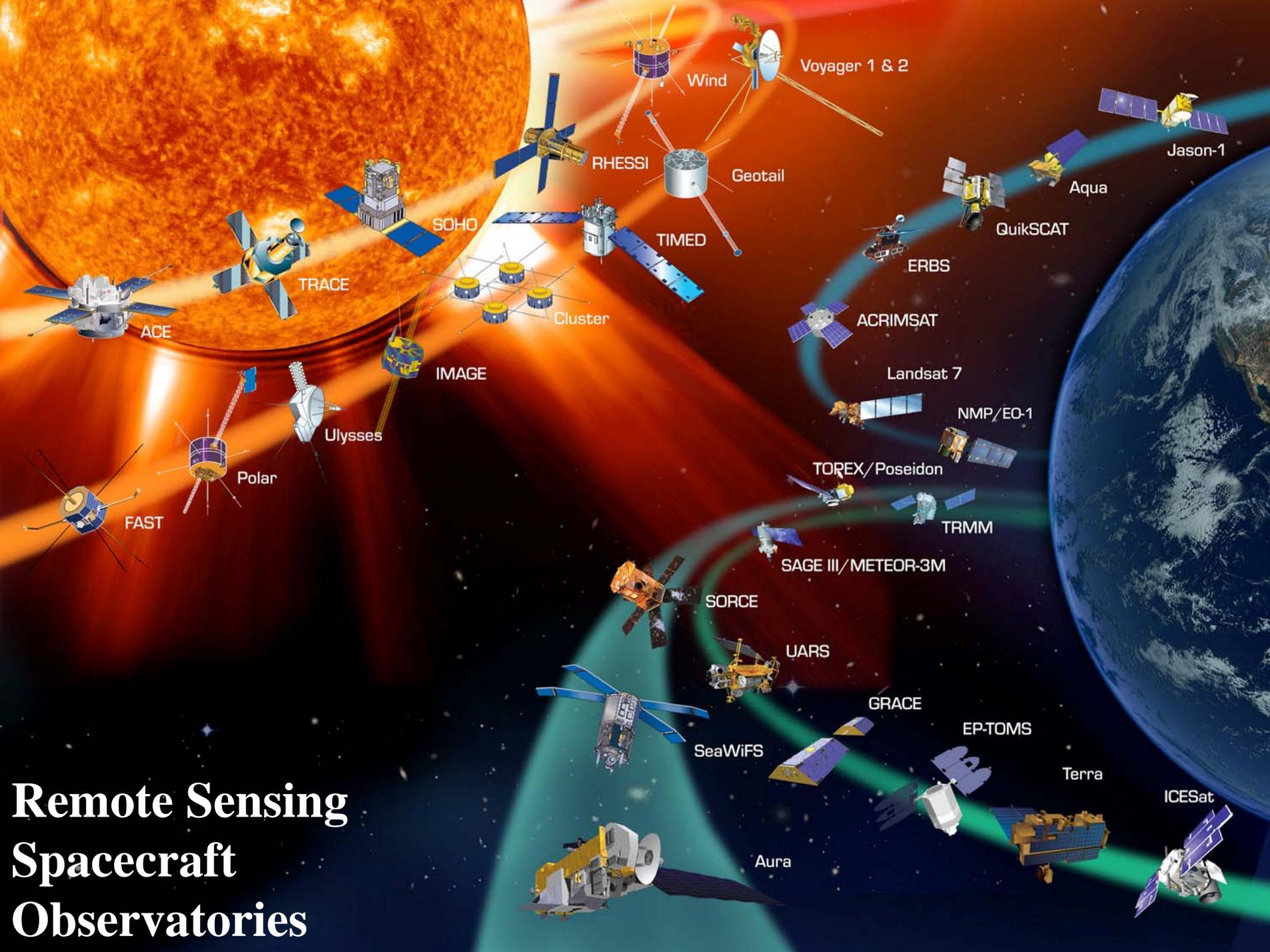


The NASA Vision

To improve life here,
To extend life to there,
To find life beyond.

The NASA Mission

To understand and protect our home planet,
To explore the universe and search for life,
To inspire the next generation of explorers
... as only NASA can.



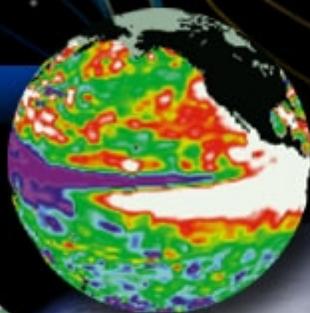
Remote Sensing Spacecraft Observatories

Earth-Sun System Science

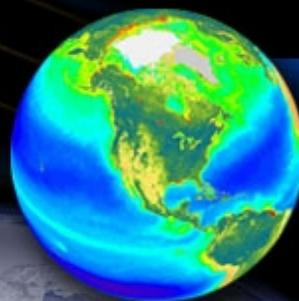


Sun- Earth
Connection

Climate Variability
and Change



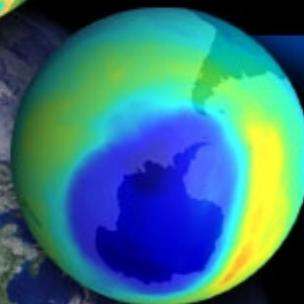
Carbon Cycle
and Ecosystems



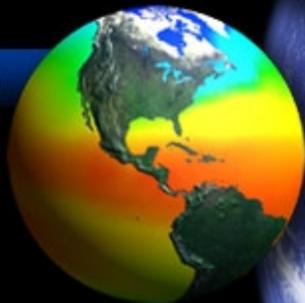
Earth Surface
and Interior



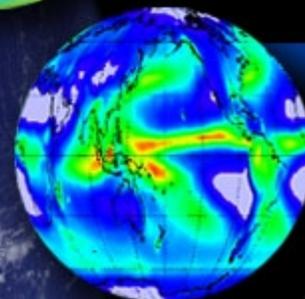
Atmospheric
Composition



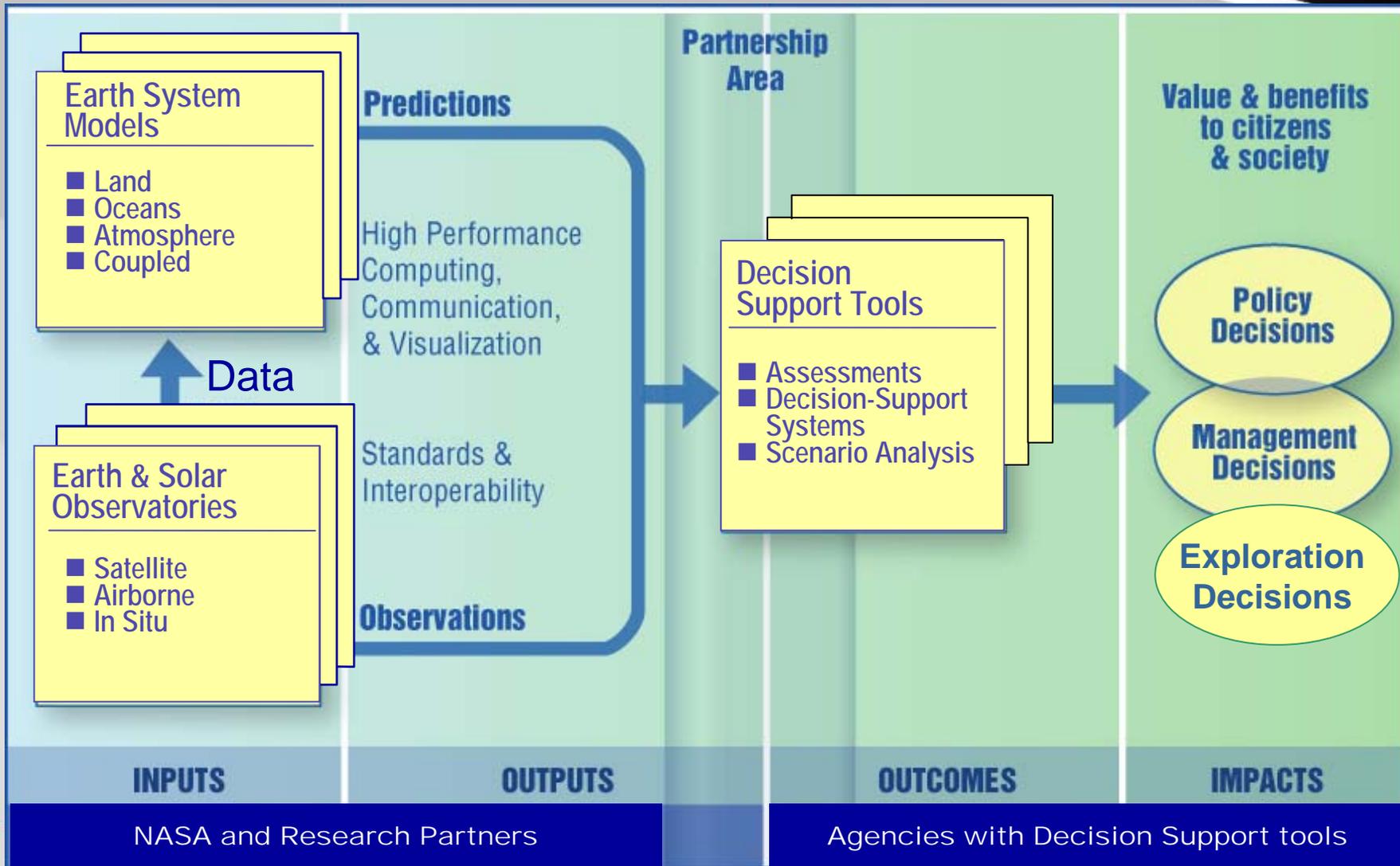
Weather



Water &
Energy
Cycle



Integrated System 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

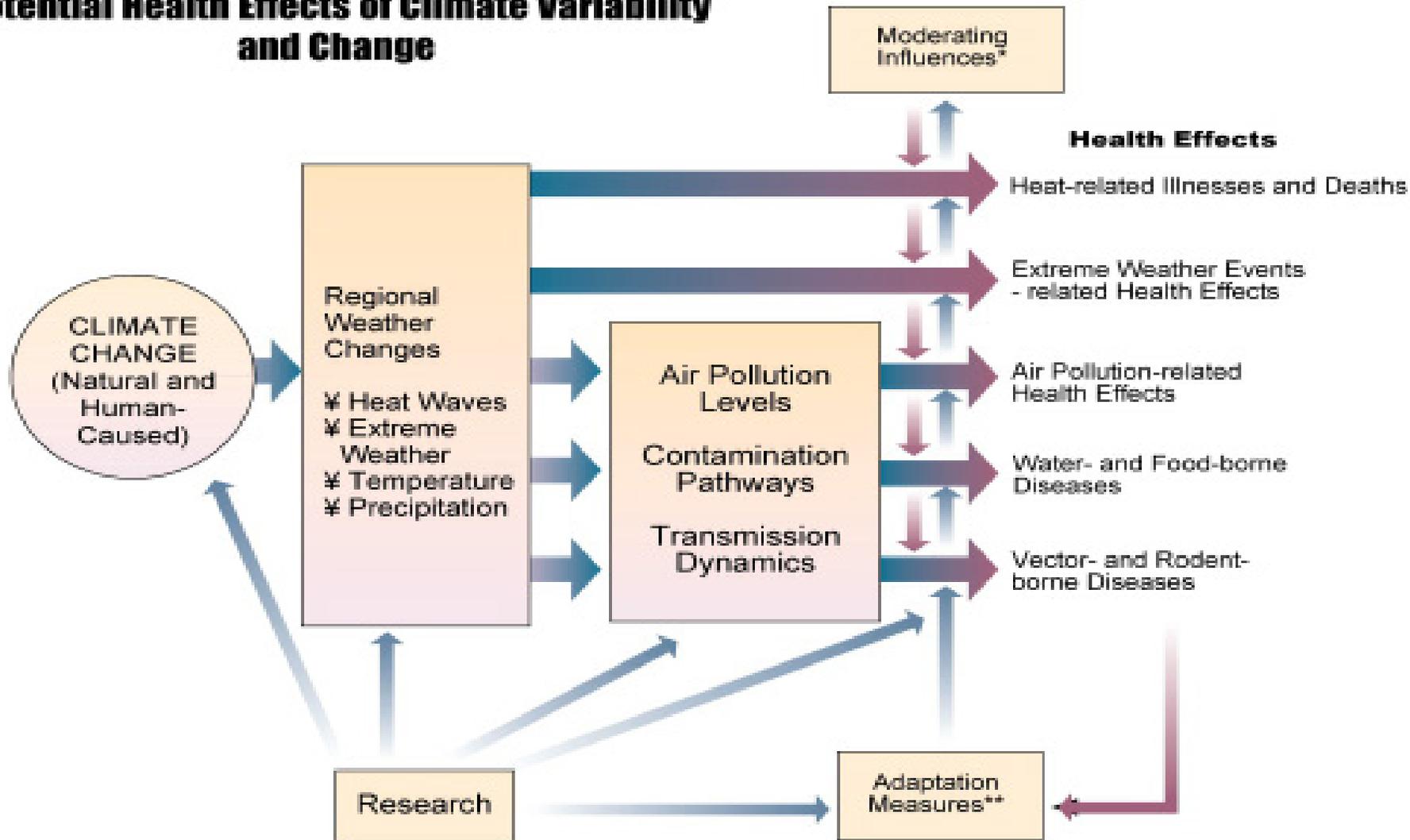


Water Management

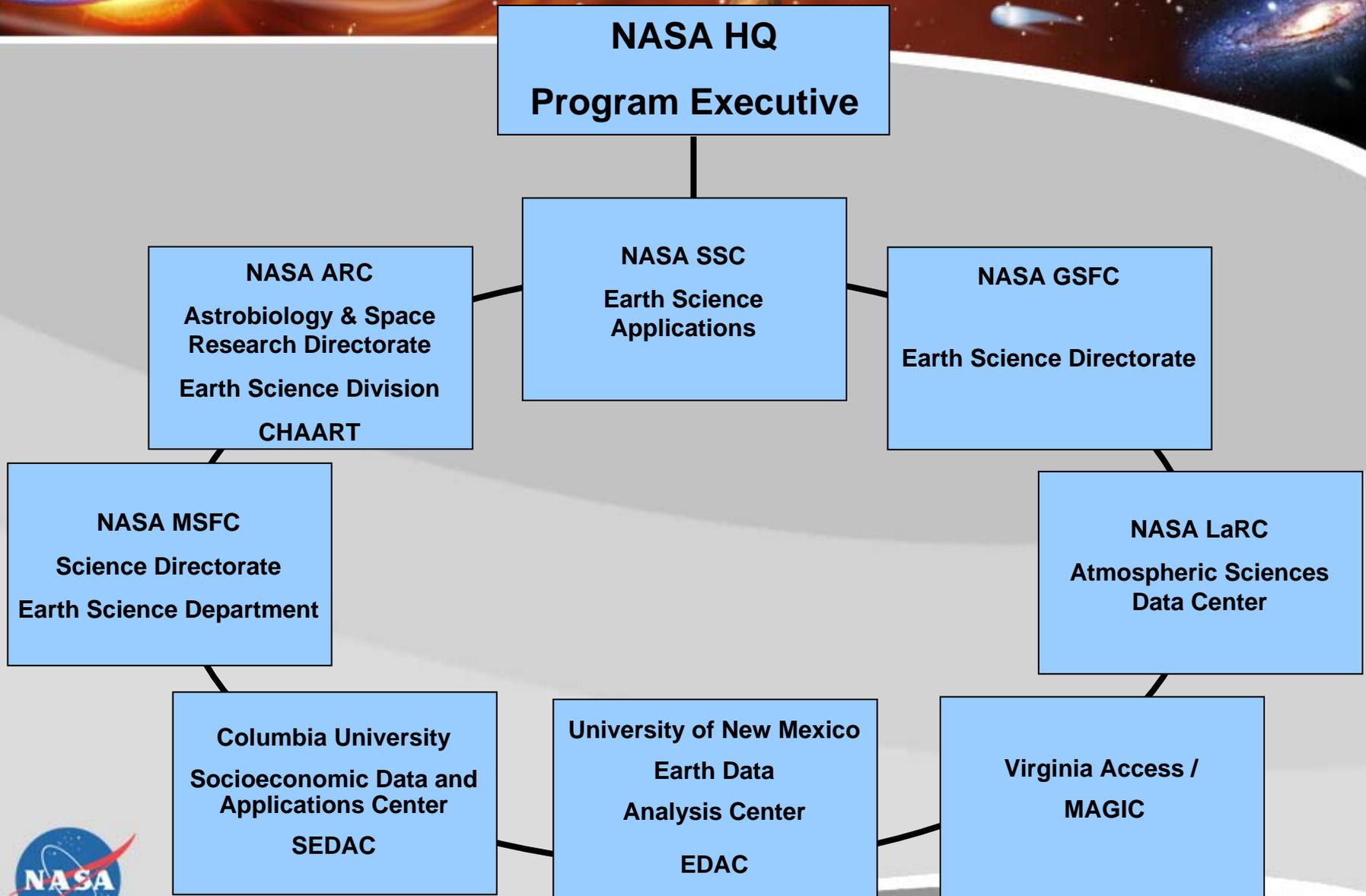


Why public health?

Potential Health Effects of Climate Variability and Change



Public Health Applications Program





Public Health

Integrated System Solutions



EARTH SYSTEM MODELS

Terrestrial / Atmospheric: MAESTRO*
Climate Variability Models: GHCN
Land Surface Model: CLSM, LSE
Weather/ Seasonal Models: COLA
Science & Research: GSFC Plague
Algorithm
Atmospheric / Ocean Models: GMAO

**Supported Non-NASA Model*



- Chemistry Climate Change
- Local & Global Long-Range Prediction of Pollutants
- CO₂ & CH₄ Atmospheric Concentration Projections

DECISION SUPPORT TOOLS

- EPHTN / HELIX

- ArboNet / Plague

- Malaria Surveillance/GSAT

- RSVP with TRIMS

- Department of Health and Human Service (DHHS) / Secretary's Command and Control Center (SCC)



VALUE & BENEFITS

Early warnings of harmful exposures, conditions favorable to vector proliferation

Improved prevention initiative targeting.

Reduction of environmental-related diseases

Improvement in bio-terrorism event information management

Data

MONITORING & MEASUREMENTS

- EO-1
 - TRMM
 - Terra, Aqua
 - ASTER
 - MISR
 - MODIS
 - Landsat 4,5,7
 - NPOESS*
 - SRTM
- Land cover / land use
 - Surface temperature
 - Vegetation indices
 - Aerosol properties
 - Surface topography

**Future Mission*

Biomass

- Soil Moisture
- Atmosphere Temperature
- Global Precipitation
- UV Irradiance
- Total Column Ozone
- Soil Moisture
- CO₂ & Methane
- Total Aerosol Amount



Surveillance Project: EPHTN

draft
v. 07 | 09.10.03

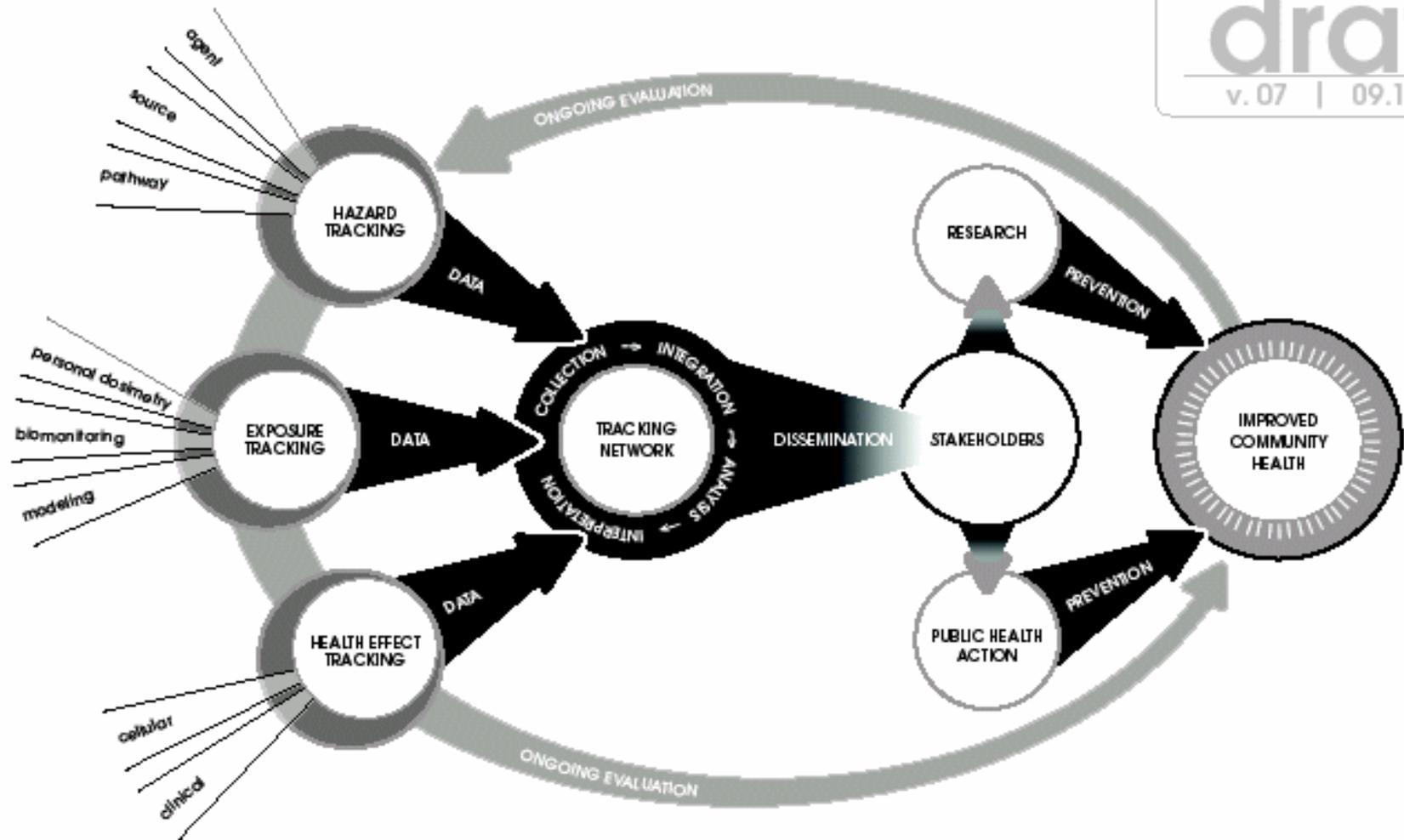


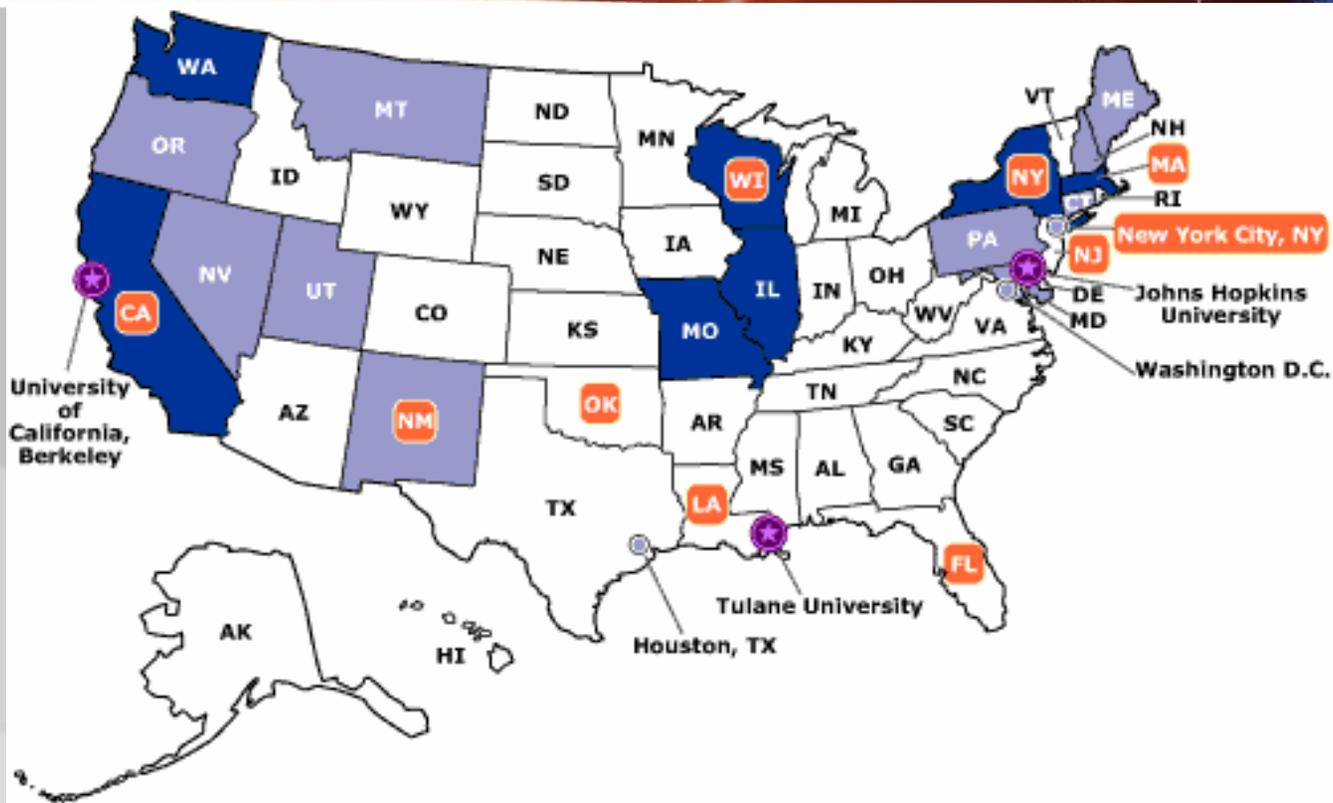
Figure 1: A conceptual model for Environmental Public Health Tracking

EPHTN Vision

- **Data on a core set of:**
 - **chronic diseases and other health effects with possible environmental etiology**
 - **chemicals, physical agents, biomechanical stressors, biological toxins**
- **Enable states to track their own priorities, exchange data with states and the Fed**
- **Capacity to exchange data with EPA's National Environmental Information Exchange Network**
- **Part of CDC's Public Health Information Network**
- **Interoperable with the NEDSS**



EPHTN Status



-  Planning & Capacity Building Activities
-  Infrastructure Enhancement & Data Linkage Demonstration Projects (with a planning and capacity building component)
-  Centers of Excellence
-  Data Linkage Demonstration Projects



NASA – CDC / ATSDR MOU

Department of Health and Human Services
Public Health Service
Centers for Disease Control and Prevention (CDC)

MEMORANDUM OF UNDERSTANDING

Between

The National Aeronautics and Space Administration
Office of Earth Science, Applications Division

And

The National Center for Environmental Health/Agency for Toxic Substances and Disease
Registry

I. Project Title:

Applications of Earth Science Research and Development for Environmental Public Health

II. Purpose and Scope

This Memorandum of Understanding (MOU) provides a framework for cooperation between the National Aeronautics and Space Administration (NASA) and the Centers for Disease Control and Prevention (CDC) and the Agency for Toxic Substances and Disease Registry (ATSDR) (hereinafter the Party or Parties) to explore the application of Earth system science, technology, and data to environmental public health.

A. This cooperation and coordination is not limited to the Parties to this MOU, and each Party, independently or jointly, may cooperate with other Federal agencies and their extensions; interested State, regional and local agencies, colleges and universities; private industries, nonprofit organizations; and foundations and public interest groups. All Parties view this MOU as important for exploring the utility of Earth system science, technology and data for characterizing the relationship between environmental hazards, human exposures and potential health effects. Of particular interest as a focus of collaborative activities is CDC's National Environmental Public Health Tracking Network.

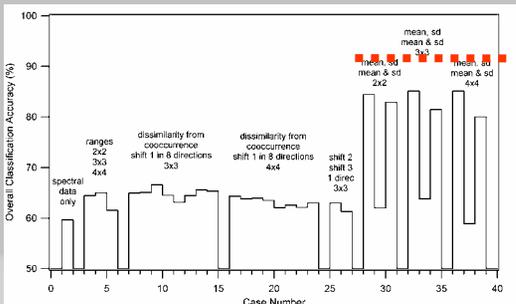


Surveillance Project: Malaria/GSAT

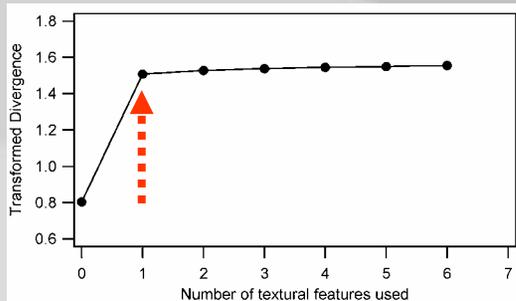


Habitat identification

Textural/contextual classifications significantly increase landcover mapping accuracy using high resolution data such as Ikonos.



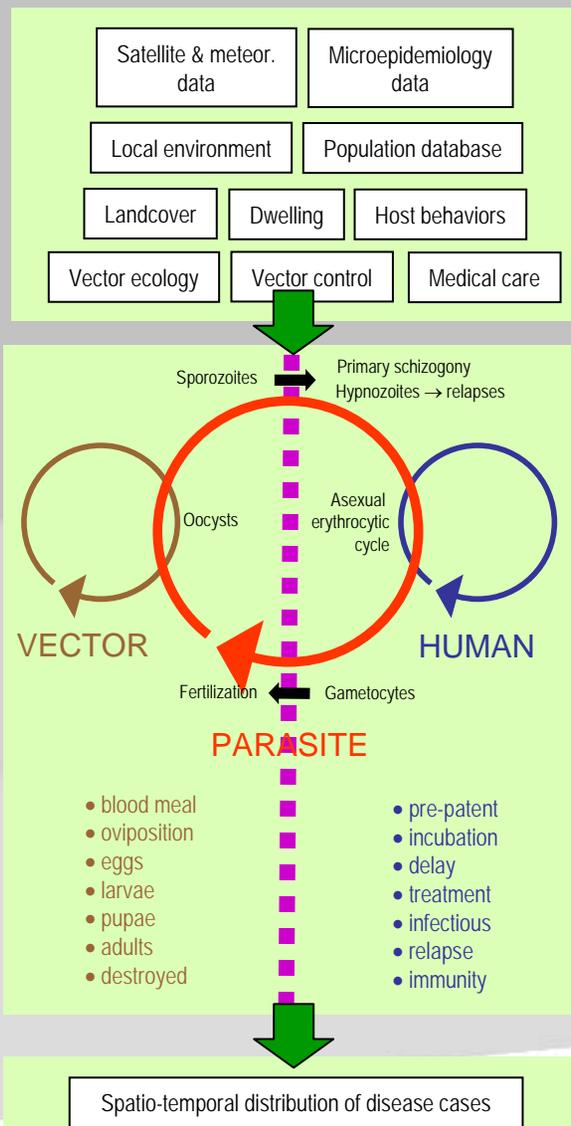
Discrete Wavelet Transform is used to differentiate confusion vegetation types.



Evaluated Thai military airborne data and established neural network rectification capability.

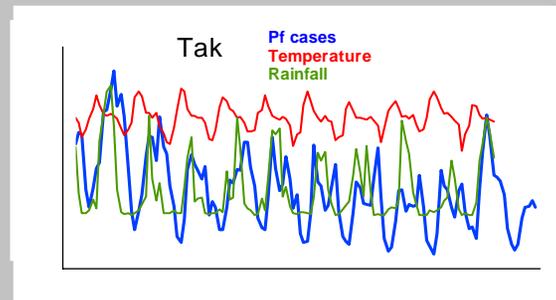


Identifying key factors that sustain or intensify transmission

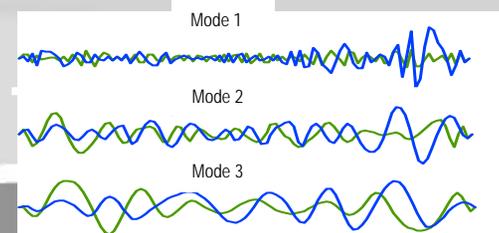
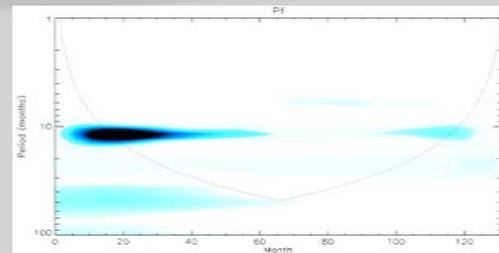


Risk prediction

Nonparametric model computes the risk of disease outbreak using meteorological and epidemiological time series as input.



Wavelet Transform and Hilbert-Huang Transform Empirical Mode Decomposition identify the driving variables that lead to disease outbreaks and provide more accurate predictions.



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Surveillance Project: RSVP



Undifferentiated Febrile Illness OR
Influenza-like Illness

History/Symptoms

Cough Y N GI Symptoms Y N

URI Symptoms Y N Headache Y N

Conjunctivitis Y N Myalgia Y N

Signs

Temperature <36 36 37 38 39 40 41 >41

Increase Respiratory Rate Y N Stiff Neck Y N

O₂ Sat. <75 75-80 80-85 85-90 90-95 95-100 Rash Y N

Abnormal Lung Sounds Y N

Labs

Platelet <50 50-100 100-150 >150

WBC <2,000 2,000-5,000 5,000-10,000 10,000-15,000 15,000-20,000 >20,000

Chest X-Ray Normal Abnormal Focal infiltrate Diffuse infiltrate

Symptoms Data Entry Buttons

Signs Data Entry Buttons

Laboratory Data Entry Buttons

Control Buttons

were 244 culture submissions this week with positive for RSV. There was NO FluB.

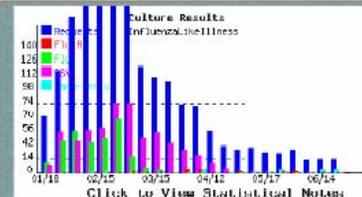
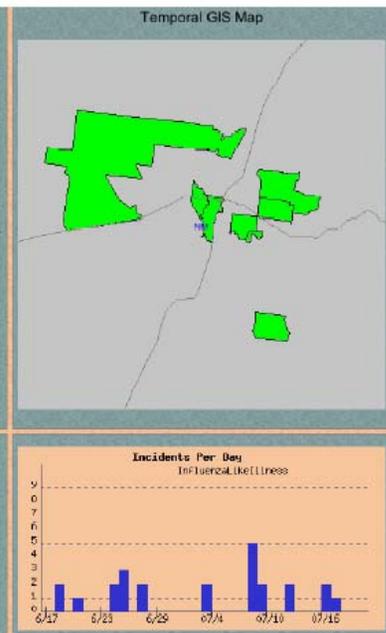
ons is as follows:

analysis, adjusted for the total number of that the FluA outbreak is statistically similar in January. The RSV outbreak first identified in mid-January appears to continue unabated.

Week ending 2/8/02: There were 202 culture submissions this week with 45 positive for FluA and 34 positive for RSV. There was NO FluB.

The age breakdown for FluA detections is as follows:
 0 - 4 years: 19 cases
 5 - 24 years: 24 cases
 24 - 64 years: 7 cases
 > 64 years: 3 cases

Ordinal Contingency Table analysis, adjusted for the total number of sample submissions, shows that the FluA outbreak is statistically similar in the first week of February to January. The RSV outbreak first identified in mid-January appears to continue unabated.



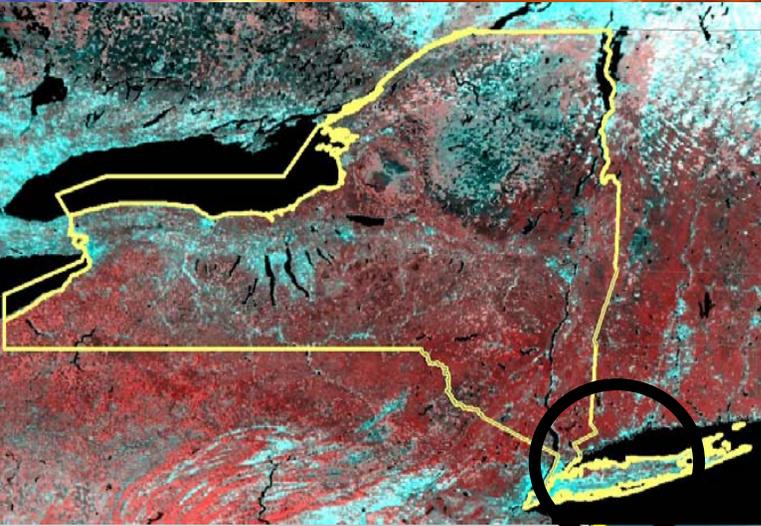
DHHS Secretary's Command and Control Center



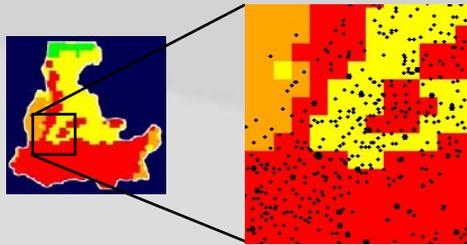
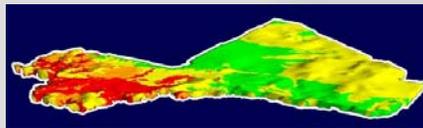
- The DHHS Secretary's Command Center (SCC) will serve as the national incident command center for all health and medical preparedness, response, and recovery activities.
- In 2005, our program is evaluating the SCC for integration of NASA Earth Science satellite observations and model predictions.
- An MOU with DHHS is expected by the end of the year.



Privacy and medical confidentiality



Workforce development



Feature Properties ? OK X

Attributes Geography

Property	Value
PT_NUM	123 14
LANDCOVER	abc Marsh
LARVAL_CT	123 7
TEMP	123 19.00
PH	123 8.50
OXREDPOT	123 142.00
CONDUCT	123 0.80

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Public Health Roadmap

Support Tool

EARTH SCIENCE RESEARCH

DECISION-SUPPORT INPUTS

GOALS/PARTNERS

State 2 Public health surveillance systems able to track weather/climate/environmental factors to improve disease outbreak predictions, increase warning time

Data standards, workforce development support, sustained integration of data and models

Surveillance System have automated ingest of data and models; public health decision-support systems benchmark use of Earth system sciences

Integration of Earth system science data and models into surveillance systems; visualization of weather/climate/environmental data

EPHTN and Malaria Modeling and Surveillance System validate data and models for use in surveillance; visualization technology enhances public health risk communication

Chronic and infectious disease models coupled with Earth science models

Predictive capacity of Earth system science data and modeling verified for specific environmental exposures, plague

TOMS-EP, ASTER yield data on air quality, toxic exposures, urban heat island

New weather/climate/environment disease relationships discovered; results applied to Environmental Public Health Tracking Network, Malaria Modeling and Surveillance, ArboNet, RSVP

MODIS TRMM yields new information on disease vector ecology

State 1 Public health surveillance systems require complete information on weather/climate/environment factors



Improved capabilities of the public health community to use Earth science data products and technology to identify and address environmental risk factors related to public health



EARTH OBSERVING MISSIONS



TOMS-EP



TRMM



Terra



EO-1



Aqua



Aura



NPP



GPM



NPOESS

2003

2005

2007

2009

2011

2013

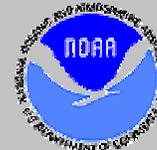
Enhanced Decision Support

NASA's Public Health Partners

.gov/ph



.gov/rs



.org



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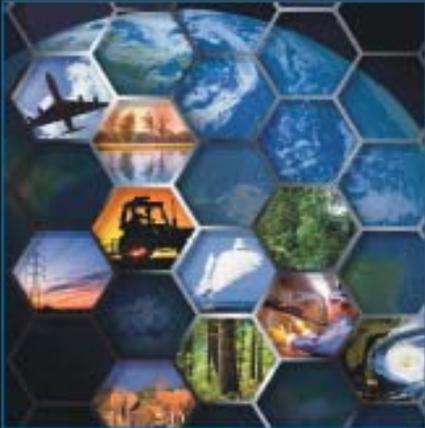
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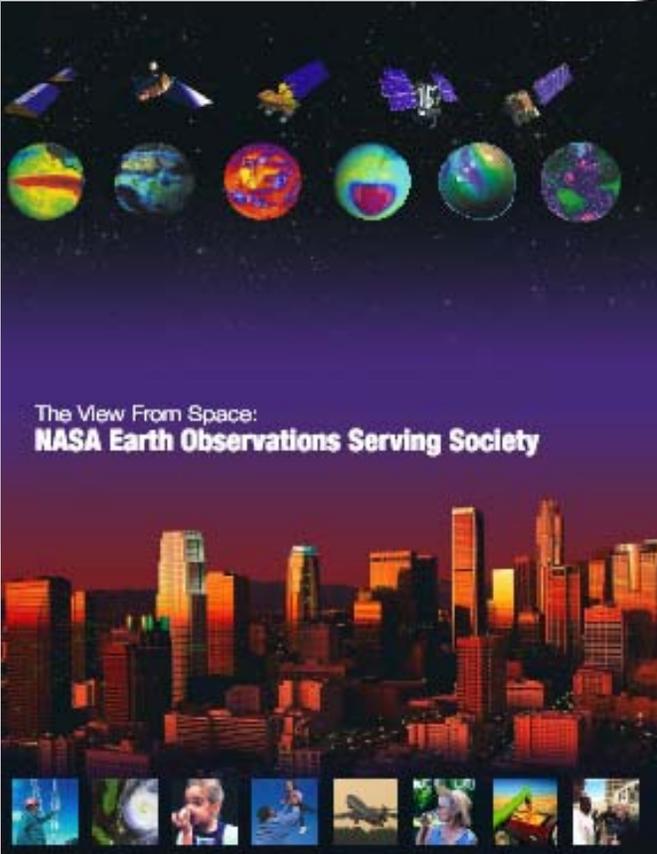


Applied Sciences Program



National Aeronautics and
Space Administration

Earth Science Enterprise
Applications Plan



The View From Space:
NASA Earth Observations Serving Society

<http://science.hq.nasa.gov/earth-sun/applications/index.html>



Epidemiology in the 21st Century

