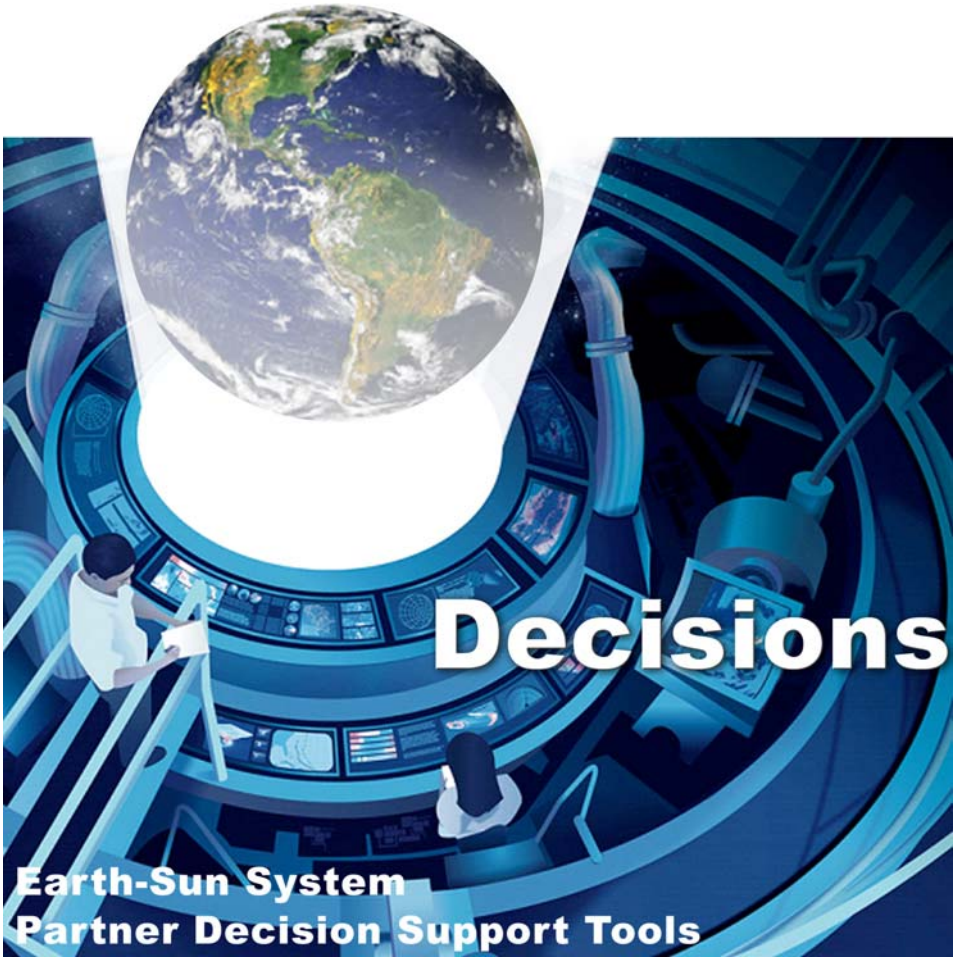

Working Draft

Version 1.42 - November 2005

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The NASA Vision

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

The NASA Mission

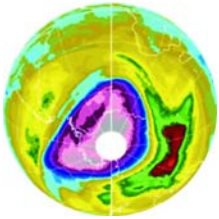
To understand and protect our home planet,
To explore the universe and search for life,
To inspire the next generation of explorers...
as only NASA Can

www.nasa.gov

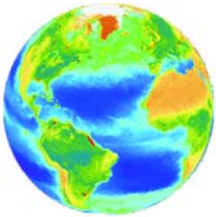
Science Mission Directorate
Earth-Sun System Division

Focus Areas

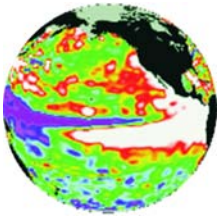
The NASA Earth-Sun Division seeks to develop a scientific understanding of the Earth-Sun system and its response to natural and human-induced changes to enable improved prediction of climate, weather, and natural hazards for present and future generations.



Atmospheric Composition

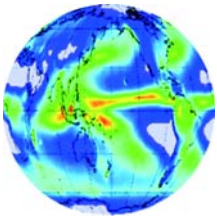


Carbon Cycle & Ecosystems

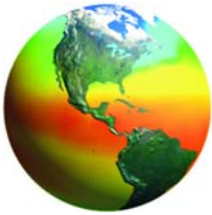


Climate Variability & Change

Earth Surface & Interior



Water & Energy Cycle



Weather

Sun Solar System

Research Strategy

NASA's Earth-Sun System Division is developing a scientific understanding of the Earth-Sun system and its response to natural and human-induced changes to enable improved prediction capability for climate, weather, and natural hazards. The Earth-Sun System Division has an end-to-end strategy to ensure that all the information, understanding, and capabilities derived from its research program achieve maximum usefulness for the scientific and decision-making communities. Increasing our knowledge of the Earth system is the goal of the Earth-Sun System Division's Research Program, which is complemented by the Earth-Sun System Division's Applied Sciences Program and Technology Program.

The Earth-Sun System Division has defined its research strategy around a hierarchy of scientific questions. At the highest level, the Earth-Sun System Division is attempting to provide an answer to one overarching question:

How is the Earth changing and what are the consequences for life on Earth?

The magnitude and scope of this question are too large to allow a simple answer, requiring a lower tier of questions that provide the conceptual approach that the Earth-Sun System Division is taking to improve our knowledge of the Earth system:

Variability: How is the global system changing?

Forcing: What are the primary forcings of the Earth system?

Response: How does the Earth system respond to natural and human-induced changes?

Consequence: What are the consequences of change in the Earth system for human civilization?

Prediction: How will the Earth system change in the future, and how can we improve predictions through advances in remote sensing observations, data assimilation and modelling?

Specific Science Questions

Variability	Forcing	Response	Consequence	Prediction
Precipitation, evaporation & cycling of water changing?	Atmospheric constituents & solar radiation on climate?	Clouds & surface hydrological processes on climate?	Weather variation related to climate variation?	Weather forecasting improvement?
Global ocean circulation varying ?	Changes in land cover & land use?	Ecosystems, land cover and biogeochemical cycles?	Consequences of land cover & land use change?	Improve predic-tion of climate variability and change?
Global ecosystems changing?	Motions of the Earth and the Earth's interior trans-formation?	Changes in global ocean circulation?	Coastal region impacts?	Ozone, climate and air quality impacts of atmospheric composition?
Atmospheric compostition changing?		Atmospheric trace constituent responses?	Regional air quality impacts?	Carbon cycle and ecosystem change?
Ice cover mass changing?		Sea level affected by Earth system changes?		Change in water cycle dynamics?
Earth surface transformation?				Predict and miti-gate natural haz-ards from Earth surface change?

Applications of National Priority

Agricultural Efficiency

Air Quality

Aviation

Carbon Management

Coastal Management

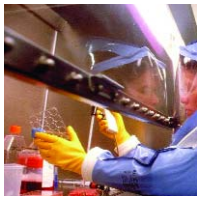
Ecological Forecasting

Disaster Management

Energy Management

Homeland Security

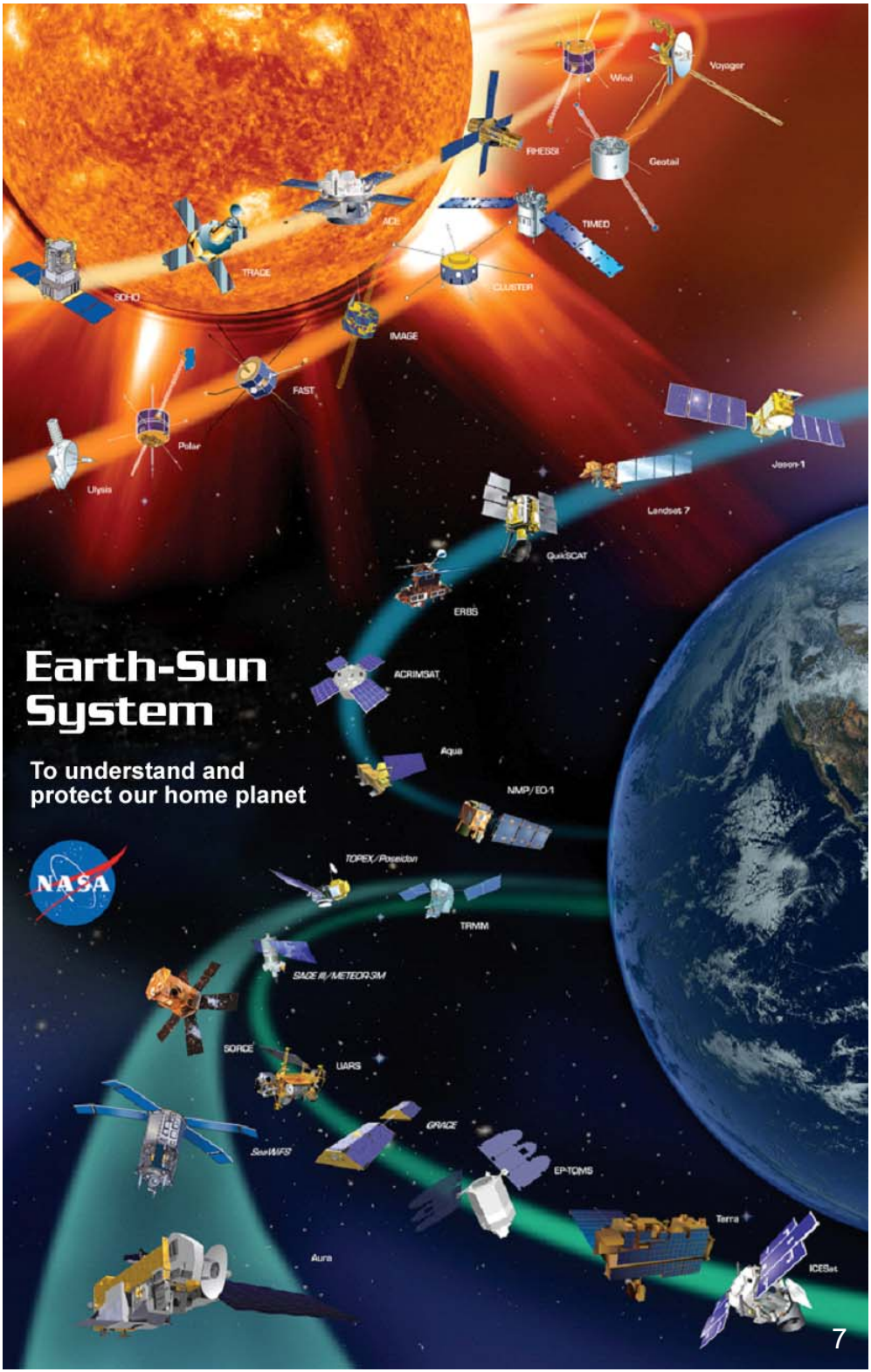
Invasive Species


Public Health

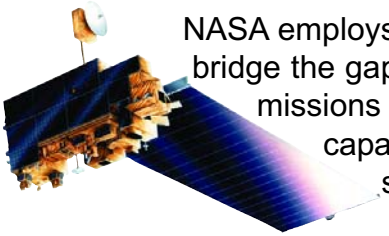
Water Management

The NASA Applied Sciences Program mission is to expand and accelerate the realization of economic and societal benefits from Earth science, information, and technology. The overarching goal is to bridge the gap between Earth system science research results and the adoption of observations and prediction capabilities for reliable and sustained use in decision support.

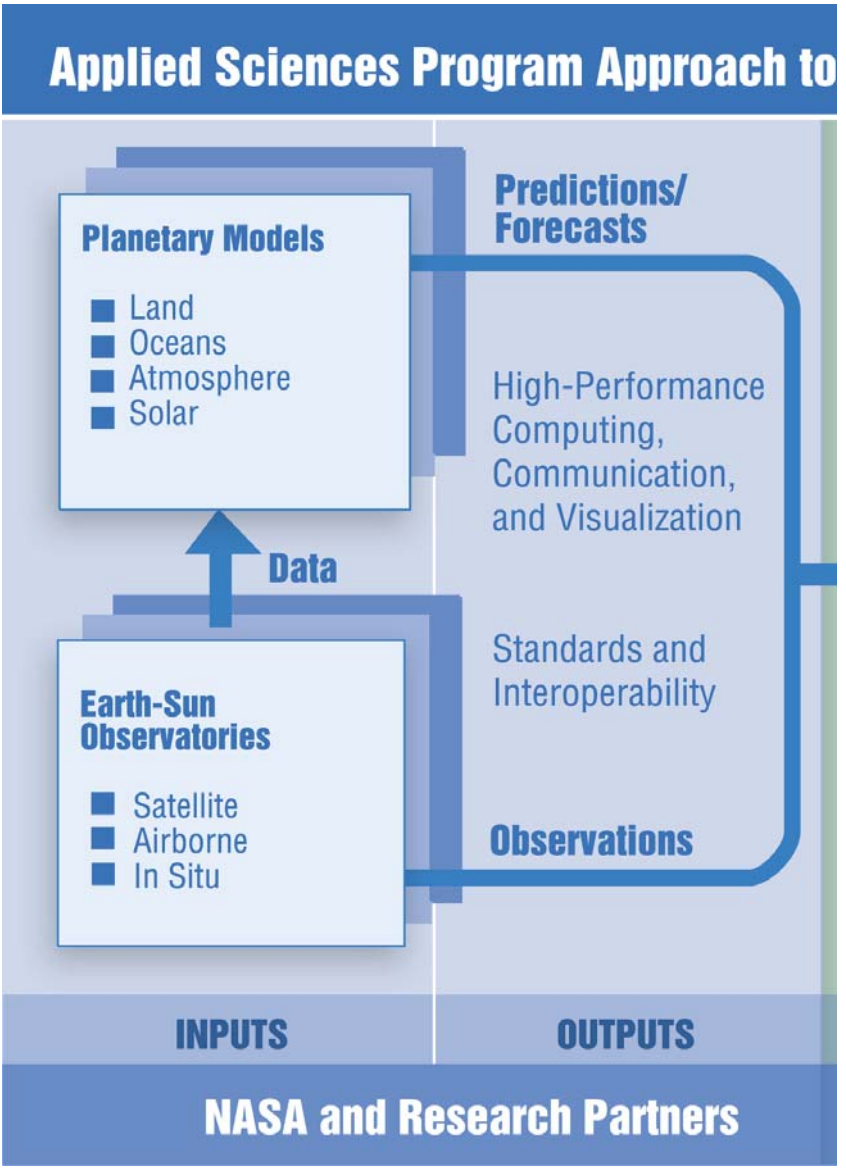
http://www.asd.ssc.nasa.gov/apps.aspx

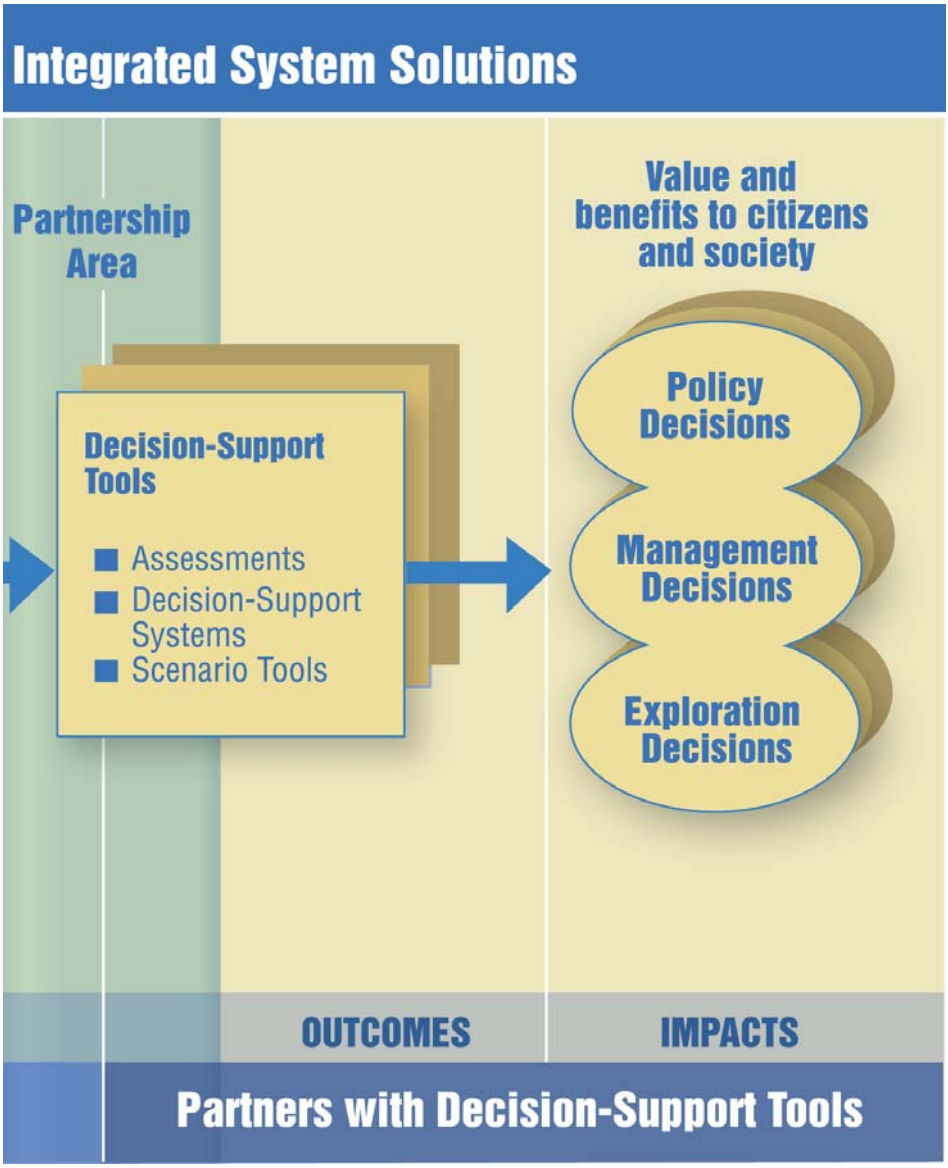

Earth-Sun System
To understand and protect our home planet
NASA
Wind
Voyager
RHESSI
Geotail
ACE
TIMED
TRACE
CLUSTER
SOHO
IMAGE
FAST
Polar
Ulysis
Jason-1
Landsat 7
QuikSCAT
ERBS
ACRIMSAT
Aqua
NMP/EO-1
TOPEX/Poseidon
TRMM
SAGE III/METEOR-3M
SORCE
UARS
GRACE
SeaWiFS
EP-TOMS
Terra
Aura
ICESat

Integrated System Solutions Architecture



NASA employs a systems engineering approach to bridge the gap between Earth-Sun system science missions and models. The data and prediction capabilities are adopted for reliable and sustained use in decision support.





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

Applied Sciences Program

Management Decision Support Tools

PECAD/CADRE
Production Estimates and Crop Assessment Division/Crop Assessment Data Retrieval and Evaluation

Purpose/General Description of Decision Support Tool: Monitor global agricultural commodities, focus on global agricultural production and conditions that affect food security.

Value and Benefits: Early warning of problems in major agricultural commodities; Better seasonal yield estimates; Early warning of food shortages; Greater economic security for agriculture sector.

Predictions:
- 12-month Global seasonal surface temperature/soil moisture/precipitation forecast
- Crop maturity
- Crop yield
- Water availability

Observations:
- Biomass
- Land cover/ use
- Land surface topography
- Ocean surface currents
- Global precipitation
- Soil moisture
- Reservoir level
- Evapotranspiration
- Radiation

Outcomes:
- Generated time-series graphs for rainfall, temperature, and soil moisture
- Multiyear time series/crop comparisons
- Vegetation anomaly detection
- Automated Web products

DRAFT

DST Point of Contact (POC): Brad Doorn
POC e-mail: pecad@fas.usda.gov
POC Phone: (202) 690-0131

Decision Support Tool User/Operator Organization: USDA Foreign Agriculture Service
Decision Support Tool Owner/Developer:
Operational Status: In use since early 1980s
DST Type:
Validation:
Configuration Control:
Notes:

Agricultural Efficiency

NASA HQ POC: Ed Sheffner
NASA HQ POC Phone: (202) 358-0239
NASA HQ POC e-mail: esheffne@mail.hq.nasa.gov

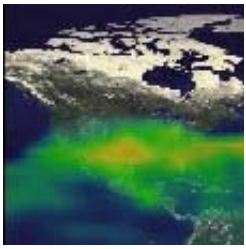
http://www.fas.usda.gov/pecad/

CMAQ
Community Multiscale Air Quality Modeling System

Purpose/General Description of Decision Support Tool: Deliver NASA Earth Science data Product to EPA/Air Quality Decision Support Systems. Deliver data from NASA space-borne assets to AIR NOW decision systems for regional particle matter forecasting.

Value and Benefits: Reduce lung-related diseases and premature death; Reduce hospital admissions and use of medicines; Reduce lost workdays and schooldays; Improve visibility and reduce haze for tourism; Improve resiliency of crops; increase yields; Increase confidence in Government; Improve crop estimates; Sensitive populations can change activities

Predictions and Observations:
- Atmospheric state parameters
- Global-to-regional concentrations
- Emissions inventories
- Regional-global transport
- Trace gas sources
- Aerosol properties
- Ozone profiles and columns
- Global-regional boundary conditions
- Data fusion techniques
- Ground-satellite data comparison techniques



Outcomes:
- Assess emissions-control strategies
- Develop achievable SIPs (State Implementation Plan)
- Assess compliance
- Waivers to air standards
- Quantify voluntary stationary emission reductions

DRAFT

DST Point of Contact (POC): Kenneth L. Schere
POC e-mail: schere.kenneth@epa.gov
POC Phone: (919) 541-3795

Decision Support Tool User/Operator Organization: Environmental Protection Agency
Decision Support Tool Owner/Developer:
Operational Status: 1991
DST Type: Software, downloadable software to be installed locally
Validation:
Configuration Control:
Notes:

Air Quality

NASA HQ POC: Lawrence Friedl
NASA HQ POC Phone: (202) 358-1599
NASA HQ POC e-mail: lfriedl@mail.hq.nasa.gov

http://www.epa.gov/asmdnerl/models3/cmaq.html

AIRNow AQI Forecasting
Air Quality Index Forecasting

Purpose/General Description of Decision Support Tool: Report concentrations of five main pollutants to the general public.

Value and Benefits: Reduce lung-related diseases and premature death; Reduce hospital admissions and use of medicines; Reduce lost workdays and schooldays; Improve visibility and reduce haze for Tourism; Improve resiliency of crops, increase yields; Increase confidence in Government; Improve crop estimates; Sensitive populations can change activities.

Predictions and Observations:
- Atmospheric state parameters
- Global-toregional concentrations
- Emissions inventories
- Regional-global transport
- Trace gas sources
- Aerosol properties
- Ozone profiles and columns
- Global-regional boundary conditions
- Data fusion techniques
- Ground-satellite data comparison techniques

Outcomes:
- Forecast transport of dust/pollutants
- Actions to reduce source emissions
- PM2.5 forecasts

DRAFT

DST Point of Contact (POC): Doreen Neil
POC e-mail: Doreen.O.Neil@nasa.gov
POC Phone: (757) 864-8171

Decision Support Tool User/Operator Organization: Environmental Protection Agency
Decision Support Tool Owner/Developer:
Operational Status: Estimated October 2003
DST Type:
Validation:
Configuration Control:
Notes:

Air Quality

NASA HQ POC: Lawrence Friedl
NASA HQ POC Phone: (202) 358-1599
NASA HQ POC e-mail: lfriedl@mail.hq.nasa.gov

http://www.epa.gov/airnow/index.html

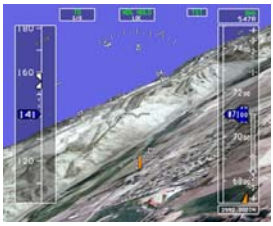
NAS-AWRP
National Air Space-Aviation Weather Research Program

Purpose/General Description of Decision Support Tool: Increase the scientific understanding of atmospheric conditions that cause dangerous weather, which in turn, impacts aviation.

Value and Benefits: Improved safety; Improved airline efficiency; Earlier warnings of hazardous weather; Reduction in the cost of flying.

Predictions:
- Convective weather
- Turbulence
- Icing
- Ceiling and visibility
- Volcanic transport
- Oceanic winds
- Winter storms
- Tropical cyclones

Observations:
- Atmospheric temperature
- Atmospheric water vapor
- Atmospheric winds
- Storm cell properties
- Volcanic gas and ash
- Cloud properties
- Global precipitation



Outcomes:
- Key weather observations
- Nowcasting products
- 24-hour precise continuous atmosphere
- Weather warnings and predictions
- Accurate and easily accessible weather forecasts
- Increase in understanding of atmospheric conditions
- Real-time interest fields
- Comprehensive image library

DRAFT

DST Point of Contact (POC): Gloria Kulesa
POC e-mail: gloria.kulesa@faa.gov
POC Phone:

Decision Support Tool User/Operator Organization: Federal Aviation Administration
Decision Support Tool Owner/Developer:
Operational Status: Phase 2 (2003-2007)
DST Type:
Validation:
Configuration Control:
Notes:

Aviation

NASA HQ POC: John Haynes
NASA HQ POC Phone: (202) 358-4665
NASA HQ POC e-mail: jhaynes@mail.hq.nasa.gov

http://www.faa.gov/aua/awr/

CQUEST
Carbon Query and Evaluation Support Tools

Purpose/General Description of Decision Support Tool: Provide access to geographic data for carbon sequestration predictions throughout the United States.

Value and Benefits: Climate change mitigation; Improved efficiency in energy production; Improved efficiency in crop production through enhancements in soil carbon; Improved economy in marginal rural agricultural areas; Climate change mitigation.

Predictions:
•Information products, predictions, and data from NASA ESE missions and models

Observations:
• Land cover condition and change
• Volume of aboveground biomass forest condition
• Soil moisture
• Agricultural production and yield—CO2 concentration in the atmosphere
• Oceanic carbon uptake and storage
• Fire management

Outcomes:
• Soil carbon sequestration
• Forest management
• Crop planning and rotation
• Irrigation control
• Atmospheric pollution monitoring and prediction
• Energy production (burning of fossil fuels)
• Climate and weather Ocean carbon sequestration

DRAFT

DST Point of Contact (POC): Chris Potter
POC e-mail: Christopher.S.Potter@nasa.gov
POC Phone: (650) 604-6164

Decision Support Tool User/Operator Organization: NASA Ames Ecosystem Science and Technology Branch
Decision Support Tool Owner/Developer: NASA Ames Research Center
Operational Status:
DST Type: Web-enabled application
Validation:
Configuration Control:
Notes:

Carbon Management

NASA HQ POC: Ed Sheffner
NASA HQ POC Phone: (202) 358-0239
NASA HQ POC e-mail: esheffne@mail.hq.nasa.gov

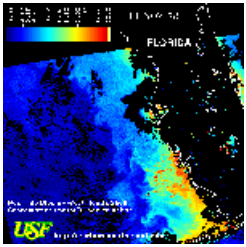
http://geo.arc.nasa.gov/website/cquestwebsite/

HABMapS
Harmful Algal Bloom Bulletin/Mapping System

Purpose/General Description of Decision Support Tool: Provide information as a mapping tool to the management community in the Gulf of Mexico during a bloom event. Access recent data on harmful algal blooms in the Gulf of Mexico.

Value and Benefits: Reduce public health risks, hospital admissions, lost work-school days; Reduce impacts to regional coastal economies & tourism; Raise quotas for shellfish harvestingprior to HABs; improve siting and design of shellfish beds; Preserve ecological diversity and tourism economies; Reduce threats to human and natural environments; Rapid response to emergencies to reduce effects on human safety and economies; Public health and reduce preventable costs.

Predictions and Observations:
- Nearshore upwelling
- Speed and direction of ocean currents
- Ecological forecasts
- Runoff change
- Seasonal forecasts
- Aerosol properties
- Salinity predictions
- Ocean surface currents/ winds/ topography
- Sea Surface salinity/temperature
- Land use
- Phytoplankton concentrations



Outcomes:
- Analysis: Predict landfall, track transport/speed/ direction, forecast duration/demise, assess severity
- Management: Warning time to fisheries managers, beach closures, shellfish quotas, finfish limits, aquaculture flushing and recirculation, mitigation response

DRAFT

DST Point of Contact (POC): Mary Culver
POC e-mail: Mary.Culver@noaa.gov
POC Phone: (843) 740-1250

Decision Support Tool User/Operator Organization: NOAA CoastWatch and Coastal Services Center
Decision Support Tool Owner/Developer:
Operational Status: 2000
DST Type: Web-enabled application
Validation:
Configuration Control:
Notes:

Coastal Management

NASA HQ POC: Lawrence Friedl
NASA HQ POC Phone: (202) 358-1599
NASA HQ POC e-mail: lfriedl@mail.hq.nasa.gov

http://www.csc.noaa.gov/crs/habf

CREWS
Coral Reef Early Warning System

Purpose/General Description of Decision Support Tool: Monitor and provide alerts on coral "bleaching" or whitening events that result in the degradation of coral reefs worldwide.

Value and Benefits: Reduce public health risks, hospital admissions, lost work-school days; Reduce impacts to regional coastal economies & tourism; Raise quotas for shellfish harvestingprior to HABs; improve siting and design of shellfish beds; Preserve ecological diversity and tourism economies; Reduce threats to human and natural environments; Rapid response to emergencies to reduce effects on human safety and economies; Public health and reduce preventable costs.

Predictions and Observations:
- Nearshore upwelling
- Speed and direction of ocean currents
- Ecological forecasts
- Runoff change
- Seasonal forecasts
- Aerosol properties
- Salinity predictions
- Ocean surface currents/ winds/ topography
- Sea Surface salinity/temperature
- Land use
- Phytoplankton concentrations

Outcomes:
- Analysis: Assess potential bleaching conditions from wind, temperature, primary productivity
- Management: Warning time and automated alerts to managers, mitigation activities

DRAFT

DST Point of Contact (POC): Jim Hendee
POC e-mail: jim.hendee@noaa.gov
POC Phone:

Decision Support Tool User/Operator Organization: NOAA/Atlantic Oceanographic and Meteorological Laboratory
Decision Support Tool Owner/Developer:
Operational Status: Current
DST Type: Web-enabled application
Validation:
Configuration Control:
Notes:

Coastal Management

NASA HQ POC: Lawrence Friedl
NASA HQ POC Phone: (202) 358-1599
NASA HQ POC e-mail: lfriedl@mail.hq.nasa.gov

GNOME
General NOAA Oil Modeling Environment

Purpose/General Description of Decision Support Tool: Manage oil spill modeling, risk assessment, mitigation, and response by predicting how wind, current, river flow and tidal processes spread oil spills over water.

Value and Benefits: Reduce public health risks, hospital admissions, lost work-school days; Reduce impacts to regional coastal economies & tourism; Raise quotas for shellfish harvestingprior to HABs; improve siting and design of shellfish beds; Preserve ecological diversity and tourism economies; Reduce threats to human and natural environments; Rapid response to emergencies to reduce effects on human safety and economies; Public health and reduce preventable costs

Predictions and Observations:
- Nearshore upwelling
- Speed and direction of ocean currents
- Ecological forecasts
- Runoff change
- Seasonal forecasts
- Aerosol properties
- Salinity predictions
- Ocean surface currents/ winds/ topography
- Sea Surface salinity/temperature
- Land use
- Phytoplankton concentrations

Outcomes:
- Oil spill modeling

DRAFT

DST Point of Contact (POC): NOAA Hazmat
POC e-mail: ORR.GNOME@noaa.gov
POC Phone: (206) 526-6317

Decision Support Tool User/Operator Organization: NOAA Hazardous Materials Response Division
Decision Support Tool Owner/Developer:
Operational Status: Current
DST Type: Web-enabled application
Validation:
Configuration Control:
Notes:

Coastal Management

NASA HQ POC: Lawrence Friedl
NASA HQ POC Phone: (202) 358-1599
NASA HQ POC e-mail: lfriedl@mail.hq.nasa.gov

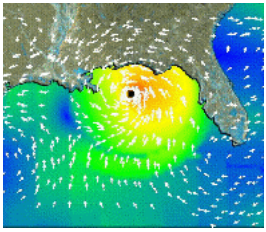
HAZUS
Hazards United States

Purpose/General Description of Decision Support Tool: Assess the effects and potential losses due to earthquakes, floods, and wind hazards using GIS software.

Value and Benefits: Identify/prioritize high-risk Communities; Reduce in lives and property lost; Reduce in damage cost and time to recovery; Anticipate the scope of disaster-related damage; Improve disaster response; Community planning; Land Resource preservation.

Predictions:
- Atmospheric temperature water vapor, winds
- Severe weather (lightning)
- Volcanic ash
- Aerosols, smoke
- Cloud properties
- Global precipitation
- Land/terrain/use/veg
- Aquifers
- Wetlands

Observations:
- Hazard maps
- Earthquake vulnerability and prediction
- Flooding and coastal inundation
- Hurricane/ typhoon track and intensity
- Precipitation amount
- Wind Velocity/direction
- Surface deformation



Outcomes:
- Disaster mitigation/ preparedness
- Built environment risk and loss
- Socio-economic impacts

DRAFT

DST Point of Contact (POC): Claire Drury
POC e-mail: hazus@fema.gov
POC Phone: (202) 646-2884

Decision Support Tool User/Operator Organization: Federal Emergency Management Agency
Decision Support Tool Owner/Developer:
Operational Status: Available since 1997
DST Type: Software, downloadable software to be installed locally
Validation:
Configuration Control:
Notes:

Disaster Management

NASA HQ POC: Stephen Ambrose
NASA HQ POC Phone: (202) 358-0851
NASA HQ POC e-mail: sambrose@mail.hq.nasa.gov

http://www.fema.gov/hazus

AWIPS
Advanced Weather Interactive Processing System

Purpose/General Description of Decision Support Tool: Display overlayed layers of graphical meteorological data over a specific geographical area to assist in delivering local forecasts quickly.

Value and Benefits: Identify/prioritize high-risk Communities; Reduce in lives and property lost; Reduce in damage cost and time to recovery; Anticipate the scope of disaster-related damage; Improve disaster response; Community planning; Land Resource preservation.

Predictions:
- Atmospheric temperature water vapor, winds
- Severe weather (lightning)
- Volcanic ash
- Aerosols, smoke
- Cloud properties
- Global precipitation
- Land/terrain/use/veg
- Aquifers
- Wetlands

Observations:
- Hazard maps
- Earthquake vulnerability and prediction
- Flooding and coastal inundation
- Hurricane/ typhoon track and intensity
- Precipitation amount
- Wind Velocity/direction
- Surface deformation

Outcomes:
- Weather prediction and observations
- Weather watches and warnings
- Data dissemination assimilation, models
- Public access to information

DRAFT

DST Point of Contact (POC):
POC e-mail:
POC Phone:

Decision Support Tool User/Operator Organization: NOAA National Weather Service
Decision Support Tool Owner/Developer: Northrup Grumman Information Technology
Operational Status:
DST Type:
Validation:
Configuration Control:
Notes:

Disaster Management

NASA HQ POC: Stephen Ambrose
NASA HQ POC Phone: (202) 358-0851
NASA HQ POC e-mail: sambrose@mail.hq.nasa.gov

http://199.26.34.19/AWIPS_home.html

SERVIR
Regional System of Monitoring and Visualization

Purpose/General Description of Decision Support Tool: Monitor and forecast ecological changes, respond to natural disasters, and better understand both natural and human effects on climate in Mesoamerica.

Value and Benefits: Manage a global hotspot of biodiversity (i.e., Mesoamerica) at a regional scale through the coordination of the activities of seven countries—a model for other regions; Predict the impacts of changing land use patterns and climate on the ecosystem services that support all human enterprises; Develop ecological forecasts with reliable assessments of error.

Predictions:
- Species distributions
- Ecosystem fluxes
- Ecosystem productivity
- Population ecology
- Land cover change

Observations:
- Land cover/land use and disturbances (e.g., fire)
- Species composition
- Biomass/productivity
- Phenology
- Vegetation structure
- Elevation
- Surface temperature
- Soil moisture
- Precipitation
- Winds
- SST, SSH, circulation, and salinity
- Atmospheric temperature

Outcomes:
- Monitor changes in land cover, weather, and fires to assist the sustainable management of the Mesoamerican Biological Corridor

DRAFT

DST Point of Contact (POC): Dan Irwin
POC e-mail: Daniel.E.Irwin@nasa.gov
POC Phone: (256) 961-7945

Decision Support Tool User/Operator Organization: National Space Science and Technology Center
Decision Support Tool Owner/Developer: NASA/World Bank/USAID/CCAD
Operational Status: 2002/2003
DST Type: Clearinghouse or compendium of thematically related pieces
Validation:
Configuration Control:
Notes:

Ecological Forecasting

NASA HQ POC: Woody Turner
NASA HQ POC Phone: (202) 358-1662
NASA HQ POC e-mail: woody.turner@nasa.gov

http://servir.nsstc.nasa.gov

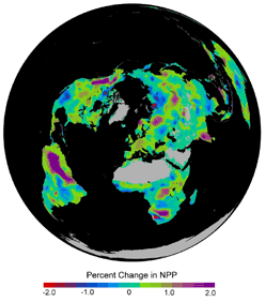
TOPS
Terrestrial Observation and Prediction System

Purpose/General Description of Decision Support Tool: Enhance management decisions related to floods, droughts, forest fires, human health, and crop, range, and forest production.

Value and Benefits: Manage a global hotspot of biodiversity (i.e., Mesoamerica) at a regional scale through the coordination of the activities of seven countries—a model for other regions; Predict the impacts of changing land use patterns and climate on the ecosystem services that support all human enterprises; Develop ecological forecasts with reliable assessments of error.

Predictions:
- Species distributions
- Ecosystem fluxes
- Ecosystem productivity
- Population ecology
- Land cover change

Observations:
- Land cover/land use and disturbances
- Surface and atmospheric temperatures
- Soil moisture and precipitation
- Winds
- Species composition
- Biomass/productivity
- Phenology
- Vegetation structure
- Elevation
- SST, SSH, circulation, and salinity



Outcomes:

DRAFT

DST Point of Contact (POC): Ramakrishna Nemani
POC e-mail: nemani@ntsg.umt.edu
POC Phone: (406) 243-4693

Decision Support Tool User/Operator Organization: University of Montana Numerical Terradynamic Simulation Group
Decision Support Tool Owner/Developer: University of Montana Numerical Terradynamic Simulation Group
Operational Status: 1982
DST Type: Software, downloadable software to be installed locally (currently unavailable)
Validation:
Configuration Control:
Notes:

Ecological Forecasting

NASA HQ POC: Woody Turner
NASA HQ POC Phone: (202) 358-1662
NASA HQ POC e-mail: woody.turner@nasa.gov

http://www.ntsg.umt.edu/tops/index.php

HOMER
Micropower Optimization Model

Purpose/General Description of Decision Support Tool: Find the most cost effective methods of energy distribution by performing energy balance calculations for each hour of the year.

Value and Benefits: Optimize renewable energy systems for power production; Integrate traditional and renewable energy supply systems into electric power grid; Improve prediction of electric power need and supply—mitigate power shortages, prevent price increase; Reduce greenhouse emissions from energy production

Predictions:
- 20+ years
- Past 90 days
- 1–15-day forecasts
- 12–18-month seasonal forecasts
- 10–20-year forecasts

Observations
- Temperature and humidity profiles
- Cloud systems
- Land cover albedo
- Land surface temperature
- Soil moisture
- Ocean surface winds
- Global Precipitation
- Total aerosol amount
- Land surface topography
- Trace gas profiles

Outcomes:

DRAFT

DST Point of Contact (POC): Peter Lilianthal
POC e-mail: peter_lilianthal@nrel.gov
POC Phone: (303) 384-7444

Decision Support Tool User/Operator Organization: Midwest Research Institute/DOE Office of Energy Efficiency
Decision Support Tool Owner/Developer: National Renewable Energy Laboratory
Operational Status: Version 2.10 (November 4, 2004)
DST Type:
Validation:
Configuration Control:
Notes:

Energy Management

NASA HQ POC: Greg Stover
NASA HQ POC Phone: (757) 864-7097
NASA HQ POC e-mail: Greg.Stover@nasa.gov

http://www.nrel.gov/homer

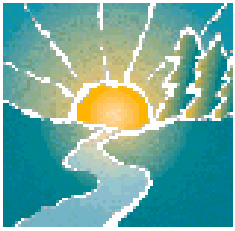
RETScreen
Renewable Energy Technologies Screen

Purpose/General Description of Decision Support Tool: Provide global radiation budget datasets. Provide accurate global solar radiation and meteorology data.

Value and Benefits: Optimize renewable energy systems for power production; Integrate traditional and renewable energy supply systems into electric power grid; Improve prediction of electric power need and supply—mitigate power shortages, prevent price increase; Reduce greenhouse emissions from energy production

Predictions:
- 20+ years
- Past 90 days
- 1–15-day forecasts
- 12–18-month seasonal forecasts
- 10–20-year forecasts

Observations
- Temperature and humidity profiles
- Cloud systems
- Land cover albedo
- Land surface temperature
- Soil moisture
- Ocean surface winds
- Global Precipitation
- Total aerosol amount
- Land surface topography
- Trace gas profiles



Outcomes:
- Provides common platform for evaluating project proposals while significantly reducing the costs and uncertainties of preliminary studies
- Reduces the time and errors of a preliminary study

DRAFT

DST Point of Contact (POC): Gregory J. Lend
POC e-mail: rets@nrcan.gc.ca
POC Phone: (450) 652-4621

Decision Support Tool User/Operator Organization: Natural Resources Canada
Decision Support Tool Owner/Developer:
Operational Status: 1998
DST Type: Excel spreadsheet
Validation:
Configuration Control:
Notes:

Energy Management

NASA HQ POC: Greg Stover
NASA HQ POC Phone: (757) 864-7097
NASA HQ POC e-mail: Greg.Stover@nasa.gov

http://www.retscreen.net

IMAAC
Interagency Modeling and Atmospheric Assessment Center

Purpose/General Description of Decision Support Tool: Coordinate federal support by DHS and provide effective communication between local, state, and federal emergency response agencies for assessing hazardous atmospheric releases during an incident of national significance.

Value and Benefits: Identify/prioritize high-risk communities; Reduction in lives lost; Reduce damage cost and time to recovery; Anticipate the scope of disaster-related damage; Improve disaster
Response.

Predictions:
- Nuclear, chemical, biological, and radiological concentrations
- Precipitation distribution
- Wind velocity/direction
- Surface topography

Outcomes:

DRAFT

DST Point of Contact (POC):
POC e-mail:
POC Phone:

Decision Support Tool User/Operator Organization:
Decision Support Tool Owner/Developer:
Operational Status:
DST Type:
Validation:
Configuration Control:
Notes:

NASA HQ POC: Stephen Ambrose
NASA HQ POC Phone: (202) 358-0851
NASA HQ POC e-mail: sambrose@mail.hq.nasa.gov

Homeland Security

URL Pending

ISFS
Invasive Species Forecasting System

Purpose/General Description of Decision Support Tool: Manage and control invasive species in all US Dept. of Interior and adjacent lands.

Value and Benefits: Reduce cost for invasive species control; Improve water quality; Reduce risk of disease to humans and livestock; Improve recreation; Improve freshwater fishing; Reduce costs for boating and waterway maintenance.

Predictions:
- Information products, predictions, and data from NASA ESE missions and models

Observations:
- Land cover and land cover change
- Climate and weather
- Location and condition of invasive species
- Soil moisture
- Water quality and recreation

Outcomes:
- Invasive species forecasting system
- Livestock grazing control
- Water quality and availability
- Fishing management
- Recreation and tourism
- Public health

DRAFT

DST Point of Contact (POC): John L. Schnase
POC e-mail: schnase@gsfc.nasa.gov
POC Phone: (301) 286-4351

Decision Support Tool User/Operator Organization: USGS, NASA Goddard Space Flight Center
Decision Support Tool Owner/Developer:
Operational Status: In use since early 1980s
DST Type: Web-enabled application
Validation:
Configuration Control:
Notes:

Invasive Species

NASA HQ POC: Ed Sheffner
NASA HQ POC Phone: (202) 358-0239
NASA HQ POC e-mail: esheffne@mail.hq.nasa.gov

http://biology.usgs.gov/invasive/index.htm

PSS
Plague Surveillance System

Purpose/General Description of Decision Support Tool:

Value and Benefits: Provide early warnings for harmful exposures, conditions favorable to vector proliferation; Reduce environmental related diseases; Improve prevention initiative targeting.

Predictions and Observations:
- Soil moisture
- Atmosphere temperature
- Ground temperature
- Humidity
- Precipitation
- Total column Ozone
- Total aerosol amount

Outcomes:
- Image output maps for PSS monitoring and scientific analysis
- Technologies for verification and validation of satellite data serve to PSS

DRAFT

DST Point of Contact (POC):
POC e-mail:
POC Phone:

Decision Support Tool User/Operator Organization:
Decision Support Tool Owner/Developer:
Operational Status:
DST Type:
Validation:
Configuration Control:
Notes:

NASA HQ POC: John Haynes
NASA HQ POC Phone: (202) 358-4665
NASA HQ POC e-mail: jhaynes@mail.hq.nasa.gov

Public Health

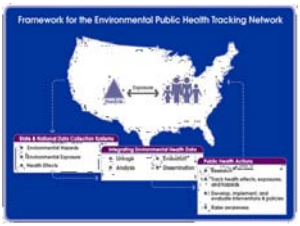
URL pending

EPHTN
Environmental Public Health Tracking Network

Purpose/General Description of Decision Support Tool: Integrate data about environmental hazards and exposures with data about diseases possibly linked to environment. Implement and evaluate regulatory and public health actions to prevent or control environment-related diseases.

Value and Benefits: Provide early warnings for harmful exposures, conditions favorable to vector proliferation; Reduce environmental related diseases; Improve prevention initiative targeting.

Predictions and Observations:
- Soil moisture
- Atmosphere temperature
- Ground temperature
- Humidity
- Precipitation
- Total column Ozone
- Total aerosol amount



Outcomes:
- Technologies for verification and validation of satellite data serve to EPHTN
- Data pipelines for direct feed of environmental measurement data to EPHTN-networked systems
- New or improved disease models
- Image output maps for EPHTN monitoring and scientific analysis

DRAFT

DST Point of Contact (POC):
POC e-mail:
POC Phone:

Decision Support Tool User/Operator Organization: Center for Disease Control and Prevention/National Center for Environmental Health
Decision Support Tool Owner/Developer:
Operational Status: Estimated 2005-2007
DST Type:
Validation:
Configuration Control:
Notes:

Public Health

NASA HQ POC: John Haynes
NASA HQ POC Phone: (202) 358-4665
NASA HQ POC e-mail: jhaynes@mail.hq.nasa.gov

http://www.cdc.gov/nceh/divisions/ehhe.htm

MMS
Malaria Modeling and Surveillance

Purpose/General Description of Decision Support Tool: Combat malaria and filariasis in the Greater Mekong Subregion using remote sensing and other technology.

Value and Benefits: Provide early warnings for harmful exposures, conditions favorable to vector proliferation; Reduce environmental related diseases; Improve prevention initiative targeting.

Predictions and Observations:
- Soil moisture
- Atmosphere temperature
- Ground temperature
- Humidity
- Precipitation
- Total column Ozone
- Total aerosol amount

Outcomes:
- Vector habitat identification
- Identify key factors that sustain or intensify
- Transmission
- Risk prediction

DRAFT

DST Point of Contact (POC): Richard Kiang
POC e-mail: (301) 614-5375
POC Phone: Richard.Kiang@nasa.gov

Decision Support Tool User/Operator Organization: Armed Forces Research Institute of Medical Sciences/Mahidol University, Bangkok, Thailand
Decision Support Tool Owner/Developer:
Operational Status: In development
DST Type:
Validation:
Configuration Control:
Notes:

Public Health

NASA HQ POC: John Haynes
NASA HQ POC Phone: (202) 358-4665
NASA HQ POC e-mail: jhaynes@mail.hq.nasa.gov

RSVP
Rapid Syndrome Validation Project

Purpose/General Description of Decision Support Tool: Collect and distribute data to and from doctors and provide current public health information pertaining to the progression of infectious disease outbreaks.

Value and Benefits: Provide early warnings for harmful exposures, conditions favorable to vector proliferation; Reduce environmental related diseases; Improve prevention initiative targeting.

Predictions and Observations:
- Soil moisture
- Atmosphere temperature
- Ground temperature
- Humidity
- Precipitation
- Total column Ozone
- Total aerosol amount

Outcomes:
- Improve knowledge of vector ecology
- Improve NCEP-ETA model with DREAM inputs
- Improve DREAM inputs with NASA products
- Improve aerosol and smoke dispersion models with NASA products

DRAFT

DST Point of Contact (POC): Greg Mann
POC e-mail: gremann@sandia.gov
POC Phone: (505) 845-7928

Decision Support Tool User/Operator Organization: Sandia National Laboratory
Decision Support Tool Owner/Developer: Sandia National Laboratory
Operational Status:
DST Type: Web-enabled application
Validation:
Configuration Control:
Notes:

Public Health

NASA HQ POC: John Haynes
NASA HQ POC Phone: (202) 358-4665
NASA HQ POC e-mail: jhaynes@mail.hq.nasa.gov

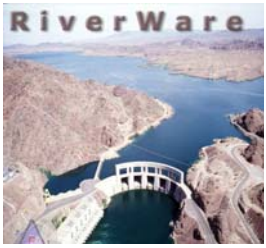
http://www.ca.sandia.gov/chembio/implementation_proj/rsvp/

RiverWare

Purpose/General Description of Decision Support Tool: Simulate and optimize the management of multipurpose reservoir systems.
.

Value and Benefits: Improvement ability to identify: impaired surface waters, storm water; management issues, drinking water source protection; Improve habitat management practices; Improve efficiency of water use; Increase agricultural productivity.

Predictions and Observations
- Soil moisture
- Evapotranspiration
- Precipitation
- Snow cover, accumulation, and water equivalent
- Groundwater storage change
- Vegetation type
- River discharge height
- Flood and drought assessment and prediction
- Seasonal forecast



Outcomes:
- Estimate river flow and water loss to vegetation
- Assess river sustainability

DRAFT

DST Point of Contact (POC): Terry Fulp
POC e-mail: dmatthews@do.usbr.gov
POC Phone: (303) 445-2470

Decision Support Tool User/Operator Organization: University of Colorado, Center for Advance Decision Support for Water and Environmental Studies
Decision Support Tool Owner/Developer:
Operational Status: 2000
DST Type: Software, downloadable software to be installed locally
Validation:
Configuration Control:
Notes:

Water Management

NASA HQ POC: Jared Entin
NASA HQ POC Phone: (202) 358-0275
NASA HQ POC e-mail: jentin@mail.hq.nasa.gov

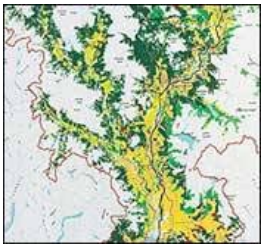
http://cadswes.colorado.edu/riverware

AWARDS
Agricultural Water Resources And Decision Support

Purpose/General Description of Decision Support Tool: Improve efficiency of water management and irrigation scheduling by providing guidance on when and where to deliver water and how much to apply.

Value and Benefits: Improvement ability to identify: impaired surface waters, storm water; management issues, drinking water source protection; Improve habitat management practices; Improve efficiency of water use; Increase agricultural productivity.

Predictions and Observations
- Soil moisture
- Evapotranspiration
- Precipitation
- Snow cover, accumulation, and water equivalent
- Groundwater storage change
- Vegetation type
- River discharge height
- Flood and drought assessment and prediction
- Seasonal forecasts



Outcomes:
- Estimate water consumption by crops
- Assess Crop suitability
- Determine Irrigation requirements

DRAFT

DST Point of Contact (POC): Curt Hartzell
POC e-mail: chartzell@do.usbr.gov
POC Phone: (303) 445-2482

Decision Support Tool User/Operator Organization: US Bureau of Reclamation
Decision Support Tool Owner/Developer:
Operational Status: 2000
DST Type: Clearinghouse or compendium of thematically related pieces
Validation:
Configuration Control:
Notes:

Water Management

NASA HQ POC: Jared Entin
NASA HQ POC Phone: (202) 358-0275
NASA HQ POC e-mail: jentin@mail.hq.nasa.gov

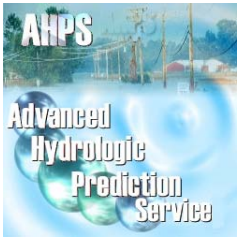
http://www.usbr.gov/rsmg.nexrad

AHPS
Advanced Hydrologic Prediction Service

Purpose/General Description of Decision Support Tool: Improve flood warnings and water resource forecasts. Provide enhanced hydrologic services, in support of protecting life, property, and economic well being.

Value and Benefits: Improvement ability to identify: impaired surface waters, storm water; management issues, drinking water source protection; Improve habitat management practices; Improve efficiency of water use; Increase agricultural productivity.

Predictions and Observations
- Soil moisture
- Evapotranspiration
- Precipitation
- Snow cover, accumulation, and water equivalent
- Groundwater storage change
- Vegetation type
- River discharge height
- Flood and drought assessment and prediction
- Seasonal forecasts



Outcomes:

DRAFT

DST Point of Contact (POC):
POC e-mail: AHPS@noaa.gov
POC Phone:

Decision Support Tool User/Operator Organization: NOAA Northwest River Forecast Center
Decision Support Tool Owner/Developer:
Operational Status:
DST Type: Web-enabled application
Validation:
Configuration Control:
Notes:

Water Management

NASA HQ POC: Jared Entin
NASA HQ POC Phone: (202) 358-0275
NASA HQ POC e-mail: jentin@mail.hq.nasa.gov

http://www.nwrfc.noaa.gov/ahps/ahps.cgi

BASINS
Better Assessment Science Integrating Point and Nonpoint Sources

Purpose/General Description of Decision Support Tool: Perform watershed and water quality based studies at selected stream sites or throughout an entire watershed.

Value and Benefits: Improvement ability to identify: impaired surface waters, storm water; management issues, drinking water source protection; Improve habitat management practices; Improve efficiency of water use; Increase agricultural productivity.

Predictions and Observations
- Soil moisture
- Evapotranspiration
- Precipitation
- Snow cover, accumulation, and water equivalent
- Groundwater storage change
- Vegetation type
- River discharge height
- Flood and drought assessment and prediction
- Seasonal forecasts

Outcomes:
- Facilitate examination of environmental information
- Provide an integrated watershed and modeling framework
- Support analysis of point and nonpoint source management alternatives
- Evaluate urban/rural land use

DRAFT

DST Point of Contact (POC): Dr. Russell Kinerson
POC e-mail: basins@epa.gov
POC Phone: (202) 566-0409

Decision Support Tool User/Operator Organization: Environmental Protection Agency
Decision Support Tool Owner/Developer:
Operational Status: Available since 1996
DST Type: Software, downloadable software to be installed locally
Validation:
Configuration Control:
Notes:

Water Management

NASA HQ POC: Jared Entin
NASA HQ POC Phone: (202) 358-0275
NASA HQ POC e-mail: jentin@mail.hq.nasa.gov

http://www.epa.gov/waterscience/basins

Policy
Partner Decision
Support Tools

MiniCAM
Mini Climate Assessment Model

Purpose/General Description of Decision Support Tool:

Value and Benefits: Optimize renewable energy systems for power production; Integrate traditional and renewable energy supply systems into electric power grid; Improve prediction of electric power need and supply—mitigate power shortages, prevent price increase; Reduce greenhouse emissions from energy production.

Predictions
- 20+ years
- Past 90 days
- 1–15-day forecasts
- 12–18-month seasonal forecasts
- 10–20-year forecasts

Observations
- Temperature and humidity profiles
- Cloud systems
- Land cover albedo
- Land surface temperature
- Soil moisture
- Ocean surface winds
- Global Precipitation
- Total aerosol amount
- Land surface topography
- Trace gas profiles

Outcomes:

DRAFT

DST Point of Contact (POC):
POC e-mail:
POC Phone:

Decision Support Tool User/Operator Organization:
Decision Support Tool Owner/Developer:
Operational Status:
DST Type:
Validation:
Configuration Control:
Notes:

NASA HQ POC:
NASA HQ POC Phone:
NASA HQ POC e-mail:

Energy Management / Climate

URL pending

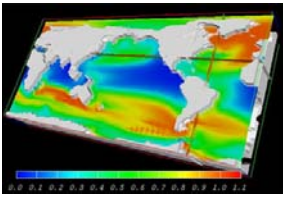
PGCAM
Process Global Climate Assessment Model

Purpose/General Description of Decision Support Tool:

Value and Benefits: Optimize renewable energy systems for power production; Integrate traditional and renewable energy supply systems into electric power grid; Improve prediction of electric power need and supply—mitigate power shortages, prevent price increase; Reduce greenhouse emissions from energy production.

Predictions
- 20+ years
- Past 90 days
- 1–15-day forecasts
- 12–18-month seasonal forecasts
- 10–20-year forecasts

Observations
- Temperature and humidity profiles
- Cloud systems
- Land cover albedo
- Land surface temperature
- Soil moisture
- Ocean surface winds
- Global Precipitation
- Total aerosol amount
- Land surface topography
- Trace gas profiles



Outcomes:

DRAFT

DST Point of Contact (POC):
POC e-mail:
POC Phone:

Decision Support Tool User/Operator Organization:
Decision Support Tool Owner/Developer:
Operational Status:
DST Type:
Validation:
Configuration Control:
Notes:

NASA HQ POC:
NASA HQ POC Phone:
NASA HQ POC e-mail:

Energy Management / Climate

URL pending

CMAQ
Community Multiscale Air Quality Modeling System

Purpose/General Description of Decision Support Tool:

Value and Benefits: Reduce lung-related diseases and premature death; Reduce hospital admissions and use of medicines; Reduce lost workdays and schooldays; Improve visibility and reduce haze for Tourism; Improve resiliency of crops, increase yields; Increase confidence in Government; Improve crop estimates; Sensitive populations can change activities.

Predictions and Observations:
- Atmospheric state parameters
- Global-toregional concentrations
- Emissions inventories
- Regional-global transport
- Trace gas sources
- Aerosol properties
- Ozone profiles and columns
- Global-regional boundary conditions
- Data fusion techniques
- Ground-satellite data comparison techniques

Outcomes:
- Assess emissions-control strategies
- Develop achievable SIPs (State Implementation Plan)
- Assess compliance
- Waivers to air standards
- Quantify voluntary stationary emission reductions

DRAFT

DST Point of Contact (POC):
POC e-mail:
POC Phone:

Decision Support Tool User/Operator Organization:
Decision Support Tool Owner/Developer:
Operational Status:
DST Type:
Validation:
Configuration Control:
Notes:

NASA HQ POC:
NASA HQ POC Phone:
NASA HQ POC e-mail:

Air Quality

URL Pending

NEMS
National Energy Modeling System

Purpose/General Description of Decision Support Tool:

Value and Benefits: Optimize renewable energy systems for power production; Integrate traditional and renewable energy supply systems into electric power grid; Improve prediction of electric power need and supply—mitigate power shortages, prevent price increase; Reduce greenhouse emissions from energy production.

Predictions
- 20+ years
- Past 90 days
- 1–15-day forecasts
- 12–18-month seasonal forecasts
- 10–20-year forecasts

Observations
- Temperature and humidity profiles
- Cloud systems
- Land cover albedo
- Land surface temperature
- Soil moisture
- Ocean surface winds
- Global Precipitation
- Total aerosol amount
- Land surface topography
- Trace gas profiles

Outcomes:

DRAFT

DST Point of Contact (POC):
POC e-mail:
POC Phone:

Decision Support Tool User/Operator Organization:
Decision Support Tool Owner/Developer:
Operational Status:
DST Type:
Validation:
Configuration Control:
Notes:

NASA HQ POC:
NASA HQ POC Phone:
NASA HQ POC e-mail:

Energy Management

URL Pending

Water Quantity

Purpose/General Description of Decision Support Tool:

Value and Benefits: Improvement ability to identify: impaired surface waters, storm water; management issues, drinking water source protection; Improve habitat management practices; Improve efficiency of water use; Increase agricultural productivity.

Predictions and Observations

Predictions and Observations

- Soil moisture
- Evapotranspiration
- Precipitation
- Snow cover, accumulation, and water equivalent
- Groundwater storage change
- Vegetation type
- River discharge height
- Flood and drought assessment and prediction
- Seasonal forecasts

Outcomes:

DRAFT

DST Point of Contact (POC):
POC e-mail:
POC Phone:

Decision Support Tool User/Operator Organization:
Decision Support Tool Owner/Developer:
Operational Status:
DST Type:
Validation:
Configuration Control:
Notes:

NASA HQ POC:
NASA HQ POC Phone:
NASA HQ POC e-mail:

Water Management

URL Pending

Sea Level Rise/Coastal Inundation

Purpose/General Description of Decision Support Tool::

Value and Benefits: Reduce public health risks, hospital admissions, lost work-school days; Reduce impacts to regional coastal economies & tourism; Raise quotas for shellfish harvesting prior to HABs; improve siting and design of shellfish beds; Preserve ecological diversity and tourism economies; Reduce threats to human and natural environments; Rapid response to emergencies to reduce effects on human safety and economies; Public health and reduce pre-ventable costs.

Predictions and Observations:

- Nearshore upwelling
- Speed and direction of ocean currents
- Ecological forecasts
- Runoff change
- Seasonal forecasts
- Aerosol properties
- Salinity predictions
- Ocean surface cur rents/winds/topography
- Sea Surface salinity/temperature
- Land use
- Phytoplankton concentrations

Outcomes:

DRAFT

DST Point of Contact (POC):
POC e-mail:
POC Phone:

Decision Support Tool User/Operator Organization:
Decision Support Tool Owner/Developer:
Operational Status:
DST Type:
Validation:
Configuration Control:
Notes:
NASA HQ POC:
NASA HQ POC Phone:
NASA HQ POC e-mail:

Coastal Management

URL Pending

Science Mission Directorate
Earth-Sun System Division

This booklet is part of a series of three booklets. Please read the Satellite Models booklet for more information on the individual models and the Missions booklet for more information on the individual missions.

These booklets are derived from the **Earth-Sun Science System Knowledge Base which is available on-line at**
http://www.asd.ssc.nasa.gov/m2m

For more information please e-mail us at:
EarthScience@ssc.nasa.gov

http://science.hq.nasa.gov

NASA: Explore. Discover. Understand.