

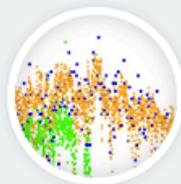
Welcome to NASA Applied Remote Sensing Training (ARSET) Webinar Series

Introduction to NASA Earth Science Data Products, Portals, and Tools

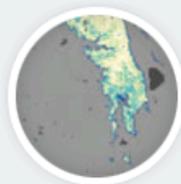
Course Dates: 16, **23**, 30 September and 7, 14 October 2014



ATMOSPHERE



CALIBRATED RADIANCE AND
SOLAR RADIANCE



CRYOSPHERE



HUMAN DIMENSIONS



LAND



OCEAN

ARSET

Appled **R**emote **S**ensing **T**raining
A project of NASA Applied Sciences



Important Information

Presentations URL:

<http://arset.gsfc.nasa.gov/>

Contact for Requesting Recorded Link for the Webinars:

Marines Martins : marines.martins@ssaihq.com

ARSET Web Page

<http://arset.gsfc.nasa.gov>

The screenshot shows the ARSET website header with the NASA logo and the text 'ARSET Applied Remote Sensing Training'. Below the header is a navigation menu with categories: DISASTERS, ECO FORECASTING, HEALTH & AIR QUALITY, and WATER RESOURCES. A sidebar on the left contains links for ARSET, Webinars, Workshops, Apply for Training, Personnel, Links, and Upcoming Webinar. A yellow arrow points from the 'Webinars' link to the main content area.

Introduction to NASA Earth Science Data Products, Portals, and Tools

09/16/2014 to 10/14/2014

Times: Tuesdays (5 one-hour sessions), 8-9 AM U.S. Eastern Standard Time (13 PM UTC)

GIS: True

Keywords: **Satellite Imagery, Tools**

Instruments: **Aqua, Landsat, Terra, TRMM**

[Webinar Information](#)

Presentations and Recordings

Week	Date	Title	Presentation	Recording	Assignment
1	Sept. 16, 2014	NASA Earth Science: <i>Research and Applications to Decision Support</i>	Session-1 (click)	View	N/A
2	Sept. 23, 2014	Overview of NASA Earth Science Data Products: Remote Sensing and Earth System Modeling Data			N/A
3	Sept. 30, 2014	NASA Data Centers and Data Access Tools			N/A
4	Oct. 7, 2014	NASA Data and GIS Applications: Air Quality, Water Resources			N/A
5	Oct. 14, 2014	NASA Data and GIS Applications: Disasters, Agriculture and Ecology			N/A

Last updated: August 18, 2014
NASA Official: Kenneth Pickering
Webmaster: Susannah Pearce
Curator: Ana Predoi

- Sciences and Exploration
- Atmospheric Laboratory
- Hydrospheric & Biospheric Laboratory

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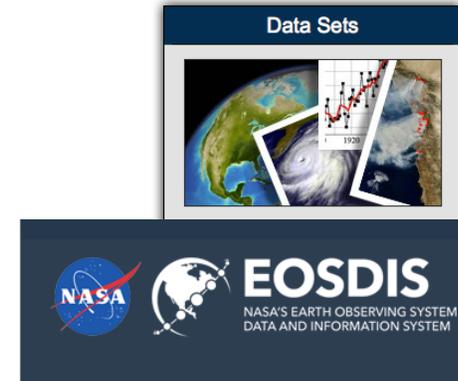
Course Outline

Week 1



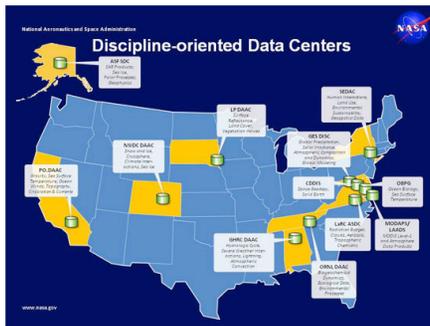
NASA Earth Science

Week 2



NASA Data Products

Week 3



NASA Data Centers and Tools

Weeks 4 & 5

Application & Capacity Building: Application Areas

Water Resources



NASA's Landsat satellites shows the Yellow River delta at five-year intervals from 1989 to 2014.

Disasters



NASA supports California wildfire control efforts with an unmanned plane [read more...](#)

NASA Data Applications with GIS

NASA Earth Sciences Data

There are **6861** Unique Data Sets!

EOSDIS FY2013 Metrics (Oct. 1, 2012 to Sept. 30, 2013)	
Unique Data Sets	6,861
Distinct Users of EOSDIS Data and Services	1.7 M
Web Site Visits	2.5 M
Average Archive Growth	8.5 TB/day
Total Archive Volume	9.8 PB
End User Distribution Products	839 M
End User Average Distribution Volume	22 TB/day



Week 2: Outline

- **Summary Lists of NASA Earth Science Data Parameters**
- **Data for Environmental Applications :**
(Products, Sources, Attributes)
 - *Air Quality*
 - *Disasters*
 - *Eco-forecasting and Land Management*
 - *Water Resources*
- **How to Search for Data?**

Earth Science Data Parameters

For Details visit: <https://earthdata.nasa.gov/>



NASA Earth Observing System Data and Information
System (EOSDIS)

EOSDIS

<https://earthdata.nasa.gov/>

The screenshot displays the EOSDIS website interface. At the top right, there is a "Login with URS!" button. The main header features the NASA logo and the text "EOSDIS NASA'S EARTH OBSERVING SYSTEM DATA AND INFORMATION SYSTEM". Below the header is a navigation menu with links for "About EOSDIS", "Data", "Our Community", "User Resources", "Labs", "Wiki", and "Register". A search bar with a "Search" button is located on the right side of the header.

On the left side, there is a vertical menu titled "DISCOVER DATA & SERVICES" with the following items:

- Data and Service Access Client (Reverb)
- Dataset Directory (GCMD)
- Search & Order Tools
- EOSDIS Data Service Directory

The main content area features a large map of North America titled "Daymet Average Daily Maximum Temperature September 1989". Below the map, there is a webinar announcement: "Webinar: Accessing Daymet Data Through Web-Based Tools and Services". The text of the webinar announcement reads: "Join us on Thursday, September 25, 2-3pm ET to discover specialized tools and web services for accessing Daymet data. The Daymet data set is a spatially gridded data set of multiple meteorologic variables on a daily time step for North America (currently to 52 degrees N) available at the ORNL DAAC." Below the text is a pagination control showing numbers 1 through 6, with 4 being the active page.

At the bottom of the page, there is a section titled "Data available by Disciplines" with a red border. This section contains six circular icons representing different data disciplines:

- ATMOSPHERE
- CALIBRATED RADIANCE AND SOLAR RADIANCE
- CRYOSPHERE
- HUMAN DIMENSIONS
- LAND
- OCEAN

Atmospheric Data

- Atmospheric temperature
- Atmospheric humidity
- Winds (wind speed, wind direction, vertical air motions, upper air winds)
- Precipitation
- Lightning (events, area, flash structure)
- Aerosol Properties
- Tropospheric Chemistry (ozone, precursor gases, carbon dioxide)
- Stratospheric chemistry (Ozone, ClO, BrO)
- Cloud properties (amount, optical properties, height)
- Radiative Energy Fluxes (Top of atmosphere, surface)

Disaster

Water Resources, Eco/Land Surface

Air Quality

Ocean Data

- Surface temperature(SST)
- Phytoplankton and Dissolved Organic Matter
- Surface Wind Fields
- Heat Flux
- Ocean Surface Topography (height, waves, sea level, tide models)
- Sea Ice
- Gravity

Climate monitoring, Coastal Water Quality/Eco system

Global Water Balance

Cryospheric Data

Water Resources, Climate monitoring

- Land ice (ice sheet topography, ice sheet volume, ice sheet volume change, glacier change)
- Sea ice (Extent, concentration, motion, temperature)
- Snow Cover (extent, water equivalent, depth)

Land Processes Data

- Land Cover and Land Use Change
- Vegetation Dynamics
- Surface Temperature
- Surface Topography (Elevation, slope, DEMs)
- Fire Occurrence (Extent, thermal anomalies)
- Volcanic Effects (Frequency of occurrence, thermal anomalies, impact)
- Soil moisture
- Gravity/Ground Water

Human Dimensions Data

- Population and Land Use
- Biodiversity and Ecosystems
- Human and Environmental Health
- Climate Change

Eco/Land management

Health

Data for Environmental Application Areas

Data Sources for

Air Quality, Disasters, Eco/Land Management, Water Resources



Satellites/Sensors

Environmental Models

Data Sources : Satellites

Air Quality	Water Resources/ Disasters*	Eco/Land Management
Terra	TRMM	Landsat
Aqua	GPM	Aqua
Aura	Terra	Terra
CALIPSO Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations	Aqua	
NPP (National Polar-Orbiting Partnership)	GRACE	
	Landsat	

*Extreme Precipitation, Flooding/Droughts, Storms, Landslides, Fire

Satellites/Sensors for Air Quality Parameters

Satellite	Sensors	Quantities
Terra and Aqua	MODerate Resolution Imaging Spectroradiometer (MODIS)	Aerosol Optical Depth (AOD)
Terra	Multi-angle Imaging SepctroRadiometer (MISR)	(AOD) Particle Type
Aqua	Atmospheric Infrared Sounder (AIRS)	Trace Gases
Aura	Ozone Monitoring Instrument (OMI)	Ozone, Sulphur Dioxide, Nitrogen Dioxide AOD
Suomi-NPP*	Visible Infrared Imaging Radiometer Suite (VIIRS)	Aerosol Optical Depth (AOD) Particle Type
CALIPSO	LIDAR	Aerosol Profile

*National Polar-orbiting Partnership

Satellites/Sensors for Disasters, Land and Water Resources Parameters

Satellite	Sensors	Quantities
TRMM	Precipitation Radar (PR) TRMM Microwave Imager (TMI) Visible Infrared Scanner (VIRS)	Rain Rate, Vertical Rain Rate Profile, Accumulated Rain, Soil Moisture
Terra and Aqua	MODerate Resolution Imaging Spectroradiometer (MODIS)	Snow Cover, Vegetation Index, Leaf Area Index, Land Cover , Clouds
Aqua	Atmospheric Infrared Sounder (AIRS) Advanced Microwave Scanning Radiometer for EOS (AMSR-E)	3-dimensional Atmospheric Temperature and Humidity, clouds Snow Water Equivalent, Sea Ice, Soil Moisture, Rain Rate
Landsat	(Enhanced) Thematic Mapper (ETM)	Vegetation Index, Leaf Area Index, Land Cover
Grace	K-Band Ranging Assembly	Terrestrial Water

Data Sources: Models

- **MERRA:** Modern Era Retrospective-analysis for Research and Application
- **GLDAS :** Global Land Data Assimilation System
- **NLDAS :** North American Land Data Assimilation System

NASA Models Data

For Water Resources and land Management

Models	Quantities
MERRA	3-dimensional Winds, Temperature, Humidity, Clouds, Rain Rate ,Snow Mass, Snow Cover, Snow Depth, Surface Snowfall Rate, Evapotranspiration
GLDAS/NLDAS	Evapotranspiration, Multi-layer Soil Moisture, Rainfall, Snowfall Rate, Snow Melt, Snow-Water Equivalent, Surface and Sub-surface Runoff

Data Attributes

For Satellites and Earth System Models

Data Attributes (Remote Sensing and Models)

Spatial Resolution
Spatial Coverage
Temporal Resolution
Temporal Coverage
Data Format
Data Latency
Data Accuracy
Data Strengths/Limitations

Data Access
Data Analysis/Visualization

Remote Sensing Data Attributes

Spatial and Temporal Resolution of Satellite Measurements

Depends on the satellite orbit configuration and sensor design

- **Spatial Resolution:**

Decided by its pixel size -- pixel is the smallest unit measured by a sensor

- **Spatial Coverage:**

The geographical area covered by a satellite

- **Temporal resolution:**

How frequently a satellite observes the same area of the earth

- **Temporal Coverage:**

Time span or life-time of a satellite for which measurements are available

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Sensor Types

Satellite Sensors

Passive remote sensors
measure radiant energy
reflected or emitted by the
earth-atmosphere System

Radiant energy is converted to
geophysical quantities such as
temperature, humidity, clouds,
precipitation, soil moisture

Examples:

MODIS, AIRS

MODIS Snow Cover on March 5, 2012



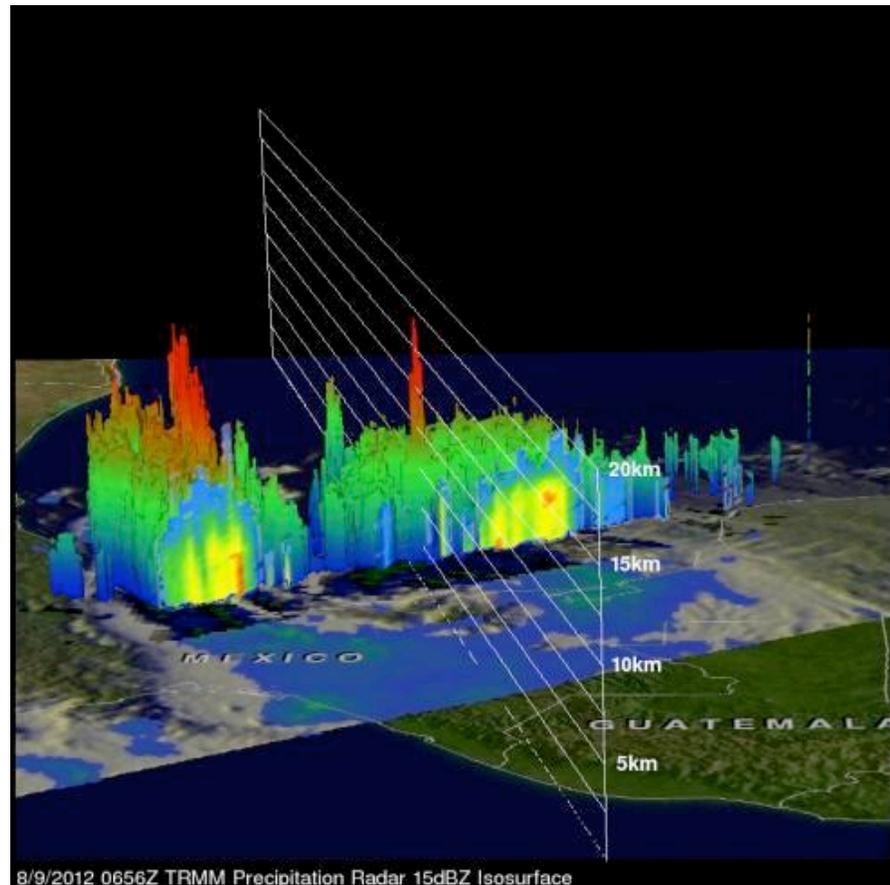
Satellite Sensors

Active remote sensors
‘throw’ beams of radiation
on the earth-atmosphere
system and measure
‘back-scattered’ radiation

The back-scattered
radiation is converted to
geophysical quantities

Examples: Precipitation
Radar, LIDAR

TRMM satellite – **Precipitation Radar**, an
active sensor, measuring 3-dimensional
reflectivity converted to rain rates for
Hurricane Ernesto (August 9, 2012)

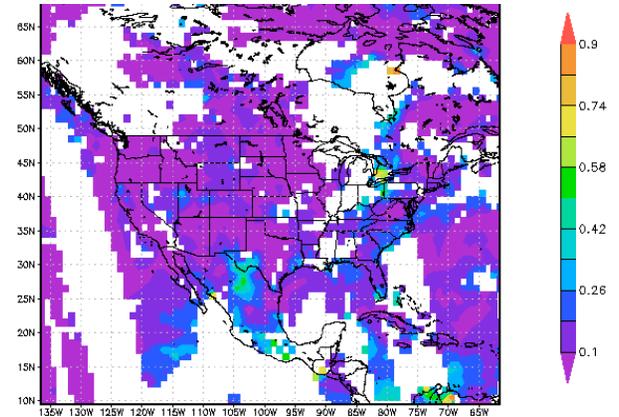


Satellite Sensors

Imagers: Create Images

Examples: MODIS, TMI

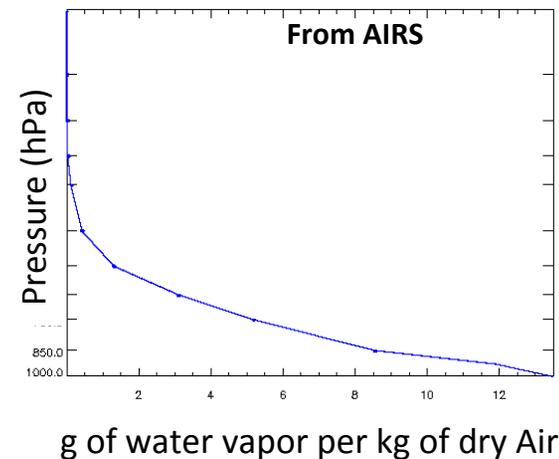
**MODIS Aerosol Optical Depth
September 1, 2014**



Sounders: Provide vertical profiles

Examples: AIRS

**Water Vapor Profile Averaged over
Central US for July 2012**



Spatial Resolution of NASA Satellite Data Products

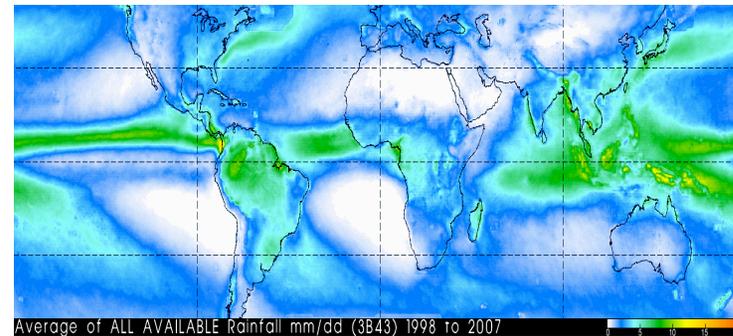
- **High Spatial resolution**
30x30 m, 250x250 m; 500x500 m; 1x1 km; 4x4 km
Example: Landsat, MODIS True Color Imagery (RGBs), TRMM Radar
- **Moderate Spatial Resolution**
0.125x0.125 to 0.25x0.25 degrees
Example: GLDAS, TRMM precipitation products.
- **Low Spatial Resolution (Level 3)**
Primarily at 1 x 1 degree - derived from each data set's native resolution product
Example: Aqua/AIRS surface air temperature, model data

NASA Satellites Measurements with Different Spatial Resolution

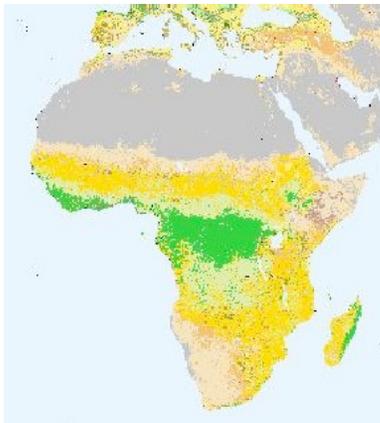
Landsat Image of Philadelphia
Spatial resolution: 30 m



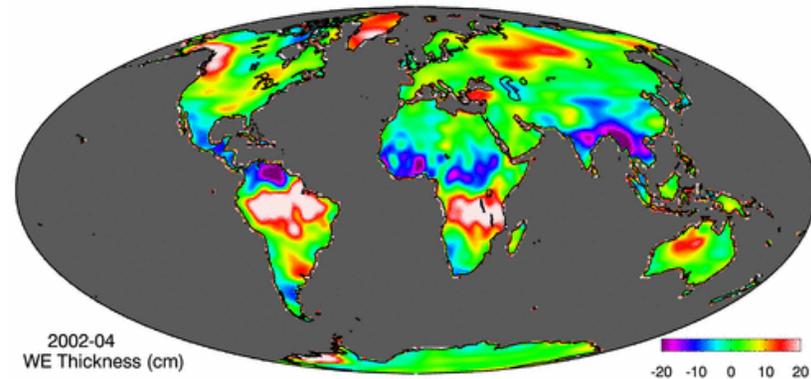
Rain Rate from TRMM
Spatial resolution: 25 km²



Land Cover from Terra/MODIS:
Spatial resolution: 1 km²
(From: <http://gislab.jhsph.edu/>)



Terrestrial Water Storage Variations from GRACE: Spatial resolution: 150,000 km² or coarser (Courtesy: Matt Rodell, NASA-GSFC)



Spatial Coverage and Temporal Resolution of Satellite Measurements

Depends on the **satellite orbit configuration** and sensor design

- **Spatial Resolution:**

Decided by its pixel size -- pixel is the smallest unit measured by a sensor

- **Spatial Coverage:**

The geographical area covered by a satellite

- **Temporal resolution:**

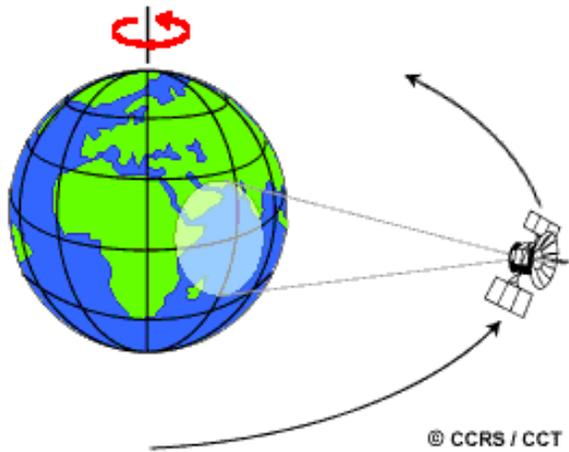
How frequently a satellite observes the same area of the earth

- **Temporal Coverage:**

Time span or life-time of a satellite for which measurements are available

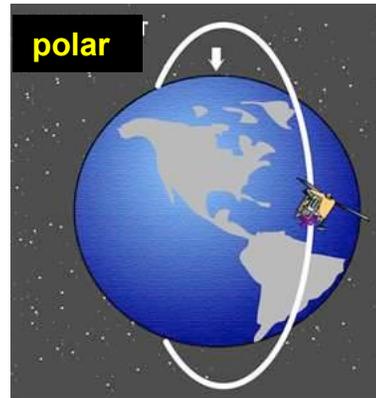
Types of Satellite Orbits

Geostationary orbit



Satellite is at ~36,000 km above earth at equator. Same rotation period as earth's. Appears 'fixed' in space.

Low Earth Orbit (LEO)



Circular orbit constantly moving relative to the Earth at 160-2000 km. Can be in Polar or non-polar orbit

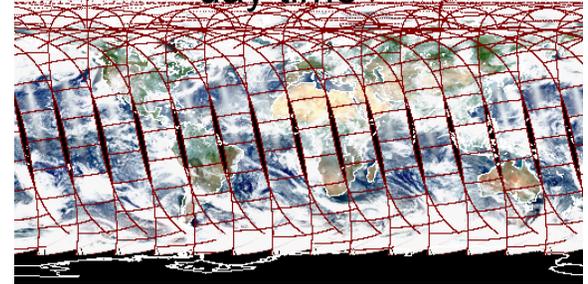
Spatial Coverage and Temporal Resolution

Polar orbiting satellites: global coverage - but **one to two or less measurements per day** per sensor. Orbital gaps present. Larger Swath size, higher the temporal resolution.

Non-Polar orbiting satellites: **Less than one per day.** Non-global coverage. Orbital gaps present. Larger Swath size, higher the temporal resolution.

Geostationary satellites: **multiple observations per day, but limited spatial coverage,** more than one satellite needed for global coverage.

Aqua (“ascending” orbit)
day time



TRMM Image



GOES Image



Temporal Resolutions

Sun Synchronous, Polar Orbiting Satellites

Less than 1 to 2 measurements per day

Aqua
Aura
CALIPSO
Landsat
NPP
Terra
SMAP

Non-sun Synchronous Satellites

Less than 1 measurement per day

TRMM
GPM

Levels of Remote Sensing Data Processing

Level 1 Products

Orbital data

Used to produce



Level 2 Products

Orbital data

Used to produce



Level 3 Products

composites
of level 2 products

Less Processing

- More user control
- Highest spatial/temporal resolution
- Harder to use



More Processing

- Less user control
- Lower spatial/temporal resolution but gridded and may be available at multiple spatial/temporal resolutions
- More web-tools available for analysis/access
- Easier to use



Model Data Attributes

Spatial and Temporal Resolution and Coverage of Model Data

(Less Rigid than Remote Sensing Data)

Depends on the model configuration

➤ **Spatial Resolution:**

Defined by the grid size, generally provided in degrees of latitude-longitude. Models provide data on vertical levels in the atmosphere, ocean, and land

➤ **Spatial Coverage:**

The geographical area covered by a model (regional or global)

➤ **Temporal resolution:**

How frequently model parameters are written out and saved

➤ **Temporal Coverage:**

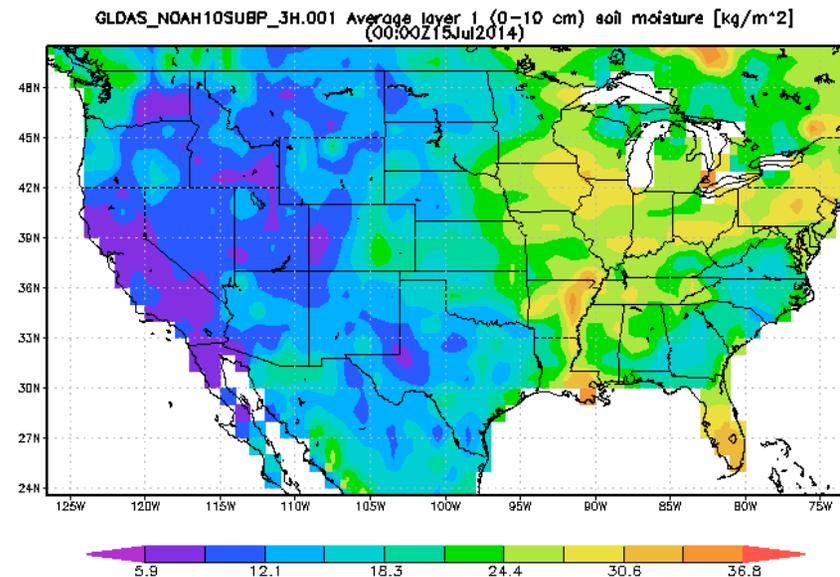
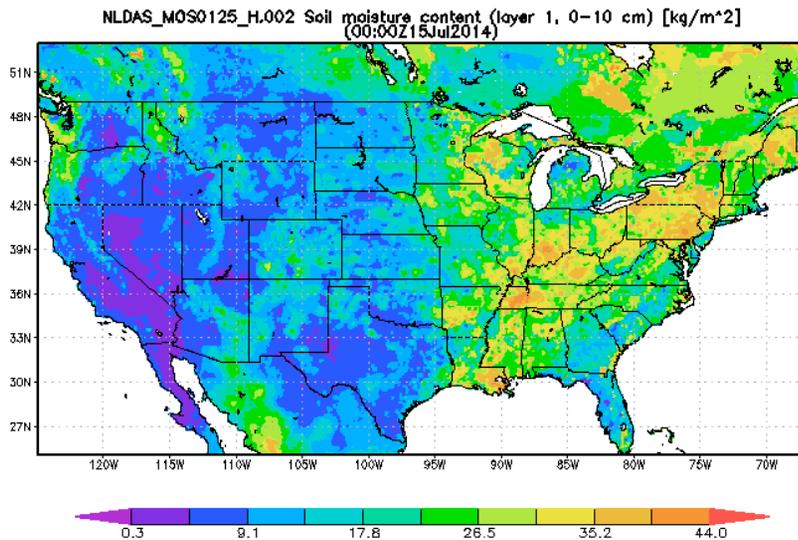
Time span over which the model runs are conducted

Examples of Model Data Resolutions

Soil Moisture (0-10 cm) at 0 UTC on 15 July 2014

NLDAS: resolution $0.125^{\circ} \times 0.125^{\circ}$

GLDAS: resolution $1^{\circ} \times 1^{\circ}$



More Detailed and small-scale variations captured by high-resolution data

Spatial Resolution and Temporal Resolutions of Model Data Products

➤ **MERRA**

2/3x1/2 degree, hourly; 1.25x1.25 degree, 42 level, hourly and monthly

➤ **GLDAS**

0.125x0.125 degree, 6 soil levels, 3-hourly and monthly; 1x1 degree, 3-hourly and monthly

➤ **NLDAS**

0.125x0.125 degree, 3 soil levels, hourly and monthly

Remote Sensing and Model Data Formats

- **Text/ASCII**
 - pros: easy to read and examine the data right away (can read with used tools such as excel and GIS software)
 - cons: large data files, not always available.
- **Binary – HDF, NetCDF**
 - pros: takes less space, more information (metadata, SDS)
 - cons: need specific tools or code to read the data
- **KML or KMZ (zipped KML)**
 - pros - easy 2D and 3D visualization of the data through free tools such as Google Earth. Data are very low volume
- **Shapefiles/Geotiff:** GIS Applications. May or may not work with open source

Data Latency

Time between data production/observation and dissemination/availability to users

Ranges from Near-Real Time (NRT) data with less than 3 hour latency to up to 3 months latency (Level 3 data)

Examples of NRT Data

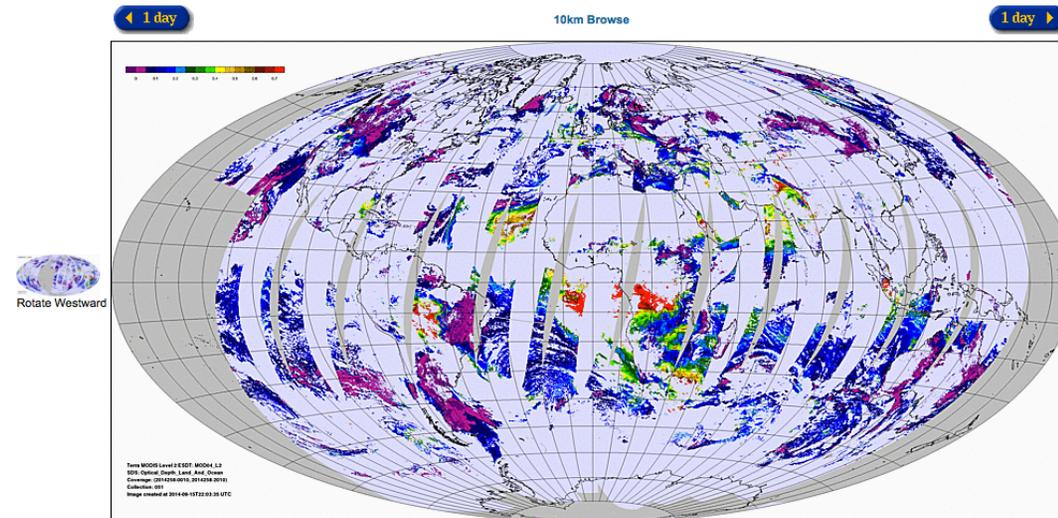
<http://lance-modis.eosdis.nasa.gov/>

- MODIS Radiances, Cloud/Aerosols, Water Vapor, Fire, Snow Cover, Sea Ice, Land Surface Reflectance, Land Surface Temperature: 90 –125 minutes

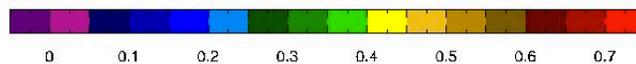
Aerosol Optical Depth

Terra Aerosol Optical Depth Land and Ocean (MOD04_L2), Day 2014-258 (09/15/2014)

To position your region of interest closer to map center, select the icon on the left to rotate the globe 120 degrees westward or select the icon on the right to rotate the globe 120 degrees eastward.



Color Look-up:

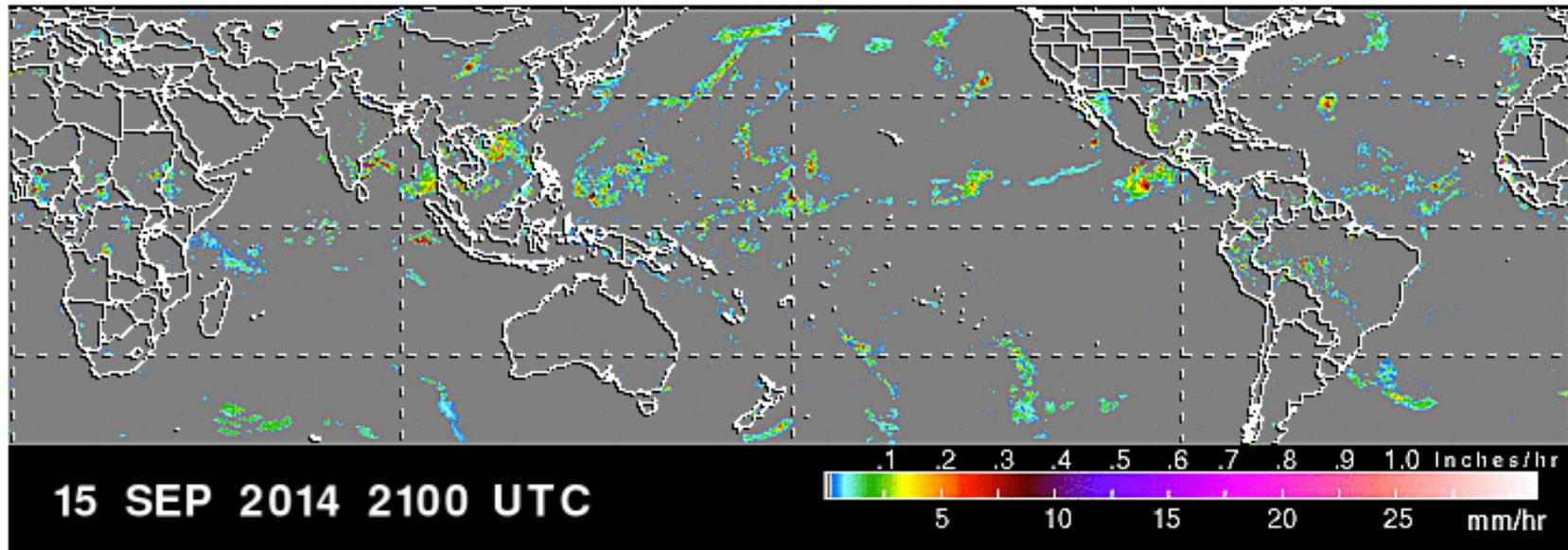


Examples of NRT Data

http://trmm.gsfc.nasa.gov/affinity/affinity_3hrly_rain.html

- TRMM and Multi-satellite Merged Data: Rain Rate (3-6 hour latency) -- used in monitoring heavy rain, flooding, landslides, tropical storms

Rain Rate in mm/hr



Latest 3 Hourly Global Rainfall [Click to See a Medium \[1.7 MB\] Animation](#)

Although TRMM has less than 1-day temporal resolution, combined with other satellites NRT data are derived that are used for monitoring floods and landslide

Data Accuracy

- Data validation and accuracy assessment are conducted by comparing satellite and model data parameters with land-based measurements, and/or aircraft field campaign measurements
- Conducted for each data product individually
- Accuracy varies with platforms (satellite/sensors, models) and may vary geographically
- Available from published literature and/or from data production team
- NASA Earth Sciences funds projects for regional validation through proposal solicitation

Remote Sensing Data Strengths and Limitations

Data Void in Station-based Measurements

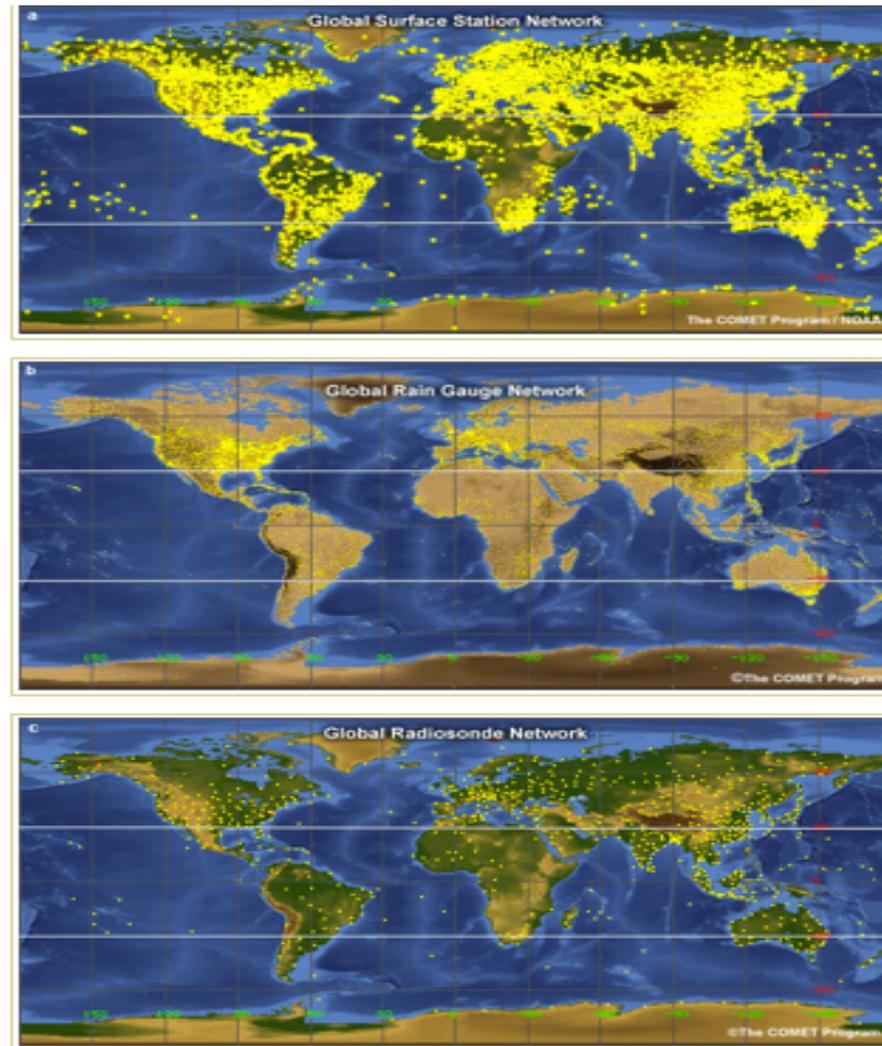
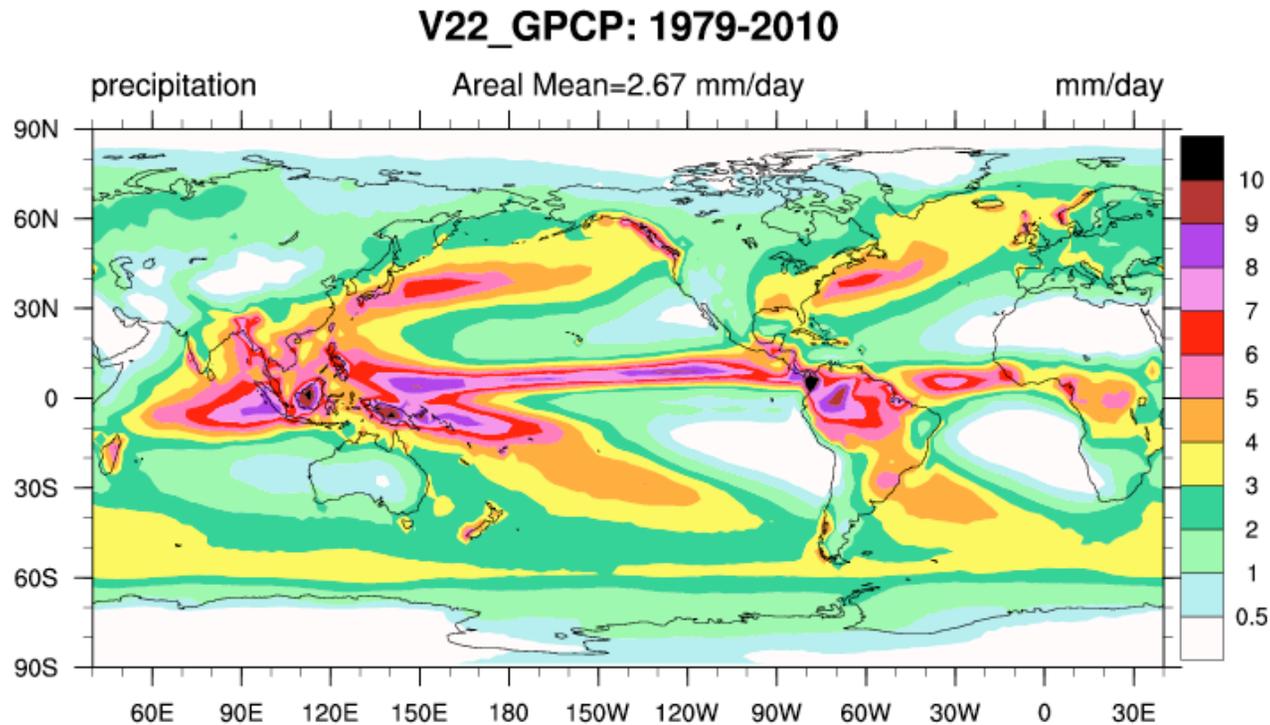


Fig. 2.1. Global network of (a) regular surface stations, (b) rain gauge stations, and (c) radiosonde stations. White lines mark $\pm 30^\circ$ latitude.

From NOAA/COMET

Remote Sensing observations



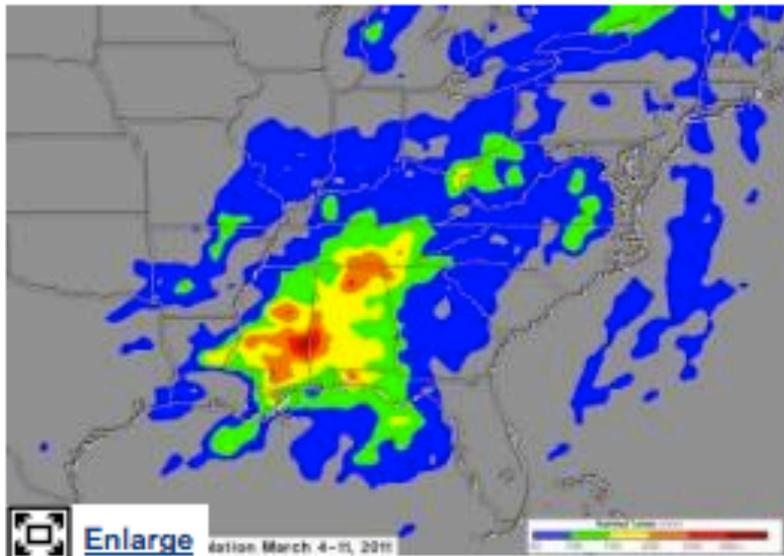
Rainfall Estimates Combined from Multiple International Satellites

- Provide information where there are no ground-based measurements, including over oceans
- Provide consistent observations over global/large areas

Remote Sensing observations provide large scale perspective

TRMM maps flooding along US East Coast from massive storm

[March 14, 2011](#)



The analysis indicated that the greatest total rainfall for the past week was over 300 mm (~11 inches) and was located over Alabama and Mississippi (in dark red). Some of the extremely heavy rainfall in this area was associated with tornado spawning thunderstorms. Much of the eastern United States was affected by rainfall totals of over 50 mm (~2 inches). Credit: NASA/SSAI, Hal Pierce

The massive rain storm that stretched from New York to Florida last week dropped some record rainfall and NASA's Tropical Rainfall Measuring Mission (TRMM) satellite measured that rainfall from space. Those rainfall totals were

Remote Sensing Observations : Trade Offs

- It is very difficult to obtain extremely high spectral, spatial, temporal and radiometric resolution at the same time
- Several sensors can obtain global coverage every one to two days because of their wide swath width
- Higher spatial resolution polar/non-polar orbiting satellites may take 8 – 16 days to attain global coverage
- Geostationary satellites obtain much more frequent observations but can only cover 1/3rd of the earth
- Large amount of data with varying formats
- Data applications may require additional processing, visualization and other tools

Model Data Strengths and Limitations

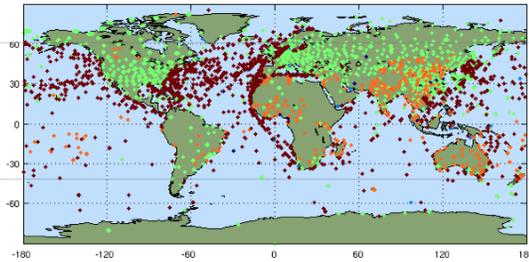
Blends the vast quantities of observational data

The Changing Observing System

07-Jan-1973 12UTC All data: 77098 observations

all lat; all lon; all lev; all kt; all kx; all qcq; all qch
/data/austir/b500_swp_73/all_obs_workdir/SAVE_ODS/b500_swp_73.ana.obs.19730107_12z.ods

Observation Locations

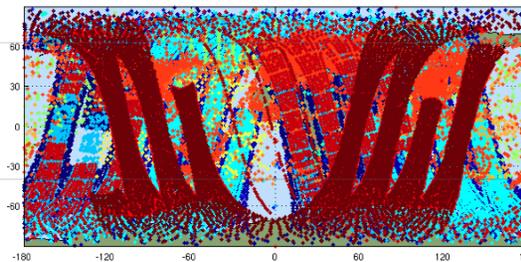


1973 – 77K Obs every 6hrs

02-Aug-1987 12UTC All data: 550602 observations

all lat; all lon; all lev; all kt; all kx; all qcq; all qch
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Observation Locations

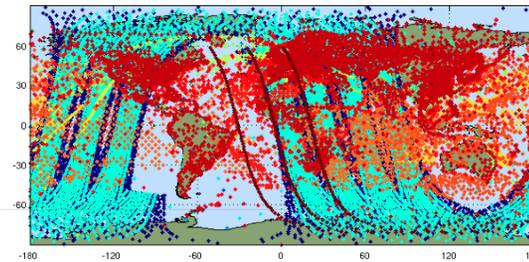


1987 – 550K Obs every 6hrs

07-Jan-1979 12UTC All data: 325765 observations

all lat; all lon; all lev; all kt; all kx; all qcq; all qch
/data/austir/b500_swp_73/all_obs_workdir/SAVE_ODS/b500_swp_73.ana.obs.19790107_12z.ods

Observation Locations

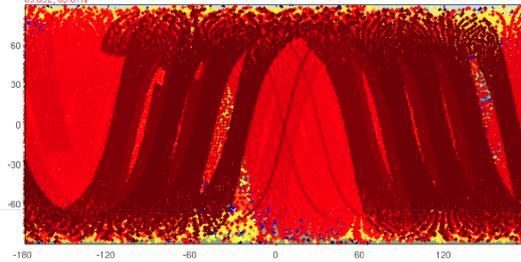


1979 – 325K Obs every 6hrs

07-Jan-2006 12UTC All data: 4217655 observations

all lat; all lon; all lev; all kt; all kx; all qcq; all qch
/data/austir/d5_b10p9stab12_jan06/all_obs_workdir/d5_b10p9stab12_jan06.ana.obs.20060107_12z.ods

Observation Locations



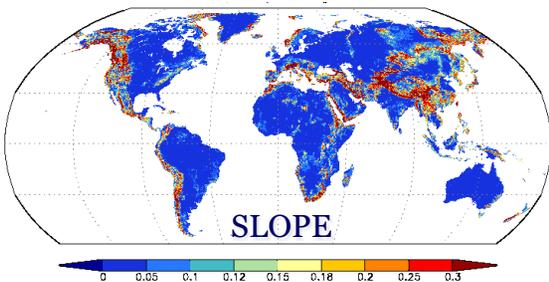
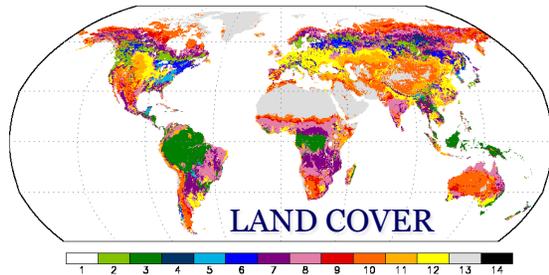
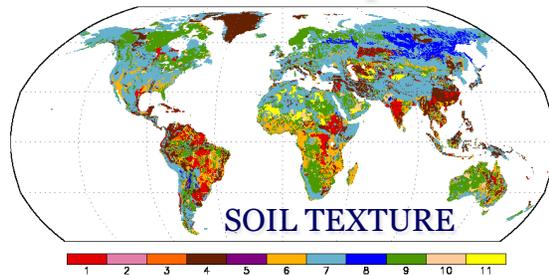
2006 – 4.2M Obs every 6hrs

Current satellite coverage assimilated in MERRA

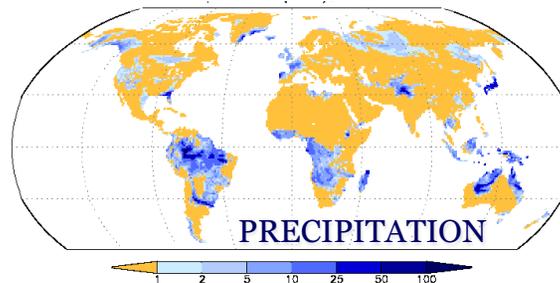
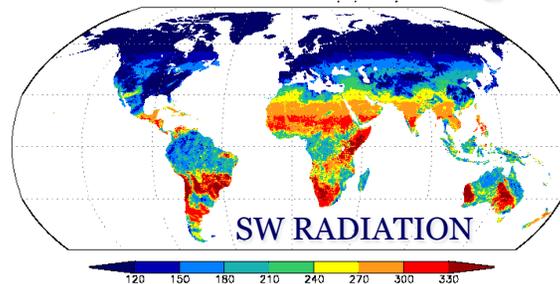
Provide Integrated Output (Example GLDAS)

GOAL: Integrate ground and satellite observations within sophisticated numerical models to produce physically consistent, high resolution fields of land surface states (e.g., snow) and fluxes (e.g., evaporation)

Parameter Inputs

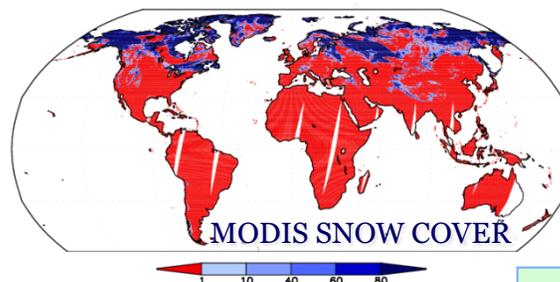


Satellite Based Forcing



AVAILABILITY: Output from 1979-present simulations of Noah ($1/4^\circ$; 1°), CLM (1°), and Mosaic (1°), and VIC (1°), at <http://disc.gsfc.nasa.gov/hydrology/index.shtml>

Assimilated Observations



USES: Weather and climate forecast initialization studies, water resources applications, hydrometeorological investigations

Integrated Output

Soil Moisture
Evapotranspiration
Runoff
Snow Water Equivalent

Courtesy Matt Rodell, NASA-GSFC

Model-derived Quantities: Trade-offs

- Help blend remote sensing and in situ observations – provide geophysical variables on uniform spatial latitude-longitude grids, and at regular intervals.
- Provide variables which are not directly observable, for example, 3-D humidity movement in the atmosphere, evapotranspiration, run off
- Help understand processes in the climate system and provide prediction capability
- Use many approximations and assumptions in representing physical processes – as good as our understanding
- There are multiple models, with varying spatial/temporal resolutions and accuracies.

How to Search for Data?

Global Change Master Directory

<http://gcmd.gsfc.nasa.gov/index.html>

The screenshot shows the NASA Global Change Master Directory website. At the top, there is a NASA logo and the text "Global Change Master Directory Discover Earth science data and services". Below this is a navigation bar with buttons for "Search", "Learn about GCMD", "Portals", and "Collaborate". The main content area features three large boxes: "Data Sets" with a globe and data chart, "Services / Tools" with a map and software icons, and "Ancillary Descriptions" with images of a satellite and an airplane. Each box has a brief description and a "Search" button. Below these boxes is a "Search by Free Text" section with a search input field, a "Go" button, and radio buttons for "Data Sets" (selected) and "Services / Tools". To the right, there is a "Highlights" section with a link to "GCMD/IDN Version 9.9.3 Software Release Announcement" and a "More:" link followed by a numbered list from 1 to 6.

Data Search Directory

Global Change Master Directory

<http://gcmd.gsfc.nasa.gov/index.html>

Global Change Master Directory
Discover Earth science data and services

Search Learn about GCMD Portals Collaborate

Data Sets
Discover and access data descriptions, relevant to global change and Earth science research.
[Search Data Sets](#)

Services / Tools
Discover and access software, models, and other services that can be used to analyze, process, and model Earth science data.
[Search Services/Tools](#)

Ancillary Descriptions
Learn about instruments, platforms, projects, and data centers collecting Earth science data worldwide.
[Search Ancillary Descriptions](#)

Search by Free Text
Free Text Search of the Directory
 Data Sets Services / Tools

Highlights
GCMDDIION Version 9.9.3 Software Release Announcement
More: 1 2 3 4 5 6

Data Search Directory

Data Sets **Services / Tools** **Ancillary Descriptions**

Search By >>

 AGRICULTURE (1884) agricultural aquatic sciences, agricultural chemicals, agricultural engineering, agricultural plant science, animal commodities show all...	 ATMOSPHERE (8092) aerosols, air quality, altitude, atmospheric chemistry, atmospheric electricity show all...	 BIOLOGICAL CLASSIFICATION (4134) animals/invertebrates, animals/vertebrates, bacteria/archaea, fungi, plants show all...	 BIOSPHERE (7045) aquatic ecosystems, ecological dynamics, terrestrial ecosystems, vegetation show all...
 CLIMATE INDICATORS (392) atmospheric/ocean indicators, biospheric indicators, cryospheric indicators, land surface/agriculture indicators, paleoclimate indicators show all...	 CRYOSPHERE (2858) frozen ground, glaciers/ice sheets, sea ice, snow/ice show all...	 HUMAN DIMENSIONS (3882) boundaries, economic resources, environmental governance/management, environmental impacts, habitat conversion/fragmentation show all...	 LAND SURFACE (5643) erosion/sedimentation, frozen ground, geomorphology, land temperature, land use/land cover show all...
 OCEANS (7515) aquatic sciences, bathymetry/seafloor topography, coastal processes, marine environment monitoring, marine geophysics show all...	 PALEOCLIMATE (1481) ice core records, land records, ocean/lake records, paleoclimate reconstructions show all...	 SOLID EARTH (3048) earth gases/liquids, geochemistry, geodetics, geomagnetism, geomorphic landforms/processes show all...	 SPECTRAL/ENGINEERING (2810) gamma ray, infrared wavelengths, lidar, microwave, platform characteristics show all...
 SUN-EARTH INTERACTIONS (364) ionosphere/magnetosphere dynamics, solar activity, solar energetic particle flux, solar energetic particle properties show all...	 TERRESTRIAL HYDROSPHERE (3406) glaciers/ice sheets, ground water, snow/ice, surface water, water quality/water chemistry show all...		

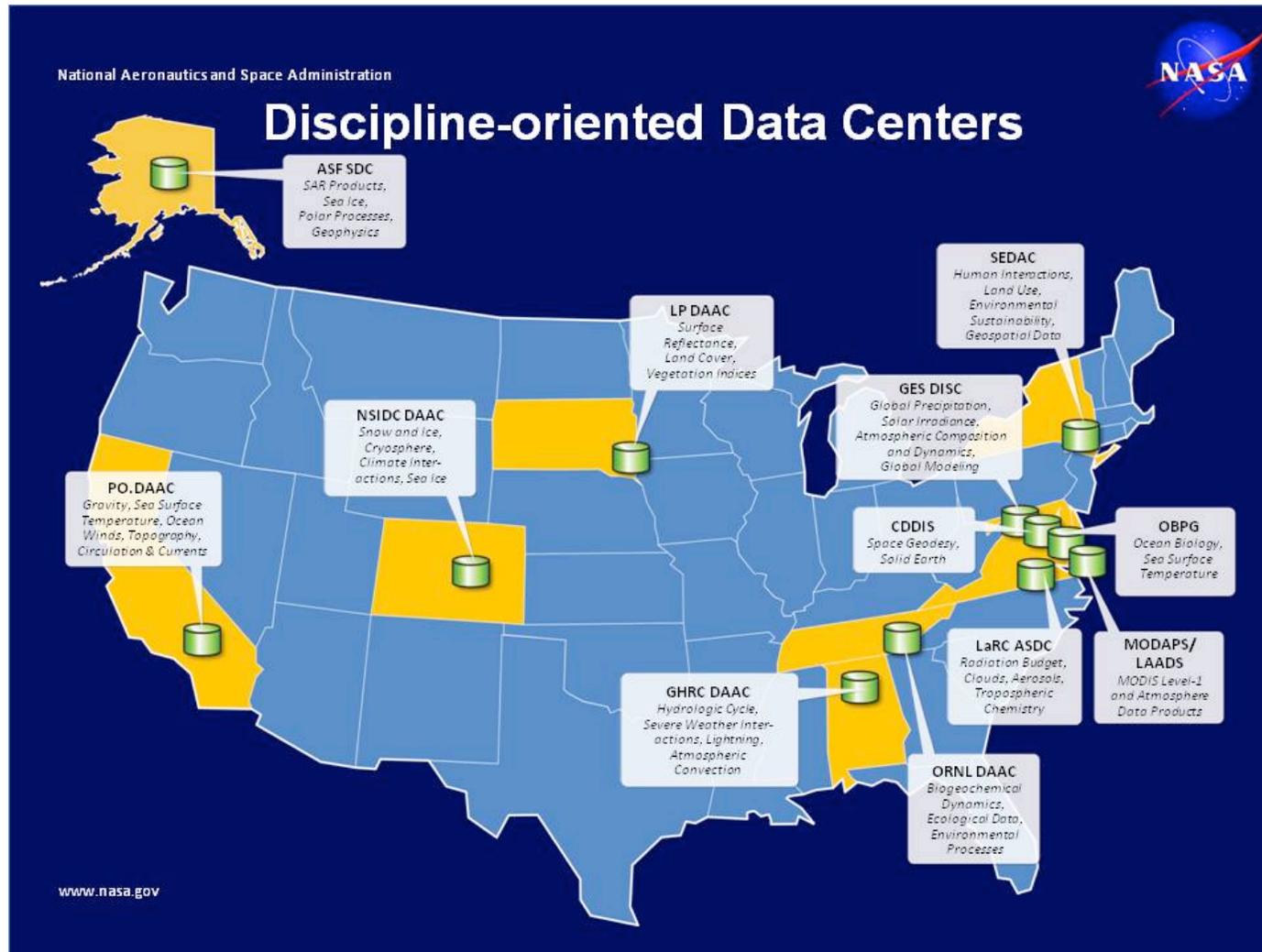
Live Demo of EOSDIS and GCMD Data Search

Coming Up Next Week --

Data Access, Analysis, Visualization

Coming Up Next Week --

NASA Data Centers and Data Access Tools



Thank You!

Amita Mehta

email: amita.v.mehta@nasa.gov