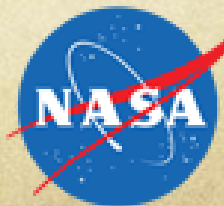


Promising data analytics technologies

Tiffany Mathews



Intro to NASA Earth Science Data Operations



MISSION OPERATIONS

DATA TRANSPORT TO
DATA CENTERS/SIPSs

SCIENCE OPERATIONS

DATA ACQUISITION



Direct Broadcast (DB)



FLIGHT OPERATIONS, DATA CAPTURE, INITIAL PROCESSING, BACKUP ARCHIVE



SCIENCE DATA PROCESSING, DATA MANAGEMENT, INTEROPERABLE DATA, ARCHIVE, AND DISTRIBUTION



Infrastructure
(Search, Order,
Distribution)

DISTRIBUTION AND DATA ACCESS

Research

Education

Value-Added
Providers

Interagency
Data Centers

Earth
System Models

International
Partners

Decision Support
Systems

NASA INTEGRATED
SERVICES NETWORK
(NISN) MISSION SERVICES

Research Data Lifecycle



Mission Operations

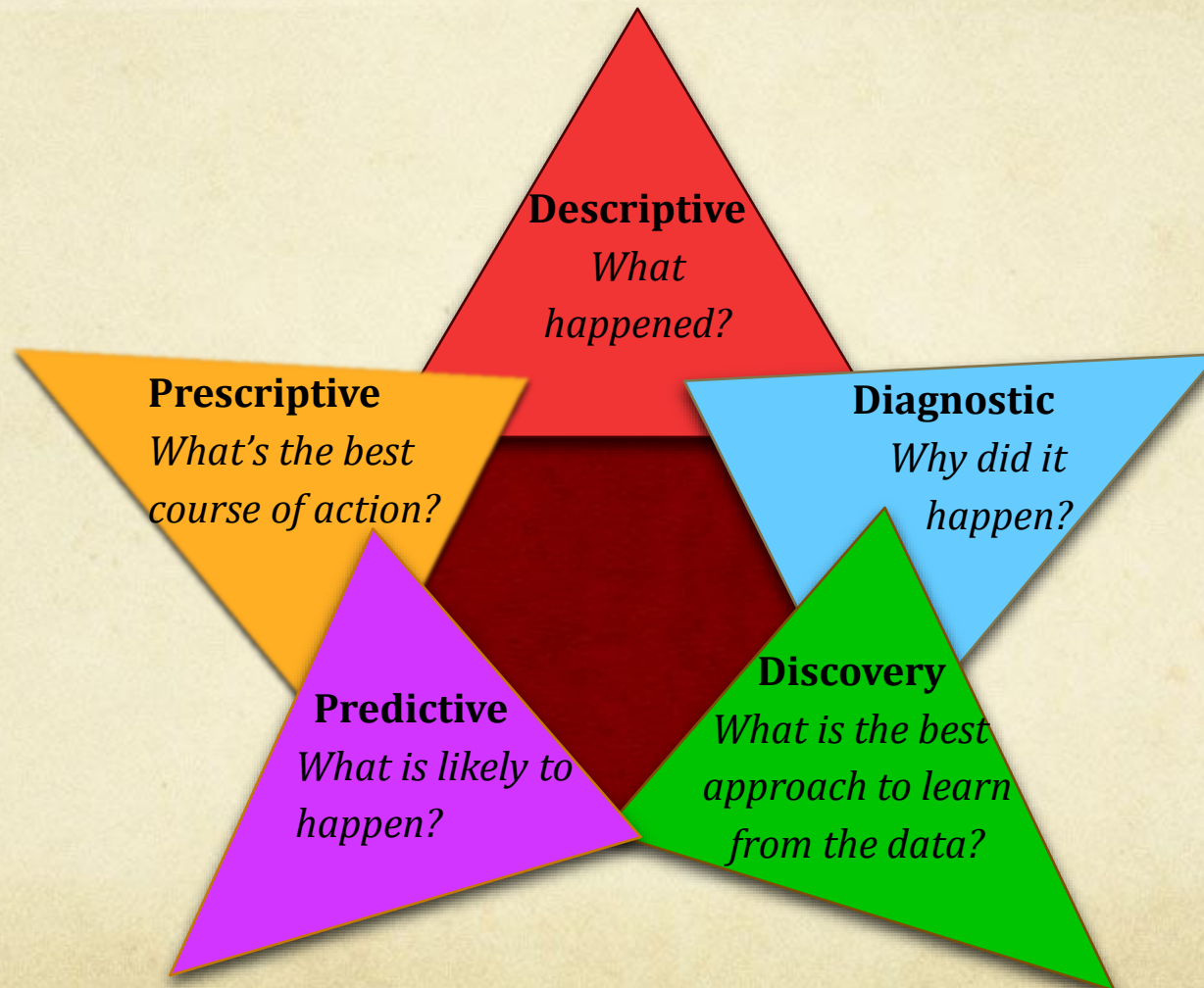
Data transport to data centers/SIPS

EOSDIS Data Centers

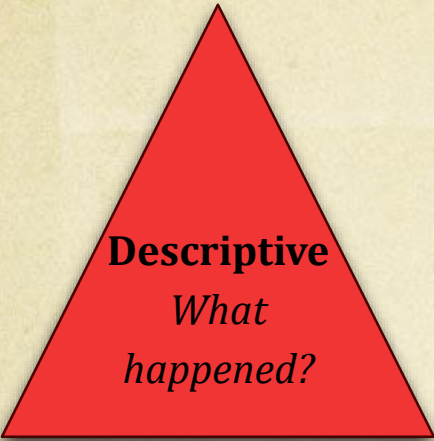
Infrastructure (Search, Order, Distribution)

Distribution and Data Access

Analytics Types



Descriptive Analytics Technologies



Descriptive
*What
happened?*

Data Conversion Tools:

Tools that help to get data in a readable format are critical to to be able to describe what happened.

Examples include:

HDF Tools

- HDUMP, a utility program to read in any gridded MISR data that is written in the HDF-EOS grid format
- HDFView for converting images from GIF, JPG, BMP, and PNG to the HDF format and back; HDF to NetCDF; and more.



Diagnostic Analytics Technologies

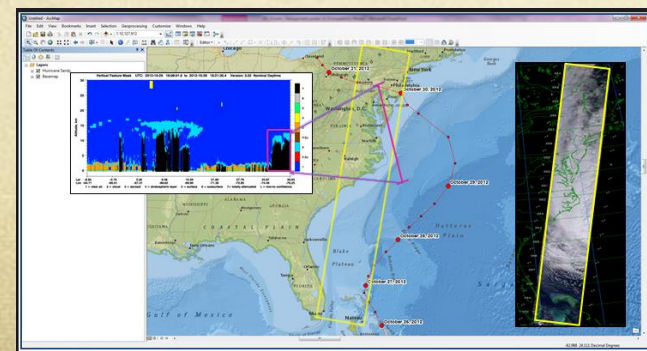
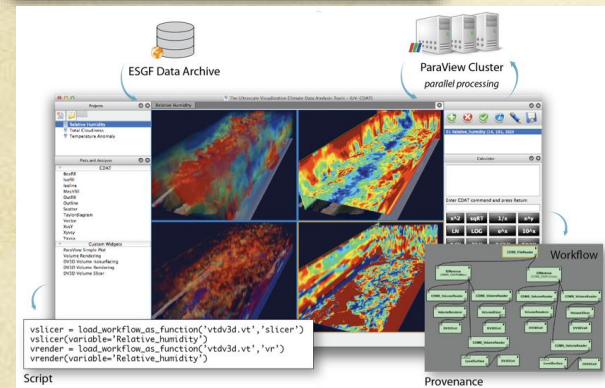
Diagnostic
*Why did it
happen?*

Visualization Tools

Tools that enable data users to consolidate data, whether from the same project or different projects measuring the same parameters, into one visualization that helps people to quickly diagnose what has happened and why.

Examples include :

1. UV-CDAT: An open source tool that performs parallel processing, data reduction and analysis to generate 3-D visualizations.
(<http://uvcdat.llnl.gov>)
2. ArcGIS: a tool developed by Esri that enables maps, models, and tools to be distributed within and outside of an organization.
(<http://www.arcgis.com>)



Discoverative Analytics Technologies



Discovery

*What is the best
approach to learn
from the data?*

Data Discovery, Semantic Web, and Subsetting Tools

Tools that offer a centralized location to search for data; provide more dynamic search options so researchers at any experience level can decide what is the best data to use for their research; and tools to enable users to refine their data orders to only include the data that they need for their research all enable users to decide the best approach to take (what data to use) to learn from the it.

Examples include:

Order tools

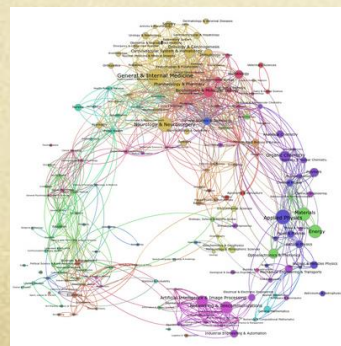
- NASA's ECHO | Reverb (central location for all new NASA Earth science data)
- OpenDAP

Semantic Web Tools

- Ontology-Driven Interactive Search Environment for Earth Science (ODISEES)
- Semantic Web for Earth and Environmental Terminology (SWEET)

Subsetting Tools

- ASDC Search and Subset Web Applications
- Simple Subset Wizard (SSW)



Predictive Analytics Technologies



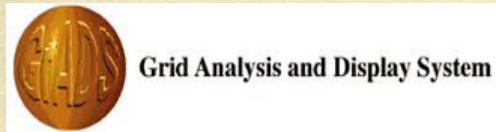
Predictive

*What is likely to
happen?*

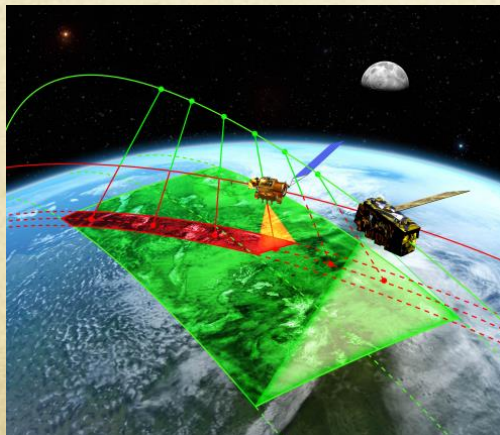
Data Modeling Tools

Tools that enable data users to model specific events, based on what has happened in the past under certain circumstances, to better predict future Earth science phenomena.

Examples include:



- GRid Analysis and Display System (GrADS): an interactive desktop tool that offers easy access, manipulation, and visualization of earth science data. It offers two data models for handling gridded and station data and supports many data file formats (NetCDF, HDF4, HDF5, etc.).
- Multi-Instrument Inter-Calibration (MIIC II): A software framework that provides better access to distributed data for inter-calibration by finding and acquiring matched samples for instruments on separate spacecraft. It offers support for both low Earth orbiting (LEO) Geosynchronous (GEO) satellite instruments.



Prescriptive Analytics Technologies



Prescriptive
*What's the best
course of action?*

Metrics Tools:

By collecting and organizing various metrics project management can gain a better understanding of the number of users, type and amount of data archived and distributed, and other related information needed to determine how to best apply resources to support the science community and determine the best course of action for future data ingest, archive, and distribution processes.

Examples include:

- ESDIS Metrics System (EMS)
- CrazyEgg/Heat Maps:

Stats: 5300 visits & 2744 clicks in 28 days 22 hours 53 mins



Data File Metrics

- APEX/HTMLDB (OPS)
- APEX/HTMLDB (UAT)
- Data File Manifest
- Documentation

Web Page Metrics

- NetInsight® 8.6 (OPS)
- NetInsight® 8.6 (UAT)
- Page Tag Manifest
- Documentation
- Page Tagging Implementation and Examples

Service

- EMS Account Request
- Earthdata Support Requests
- EMS Defect & Request Tracker
- Training & Presentations

Additional Analytics Opportunities



2014 AGU Session: Near Real Time Integration of Satellite and Radar Data for Probabilistic Nearcasting of Severe Weather it was said that when NRT Satellite Data could be added to Numerical Weather Predication and Radar data the probability of accurate readings increased from 40% to 93%

Juniper Pollen Project- researchers use NASA satellite data to see how juniper cones develop each year and adapt the dust model to predict when their pollen will be released to better inform those affected by pollen. <http://scistarter.com/blog/2013/09/nasa-meets-public-health-juniper-pollen-project/#sthash.LKOwbkpo.dpbs>

The CDC leverages NASA satellite data on the Earth's environment by translating and using it to help public health officials anticipate the outbreak and spread of infectious diseases. For example flood areas are good breeding grounds for mosquitoes and by closely monitoring the vegetation in the region affected by increased rainfall, scientists can identify the actual areas affected by outbreaks of Rift Valley Fever, a mosquito-borne disease that can be fatal to humans and animals. http://www.nursezone.com/nursing-news-events/devices-and-technology/NASA-and-CDC-team-up-to-predict-infectious-diseases_24004.aspx

