ABSTRACT

NASA Earth Sciences Division (ESD) has made great investments in the development and maintenance of data management systems and information technologies, to maximize the use of NASA generated Earth science data.

- With information management system infrastructure in place, mature and operational, very small delta costs are required to fully support data archival, processing, and data support services required by the recommended Decadal Study missions.

- This presentation describes the services and capabilities of the Goddard Space Flight Center (GSFC) Earth Sciences Data and Information Services Center (GES DISC) and the reusability for these future missions.

- The GES DISC has developed a series of modular, reusable data management components currently in use. They include data archive and distribution (Simple, Scalable, Script-based, Science [S4] Product Archive aka S4PA), data processing (S4 Processor for Measurements aka S4PM), data search (Mirador), data browse, visualization, and analysis (Giovanni), and data mining services.

- Information management system components are based on atmospheric science data sets being served by GES DISC Tools and Services include:

Tasks and Services for Data Science and Information Management at the GES DISC

Interface with User Community

Data Mining

- Data mining services available in S4PM
  - Users submit and extract data mining requests
  - Simple web interface
  - Data mining requests may be submitted as a service, with results on the interface
  - Data mining results are made available in user's FTP

Data Processing with S4PM

- Simple, scalable, script-based science processing for aerosol studies
- Open-source software operational at the GES DISC since 2002
- Modular and extensible processing architecture
- Supports: Aura, MLS, CALIPSO, MODIS, VIIRS, SIRC
- Data mining services available in S4PM
- Aura MLS
- Aura OMI
- BA C
- ATMOS LEADERSHIP

Data Archive and Distribution with S4PA

- Simple, scalable, script-based, science product archive
- Radically simplified disk-based architecture for archive and distribution
- Public and restricted access
- Subscription based
- Automated data integrity checking
- Quick on-line data retrieval
- Data subsetted on location, date, day of week, etc.
- Read software for Aura, MODIS, VIIRS
- ASCII and NetCDF
- HDF4 and HDF5
- Standard FTP
- Data lineage support

Giovanni: Data Visualization and Analysis

- Data from multiple sensors
- Subset and customize parameter display
- Multiple output formats and protocols (XML and JSON)
- WMS
- satellite products
- SIRFI
- NASA Earthview
- FTP
- SOAP
- Data lineage support

Data & Information Web Portals

- Based on Giovanni, can be used by the public
- Data subscription, data visualization, analysis, and visualization
- Data mining available via FTP
- Free or at low cost to users
- Distributed in an easily accessible manner

Interface with Science Investigators / Partners

Tools and Services for Recommended Decadal Study Missions to Facilitate Aerosol and Cloud Studies

ATOMIC

- Atmospheric Infrared Sounder (AIRS) - clouds, humidity, water vapor, CO, ozone
- High Resolution Dynamics Limb Sounder (HIRDLS) - water vapor, chemistry, aerosol
- Limb Infrared Monitor of the Stratosphere (LIMS) - chemistry mixing ratios
- Modern Era Retrospective-analysis for Research and Applications (MERRA) - atmospheric model
- Microwave Limb Sounder (MLS) - chemistry, water vapor, cirrus ice, relative humidity
- Ozone Monitoring Instrument (OMI) - chemistry, aerosol, clouds
- Solar Radiation and Climate Experiment (SORCE) - solar irradiance
- Total Ozone Mapping Spectrometer (TOMS) - ozone
- TIROS Operational Vertical Sounder (TOVS) - humidity profiles, total ozone, clouds, radiation
- Tropical Rainfall Measuring Mission (TRMM) - precipitation
- Upper Atmospheric Research Satellite (UARS) - trace gases, temperature, aerosols
- Northern Eurasia Earth Science Partnership Initiative (NEESPI) - aerosol, MODIS
- A-Train subsetsed data (AIRS, OMI, MLS, Cloudsat, CALIPSO, MODIS, POLDER) - chemistry, clouds
- Air Quality Giovanni - PM2.5, MODIS

DECADAL STUDY RECOMMENDATIONS

The National Research Council’s Committee on Earth Science and Applications from Space vision includes “a decadal program of Earth science research and applications in support of society—a vision that includes advances in fundamental understanding of the Earth system and increased application of this understanding to serve the nation and the people of the world.” - The committee made several key recommendations regarding research strategies, missions, and measurement

- In addition, the committee addressed information management with the following recommendations:
  - As new Earth observation missions are developed, early attention should be given to developing the requisite data processing and distribution system, and data archive. Distribution of data should be free or at low cost to users, and provided in an easily accessible manner.

Other Data Tools and Services

- OPANDA
- On-the-fly subsetting
- OGC Web Map Service
- GES DISC Tools and Services Center (GES DISC) and the reusability for these future missions.
- Large development and maintenance cost savings can be realized through their reuse in future missions.

Mirador Data Search

- Based on Google
- Fast, easy to use
- Questions for phrases and events
- Can support geocoding

Interface with Science Teams

REUSING SERVICES FOR RECOMMENDED DECADAL STUDY MISSIONS

Atmospheric data sets include:

- Active Sensing of CO2 Emissions Over Nights, Days, and Seasons (ASCENDS) - carbon dioxide
- Aerosol-Cloud-Ecosystems (ACE) - aerosols, clouds
- Climate Absolute, Radiance and Refractivity Observatory (CLARREO) - solar irradiance, water vapor
- Geostationary Coastal and Air Pollution Events (GEO-CAPE) - chemistry, aerosol
- Global Atmospheric Composition Mission (GACM) - aerosol, Precipitation and All-Weather Temperature and Humidity (PATH) - precipitation, water vapor, clouds
- Three-Dimensional Tropospheric Winds From Space-Based Lidar (3D-WINDS) - wind, atmospheric composition transport