



The GES DAAC Role in Applications Research

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NRC Decadal Survey Suggests Renewed Emphasis on Applications Research

- 🌍 **Full title:**
Earth Science and **Applications** from Space: National Imperatives for the Next Decade and Beyond, Committee on Earth Science and **Applications** from Space: A Community Assessment and Strategy for the Future, National Research Council ISBN: 978-0-309-10387-9, 456 pages (2007)
- 🌍 Dozens of references to space based applications research contributions to societal benefits
- 🌍 “the foundation of the committee's vision for a decadal program of Earth science research and applications in support of society”



NASA Earth Science National Applications



Agricultural



Natural Disasters



Public Health



Weather

Air Quality



Ecological Forecasting



Water Resources





Stronger Impetus has Developed...

... to find new ways to apply remote sensing Earth science data to applications research on for the sake of enhancing societal benefits

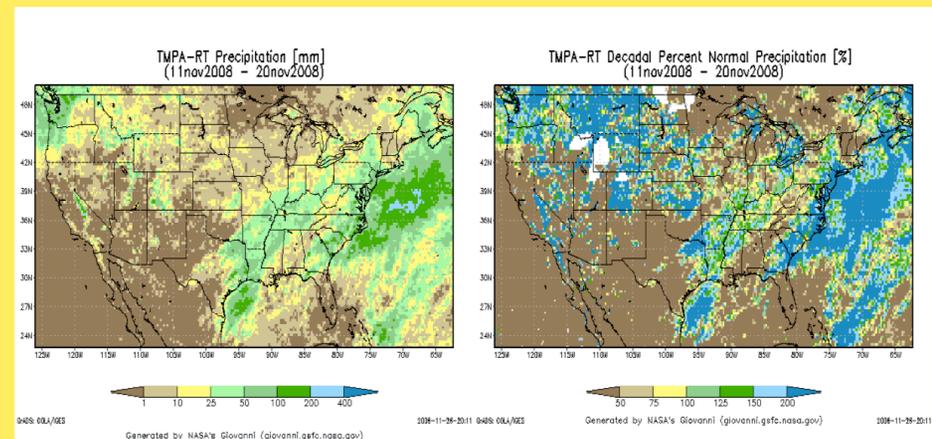
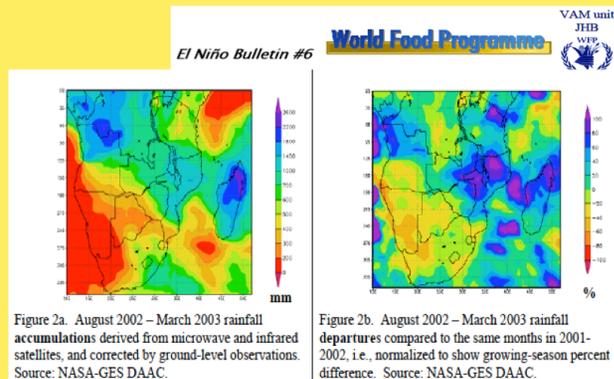


GES DAAC Applications Projects

Using NASA TRMM Precipitation Data for Monitoring Crop Conditions

<http://daac.gsfc.nasa.gov/agriculture/> (Funded by NASA's REASoN CAN-02-OES-01)

The GES DISC **Agricultural Information System (AIS)** provides NASA environmental data and information to support global crop monitoring at the U. S. Department of Agriculture (USDA) Foreign Agricultural Service (FAS) and the U.N. World Food Program (WFP). The primary goal of FAS is to improve foreign market access for U.S. agricultural products. The WFP uses food monitoring to meet emergency needs and to support economic and social development.



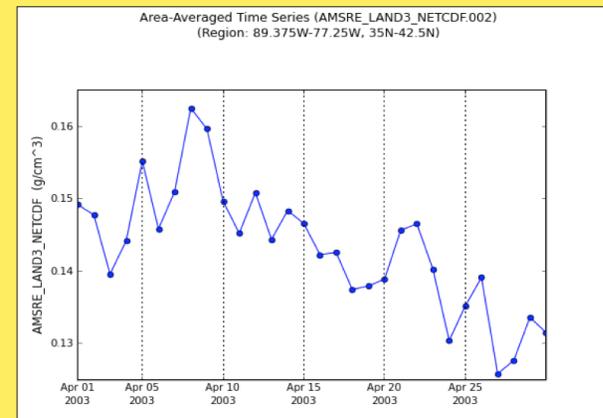
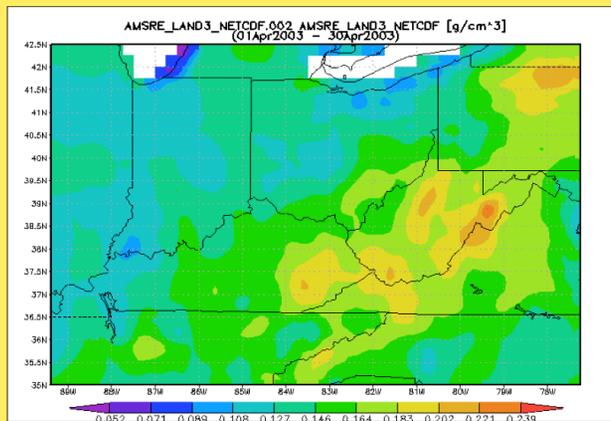


GES DAAC Applications Projects

Using NASA Soil Moisture Data in NASA/NOAA Land Surface Models to Enhance the National Weather Service River Forecast System (NWSRFS)

(Funded by NASA's ROSES 2005 -DECISIONS NNH05ZDA001N, Yao Liang, PI, currently with the Indiana University Purdue University Indianapolis)

This project focuses on improving evapotranspiration (ET) input to the NWSRFS, a sub-Decision Support System of the NWS's Advanced Weather Interactive Processing System (AWIPS). By integrating NASA's Aqua/AMSR-E and TRMM/TMI soil moisture products into land surface models that provide improved ET data seamlessly to the NWSRFS, the capability for flood and drought forecasting and disaster management is expected to be greatly enhanced. The project focuses on the Ohio River Forecast Center (RFC), for which floods and droughts are two major natural hazards that have significant impacts on the region's agriculture, industries, commercial navigation, and residential communities.



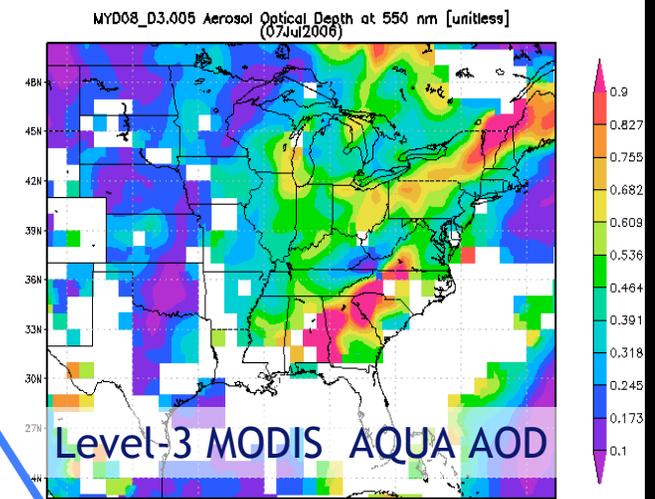
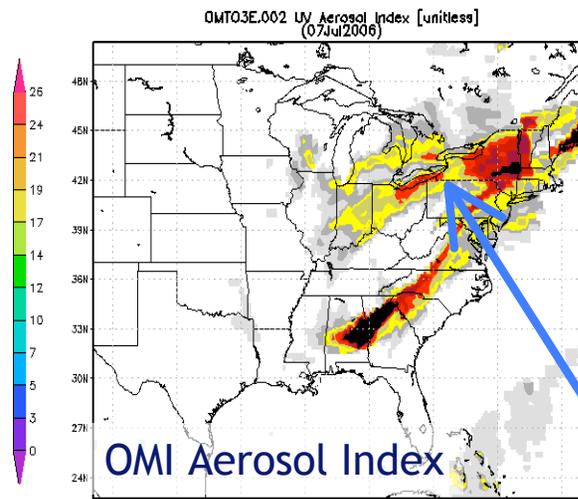
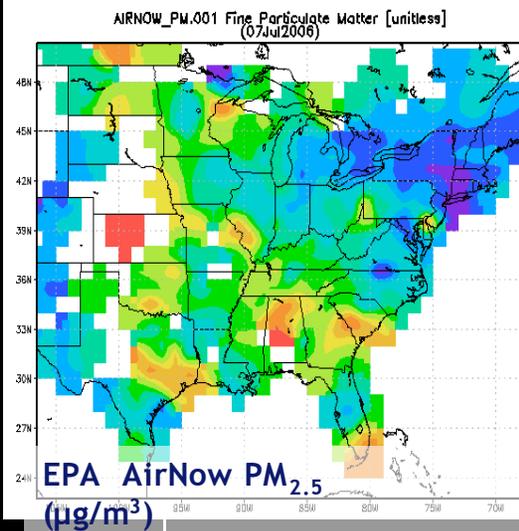


Air Quality Applications

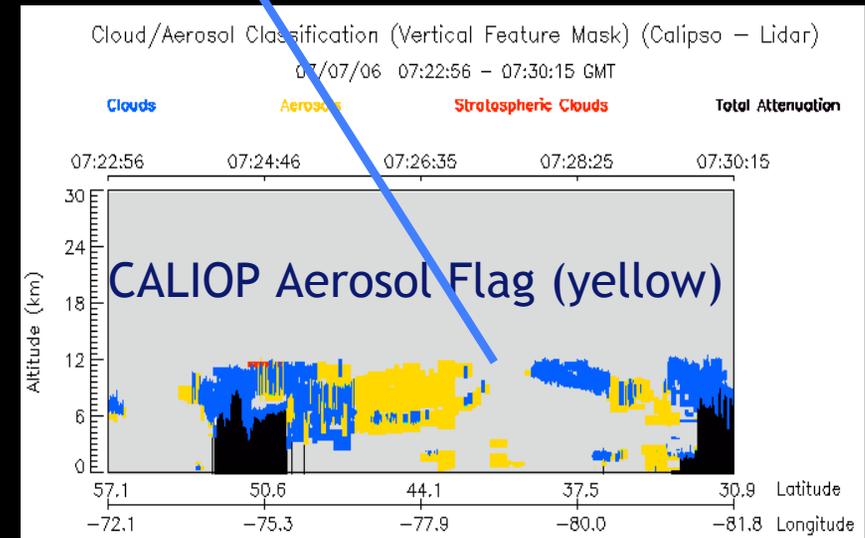
- 🌍 Temporal and geographical selection of data products - Lat/lon maps with overlay option, time series, and Hovmöller plots for *customized visualization of air quality events*
- 🌍 Combined surface monitor and satellite data - AOD/ PM_{2.5} scatter plots, correlation maps, time series and difference plots for *analysis and source attribution of pollution events*
- 🌍 Temporal animation plots of air quality data products for examining *long range transport of pollutants*



Customized Visualization of Air Quality



- MODIS and OMI imagery show smoke aerosols over the northeast, southeast and Great Lakes.
- CALIOP Aerosol Flag (yellow) confirms that aerosols are above the boundary layer
- EPA AirNow PM_{2.5} is not colocated with smoke regions in satellite imagery, *i.e.*, aerosols are primarily above the boundary layer





Analysis and Source Attribution of Pollution Events

30 JUL 2007 8:00pm
31 JUL 2007 5:30am



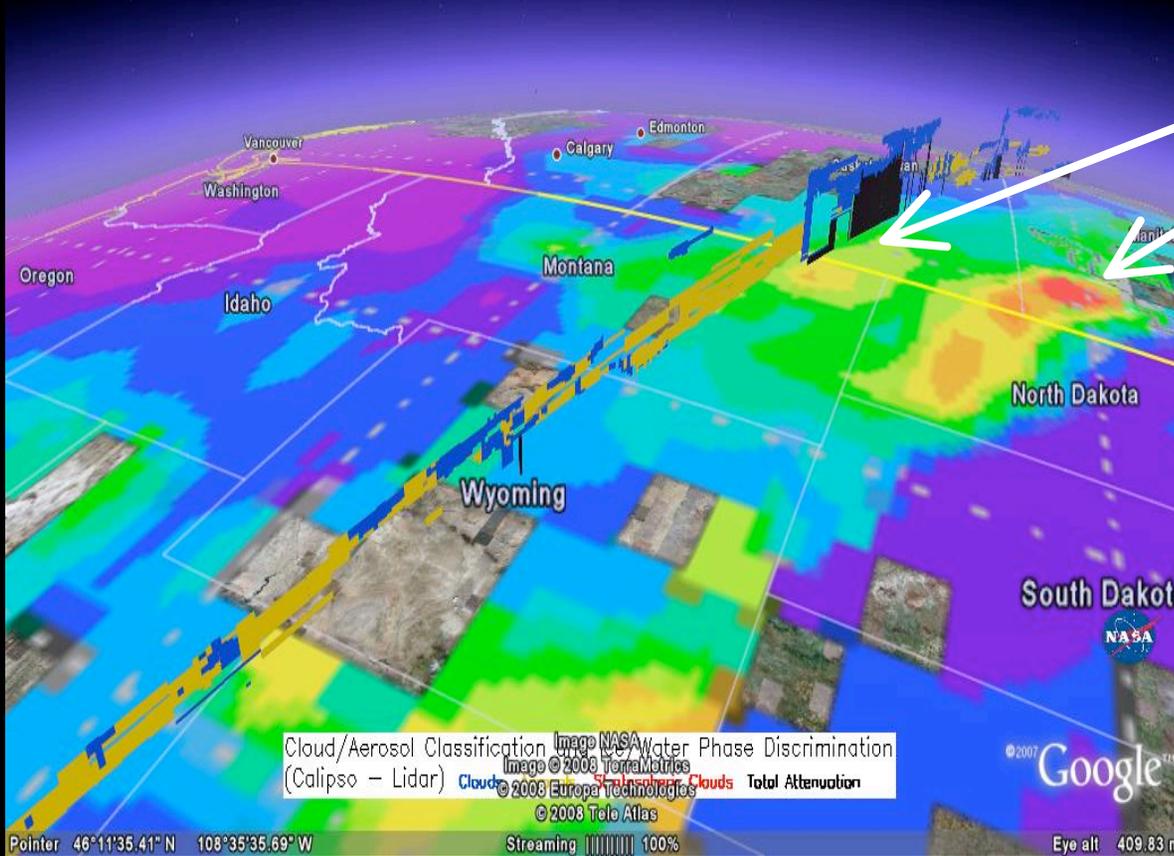
Calipso Curtain Plots
July 31, 2007
Transported Canadian
Smoke

Google Earth
Visualization

MODIS Aqua AOD in
background

Yellow: Calipso aerosol
flag

Blue: cloud flag

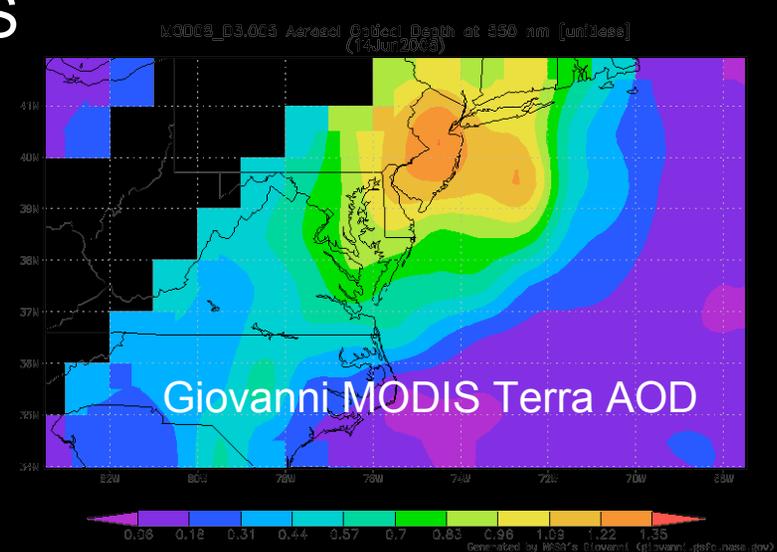
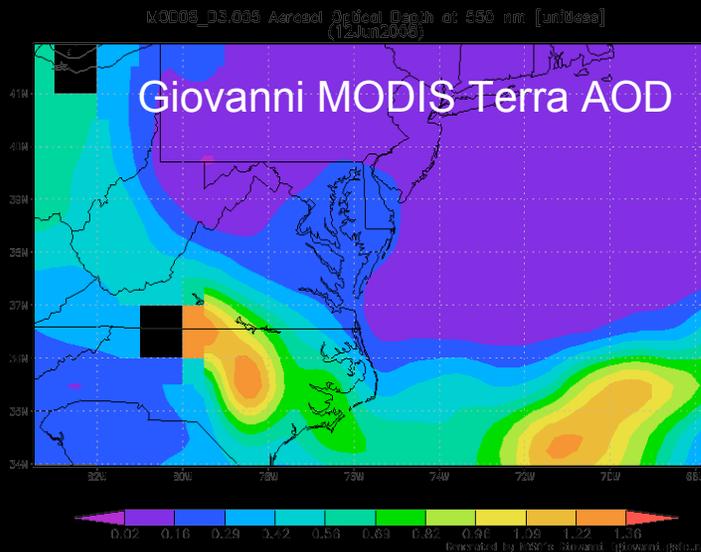




Long Range Transport of Pollutants



Satellite Views of Smoke Transported into the Northeast US





NASA Applied Sciences Trainings

- 🌍 NASA satellite data training modules and workshops for applied sciences end-users
- 🌍 GES DISC data sets and Giovanni visualization and analysis tools have a broad user base
- 🌍 User feedback enables the GES DISC to better meet these varied end-user needs
- 🌍 By the end of this week, four training workshops completed since January 2009



Utilizing NASA Science Data for Applications - Challenges

- 🌍 Translating science data for applications systems
- 🌍 Determining the right balance: Highly validated data vs. acquisition timeliness of data.
- 🌍 Maintaining resources needed to sustain the operational applications system: New data sets, new tools, new technologies
- 🌍 Meeting required spatial and temporal resolution to facilitate decision making
- 🌍 Changing the applications tools paradigm by demonstrating the benefits to applications organizations, of employing new tools and technologies
- 🌍 Maintaining continuous near real time science data inputs to applications . (*i.e.*, maintaining the timeliness of data for making decisions)
- 🌍 Overcoming status quo in the applications environment.
- 🌍 Integrating new data and technologies seamlessly into an operational applications environment
- 🌍 Continuity of NASA data



Data for Science vs. Applications

	For Science	For Decision Making
Timeliness of availability	Not urgent for science research	When needed
System Sustainability	Part of Science Mission	Often negotiated
Data Documentation	Algorithms; production; product descriptions; product validation and limitations	Interpretation of products for decision space; Relationship of new products to existing products
Data Requirements	Clear science goals at project conception	Science data to support decision making
Desired Data Representation	Data for precise analysis; Images for browse	Images for data display, plots, and reporting; Sometimes data for statistical analysis
Spatial and Temporal Data Resolution	Dependent on science research	The higher the resolution the better
Data Validation	Data must be of the highest quality	Data must be of the highest quality, but quality may be traded for timeliness

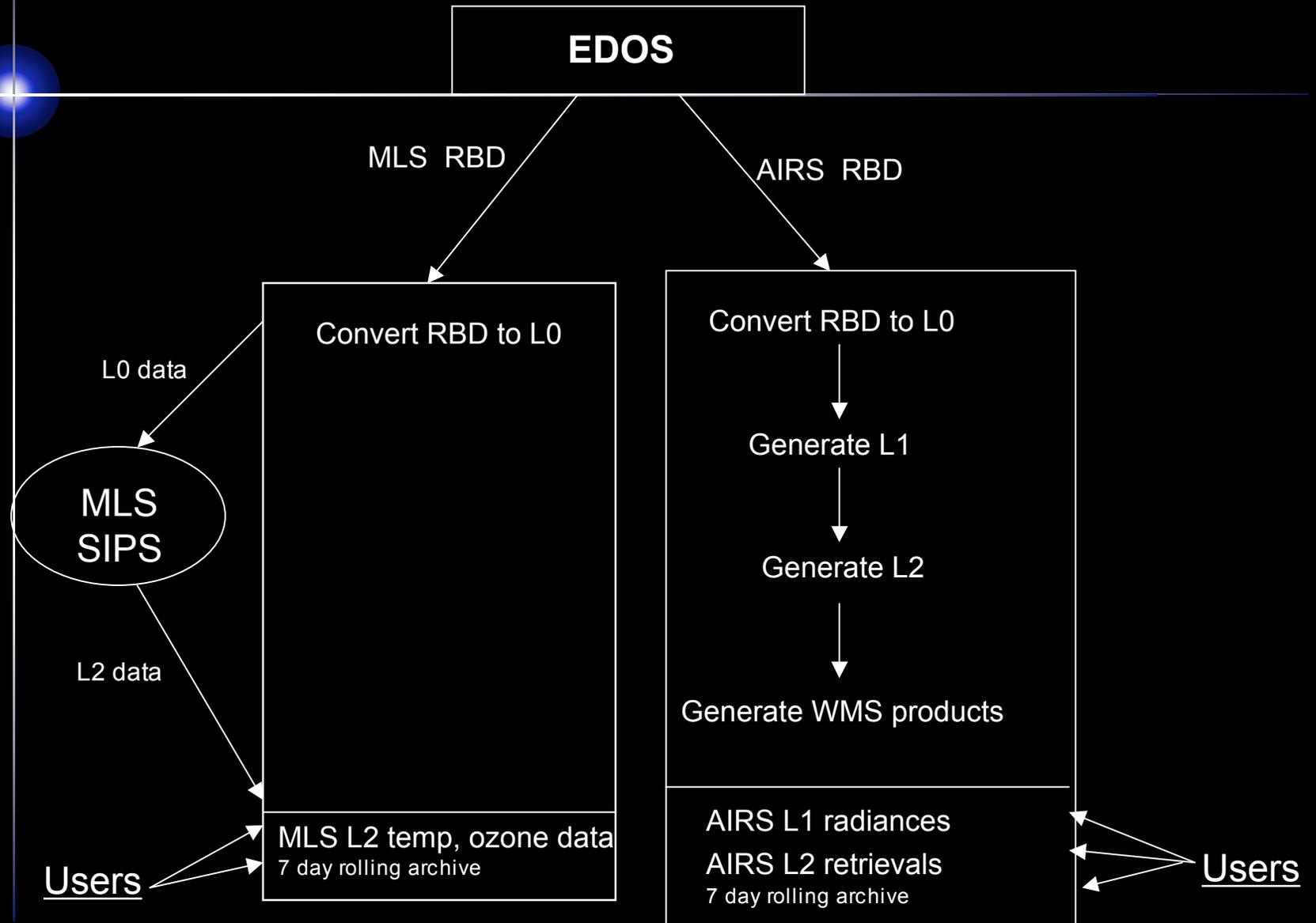


Utilizing NASA Science Data for Applications - Challenge Mitigations

- 🌍 Keep method of data transfer flexible, to avail the project of the latest technology advances.
- 🌍 Acquire deep understanding of the applications environment and needs (i.e., follow the consumption chain from usage scenarios back to relevant data).
- 🌍 Strive for as seamless as possible an integration of project data and services into existing applications environments.
- 🌍 As much as possible, get stakeholders to really feel they have a stake in the project. The *raison d'être* for the project should come from the applications as well as the providers of project data and services.
- 🌍 Plan for possible changes in the applications collaboration; They are operational and their needs could change.
- 🌍 Involve the expertise of science data providers (e.g, algorithm developer), preferably as members of a collaboration.
- 🌍 Plan for training in use of science data and services.
- 🌍 Encourage and employ the use of Near Real Time (NRT) data
- 🌍 Transition applications environment into a sustainable framework



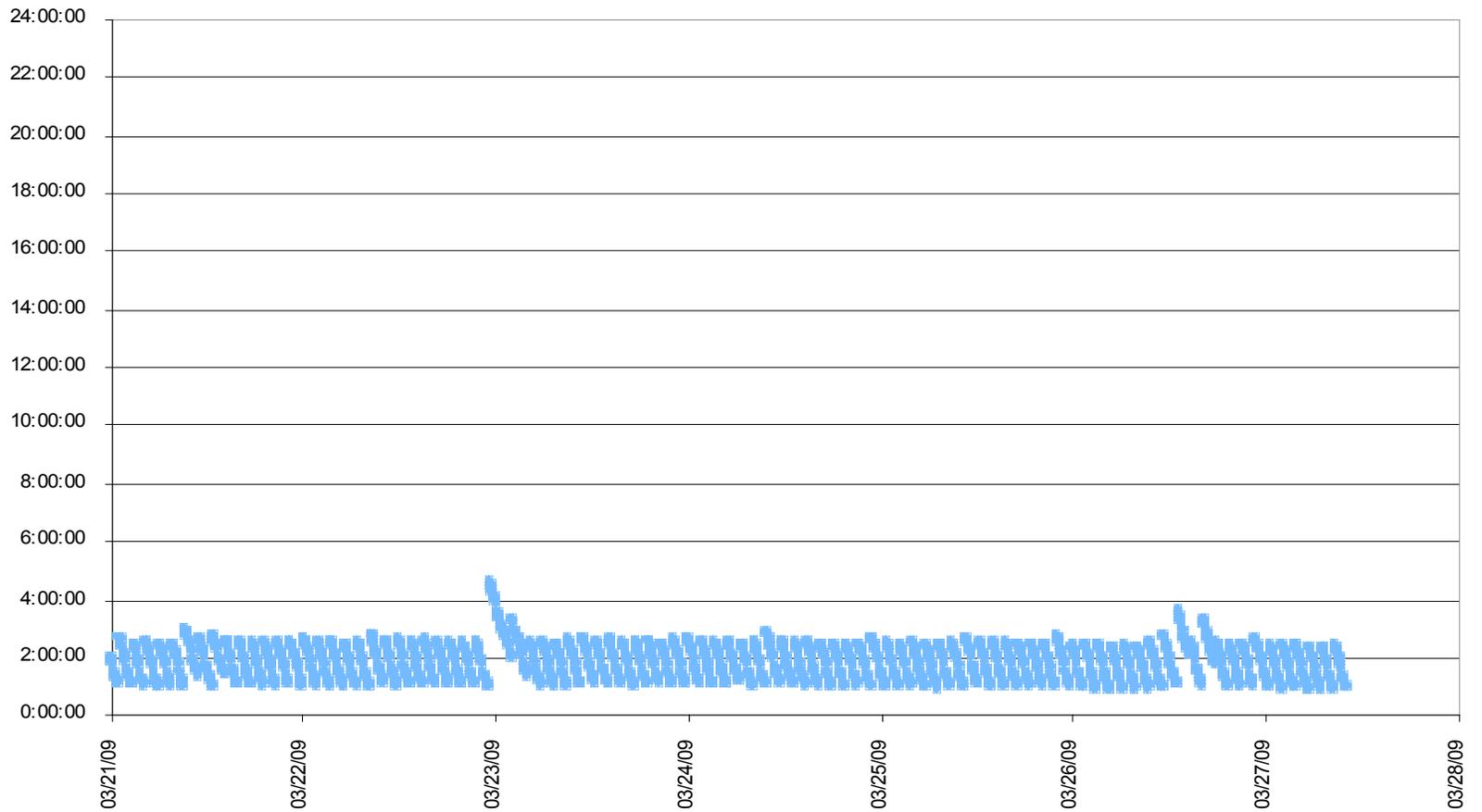
GES DAAC Near Real Time Data





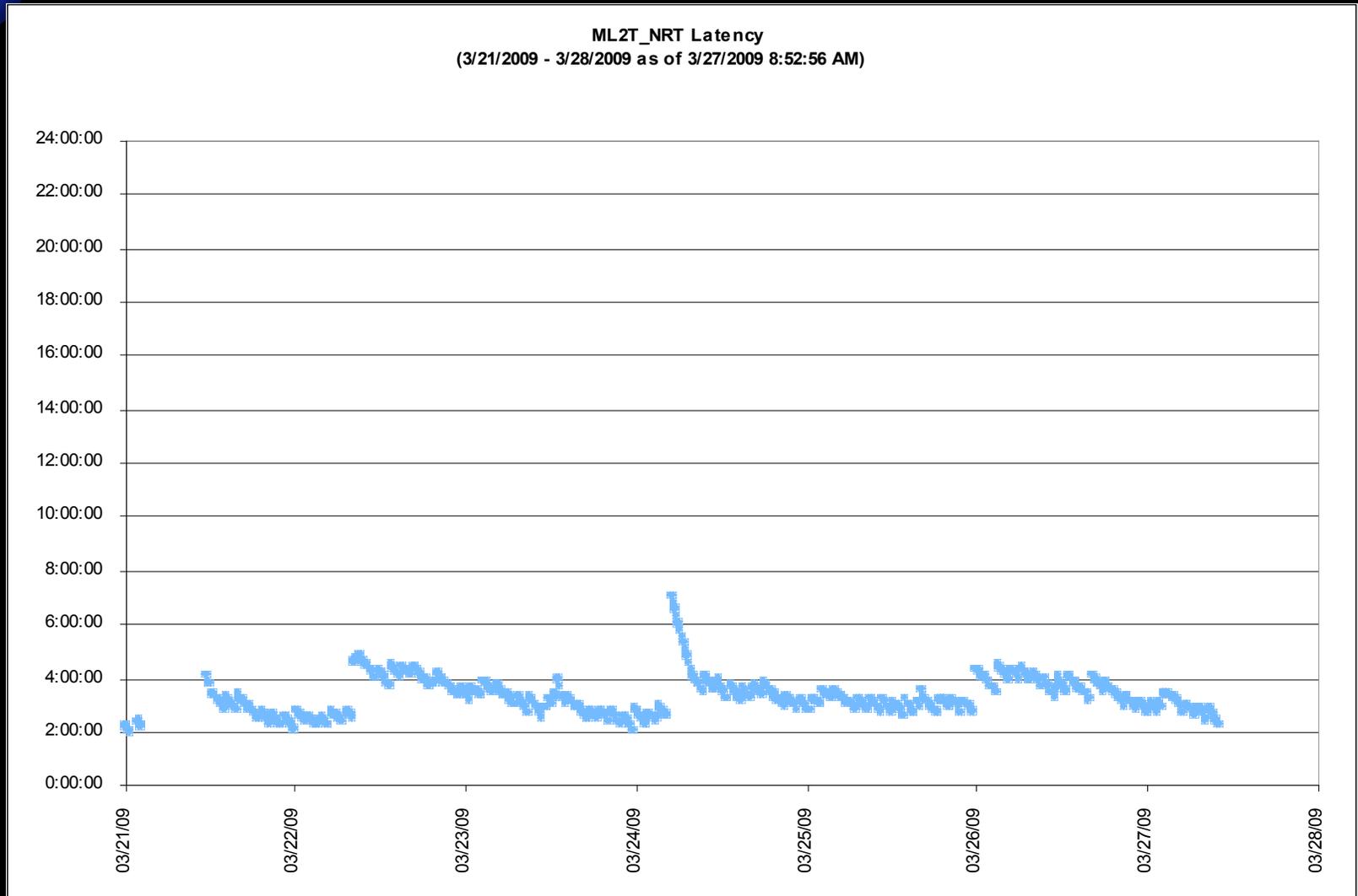
AIRS Near Real Time Data

AIR2CCF_NRT Latency
(3/21/2009 - 3/28/2009 as of 3/27/2009 8:51:33 AM)





MLS Near Real Time Data





NRT User Communities

AIRS

- 🌍 Subscriptions
None
- 🌍 FTP Pull
JPL, NOAA/NESDIS,
UCAR, Brazil, UMBC
- 🌍 Inquiries
GMAO, GSFC Code 613

MLS

- 🌍 Subscriptions
NOAA, ECMWF, MLS
SIPS, HIRDLS SIPS
- 🌍 FTP Pull
AVDC, UK, Canada
- 🌍 Inquiries
NRL

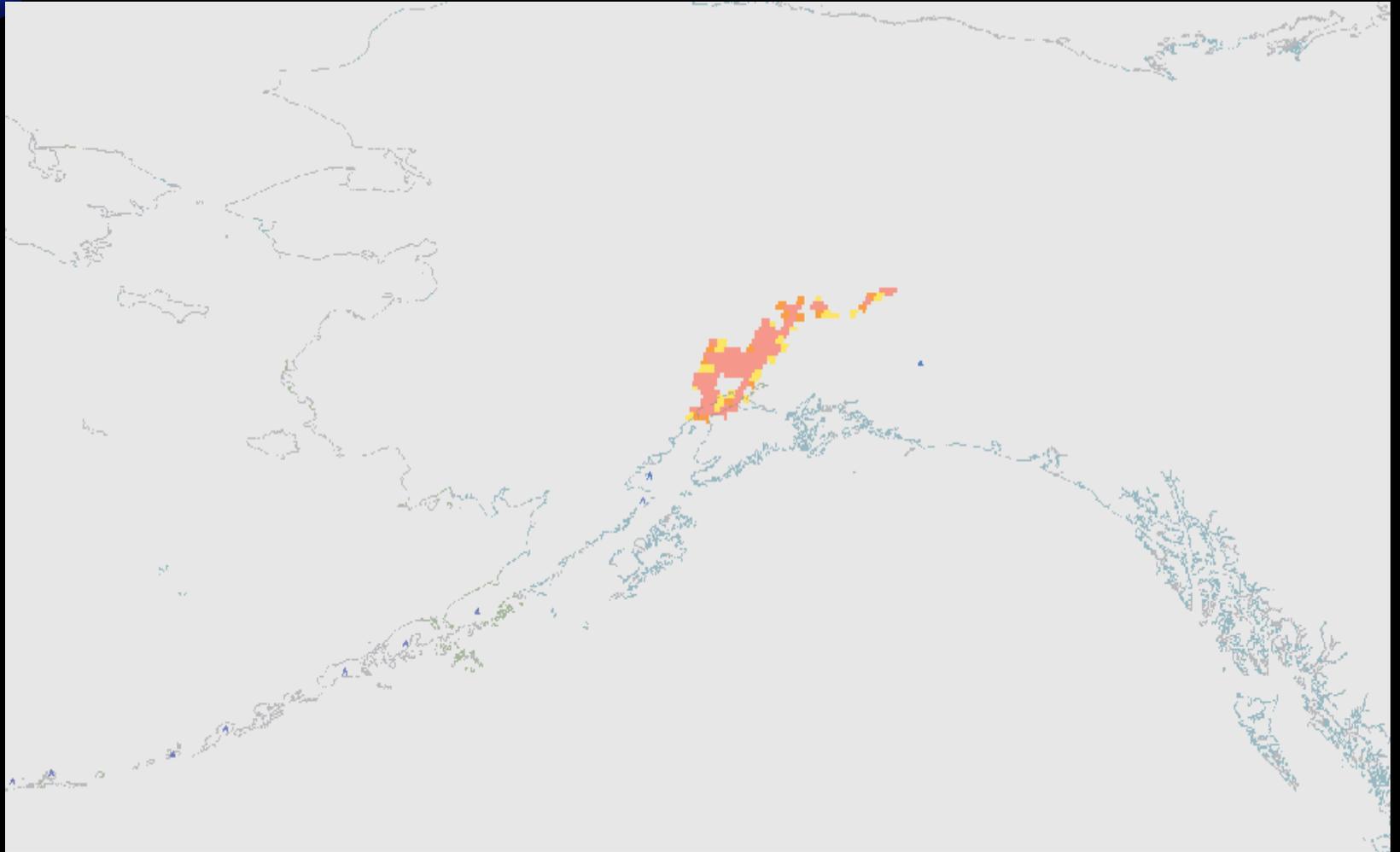


GES DISC NRT Data Support

- 🌐 Initiated at the request of science teams (AIRS, MLS)
- 🌐 Leverage off of production system capabilities
Negligible cost to add NRT functions
- 🌐 Testbed for new products and services
 - WMS
 - Format Conversion (BUFR, netCDF)
- 🌐 Applications
 - Model initialization (NWP)
 - Field Campaign (ARCTAS)
 - Volcanic activity (SO₂)
 - Air Quality (CO)



Mt. Redoubt, Alaska

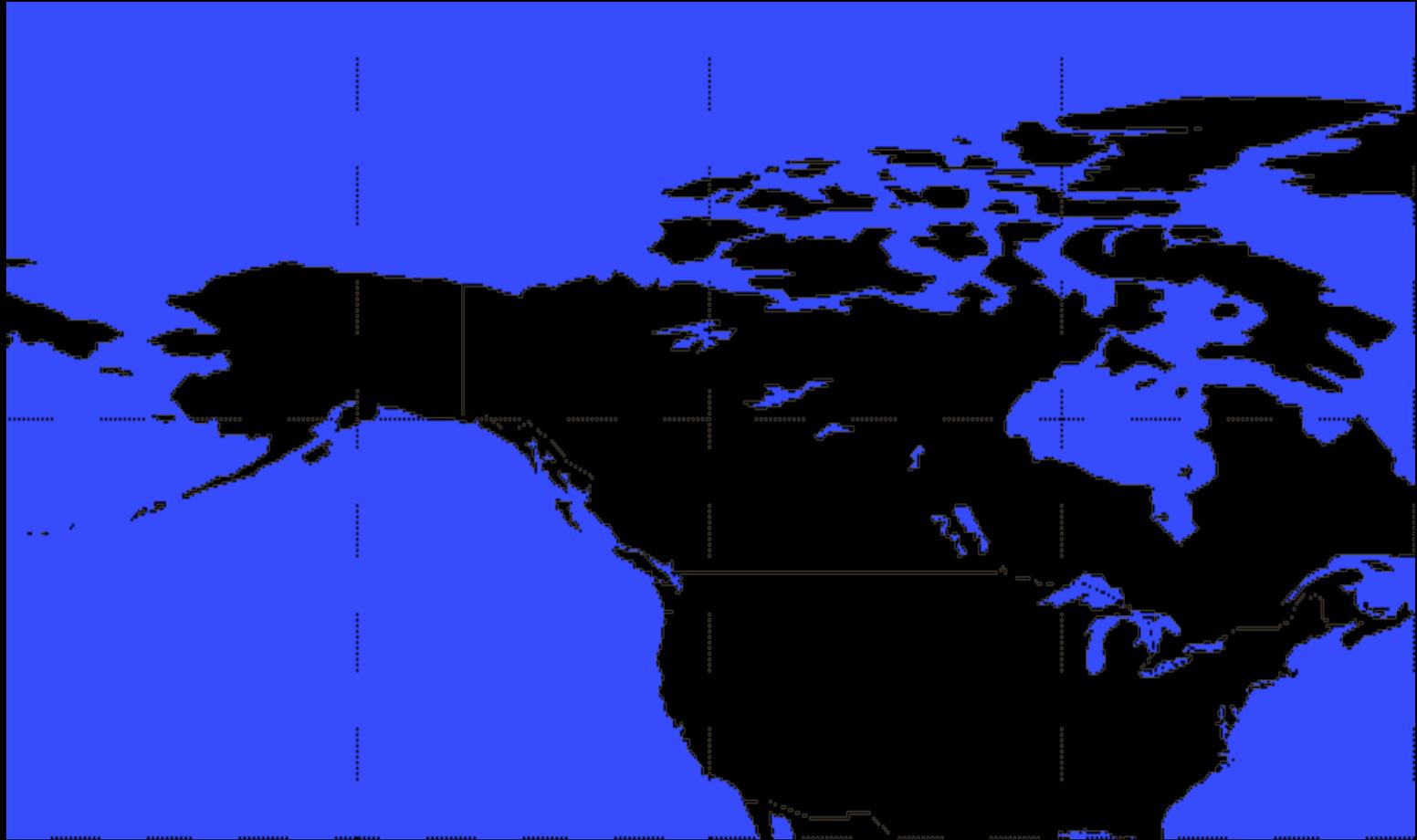


March 22-25 2009

BT_diff_SO2 [Tb(1361.44 cm-1) - Tb(1433.06 cm-1)]



Mt. Redoubt, Alaska



March 22-25 2009

BT_diff_SO2 [Tb(1361.44 cm-1) - Tb(1433.06 cm-1)]



Discussion

- ① Given the recent greater emphasis on Earth science applications, how can the GES DAAC contribute to applications research in a meaningful way, and which areas of applications should we contribute to?
- ① What connections do you see between what we have shown that might be worth pursuing or afford potential opportunity?