Data Access Services that Make Remote Sensing Data Easier to Use

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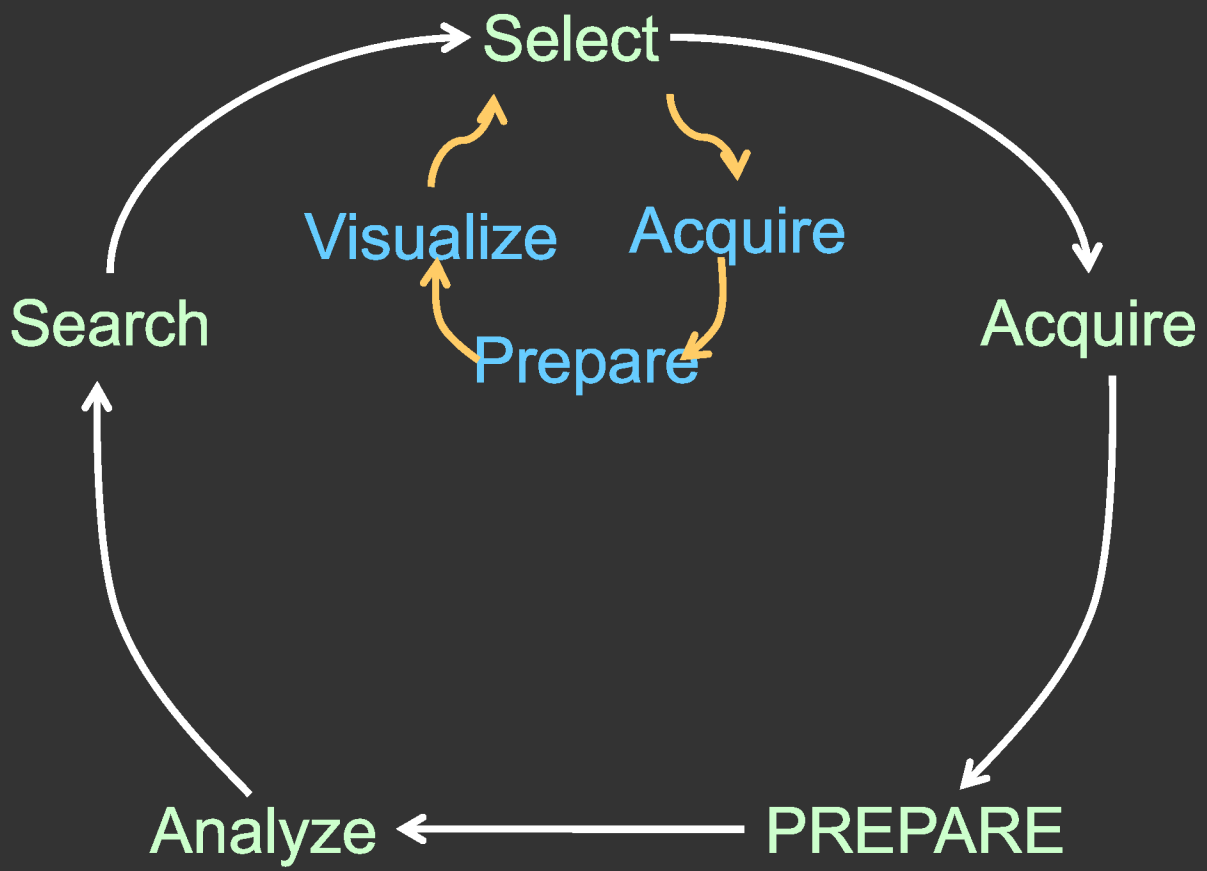
- GES DISC began as the Goddard Distributed Active Archive Center (DAAC)
  - Ingest, process, store and distribute Earth science data (mostly remote sensing)
- In the last decade, services have been added
  - Discovery
  - Access-related

The Data Usage Cycle



Preparation Steps

- Subsetting
  - Variable
  - Space
  - Time
- Gridding / (re)projection
- Reformatting to work in the analysis tools
- Quality Filtering

How much of the Preparation process can we build into the Access step?

On-the-Fly Web Services: *executed on acquisition*

On-the-Fly Web Services

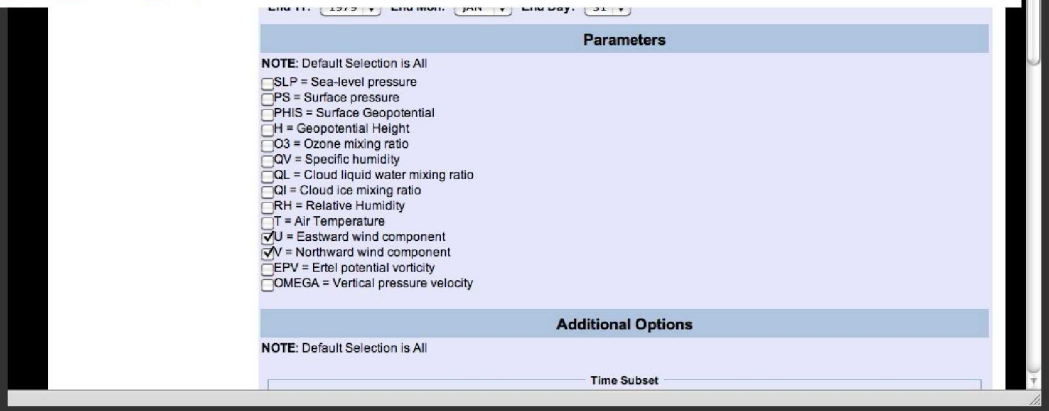
- REST-like: acquire as URLs
  - Limits error return possibilities
  - Requires an HTTP trick (shhh...) for long-running processes
- Accommodates any executable that...
  - ...Takes one file as input
  - ...Produces one file as output
- On-the-fly execution means minimal disk buffer requirements
  - No need to stage the whole request for pickup

On the Fly Subsetting

Subsetted Data Download Instructions:

- **Multiple** file download:
  - To use wget, you will need version 1.11.1 or later. To find the version, run 'wget -V'.
  - If necessary, obtain the latest version of wget
  - Download the list of URLs
  - Run: wget --content-disposition -i wget_khEIlxSN
- **Single** file download: click on the link for each file to be downloaded:

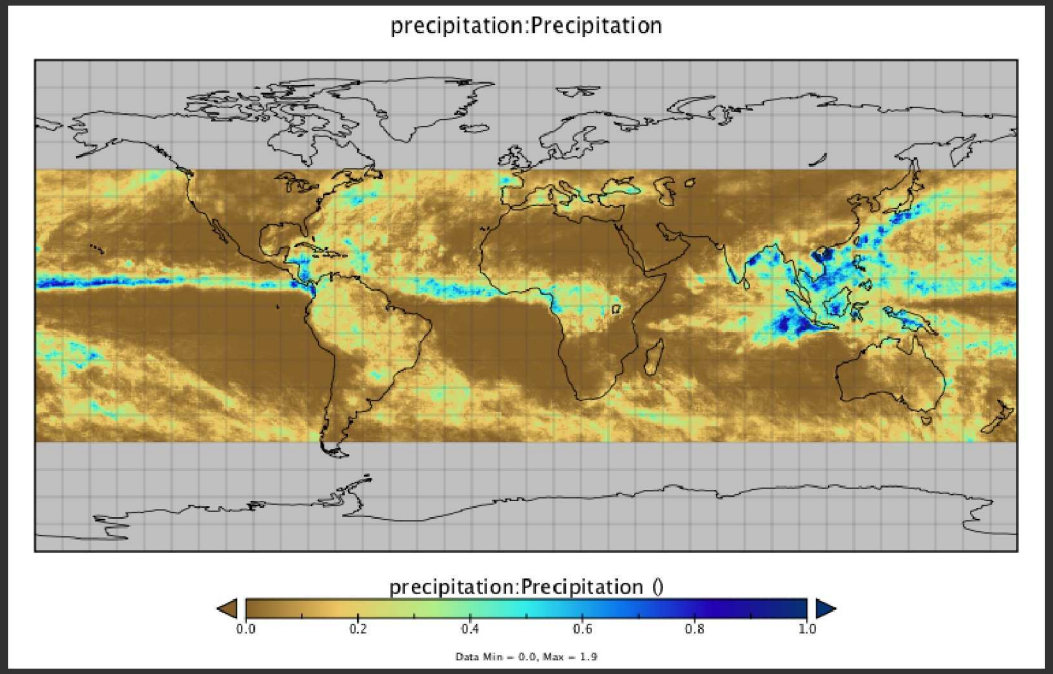
MERRA100.prod.assim.inst3_3d_asm_Cp.19790131.SUB.nc
MERRA100.prod.assim.inst3_3d_asm_Cp.19790130.SUB.nc
MERRA100.prod.assim.inst3_3d_asm_Cp.19790129.SUB.nc
MERRA100.prod.assim.inst3_3d_asm_Cp.19790128.SUB.nc
MERRA100.prod.assim.inst3_3d_asm_Cp.19790127.SUB.nc



*Modern Era Retrospective-Analysis for Research and Applications

On-the-fly Conversion to netCDF (network Common Data Form)

- Most Earth Observing System datasets are in Hierarchical Data Format (HDF)
- BUT, many visualization tools understand netCDF “better”

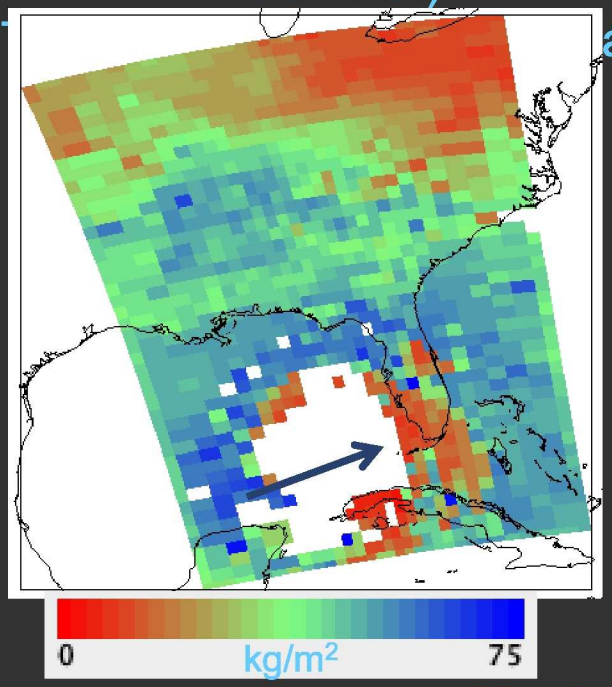


TRMM Monthly Rainfall rate for Oct 2011 in Panoply
http://www.giss.nasa.gov/tools/panoply/

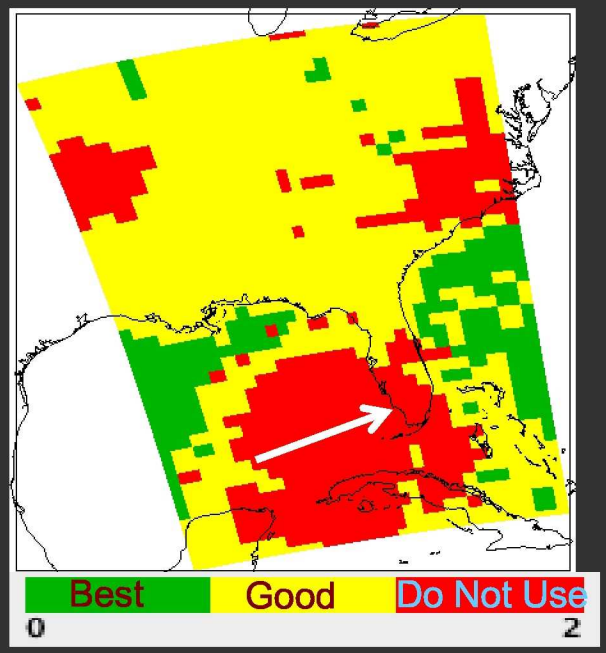
Data Quality Screening Service

- Level 2 Satellite data often comes with quality control flags
- Until now, each user typically had to write his/her own software to filter bad quality data—or ignore them

AIRS (Atmospheric Infrared Sounder)



Quality Flag



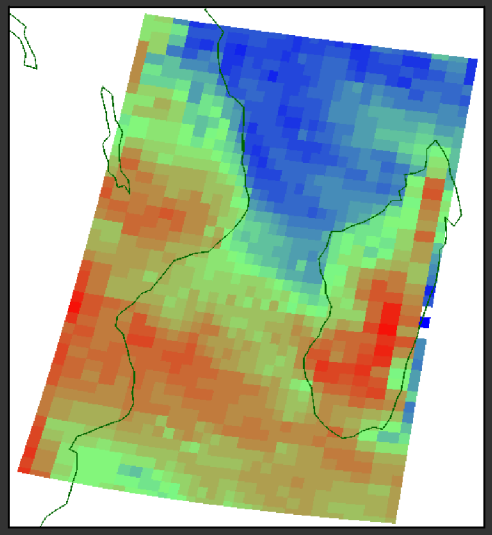
Hurricane Ike, 9/10/2008

The Data Quality Screening Service for AIRS Level 2 swath data

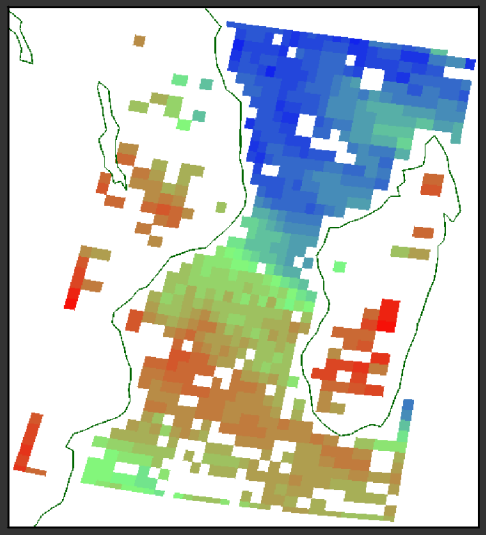
Original data array

Mask based on user criteria Quality flag<2

Good quality data pixels retained



Total column precipitable water

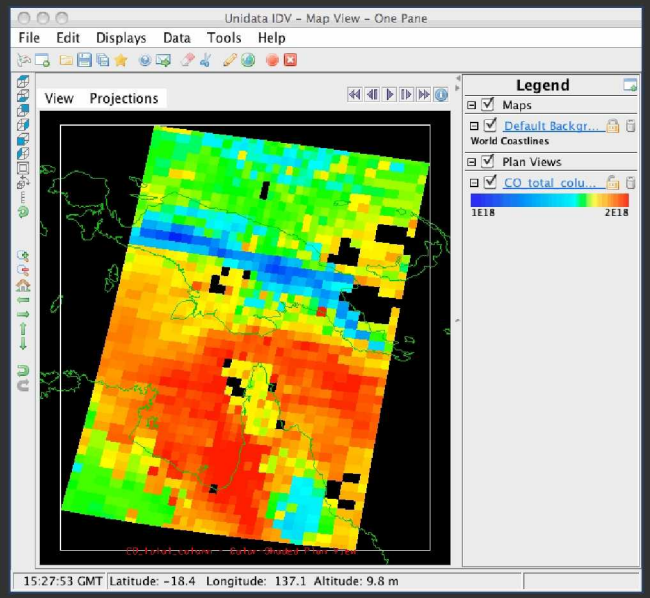


Output file has the same format and structure as the input file, with fill values replacing the low-quality data

OPeNDAP*:
a protocol standard for remote access

*Open-source Project for a Network Data Access Protocol

OPeNDAP: Subsetting and more



- Subsetting
  - individual variables
  - slices of variables
- Reformatting: download as...
  - ASCII
  - netCDF

Varieties of OPeNDAP

- Hyrax
  - High performance
  - Reformat to netCDF
- GrADS Data Server
  - Multiple input formats
  - Server-side processing
- THREDDS Data Server
  - Aggregation
  - Web Coverage Service, netCDF Subsetter
- Others: ERDDAP, PyDAP, Dapper...

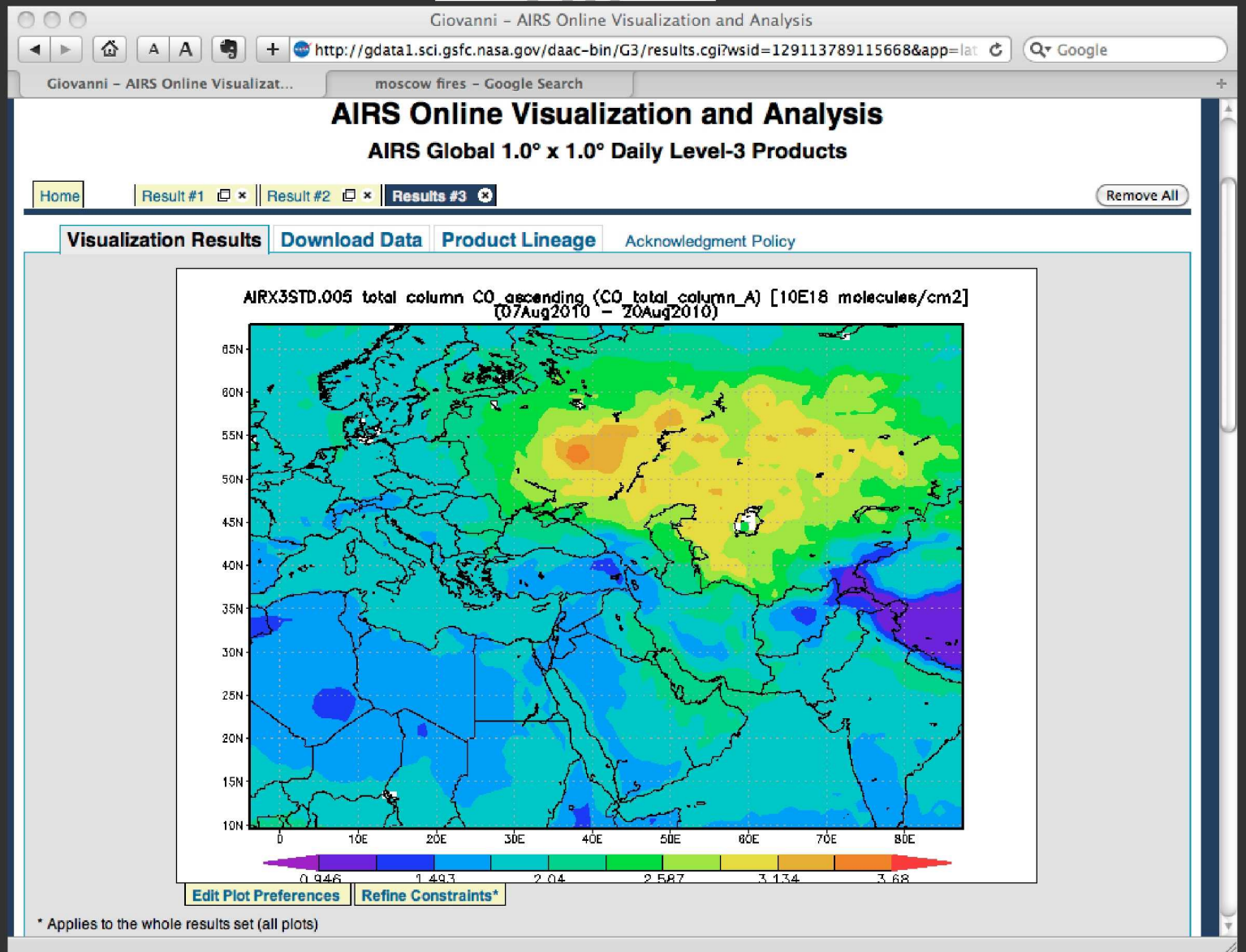
Giovanni:

online analysis and visualization

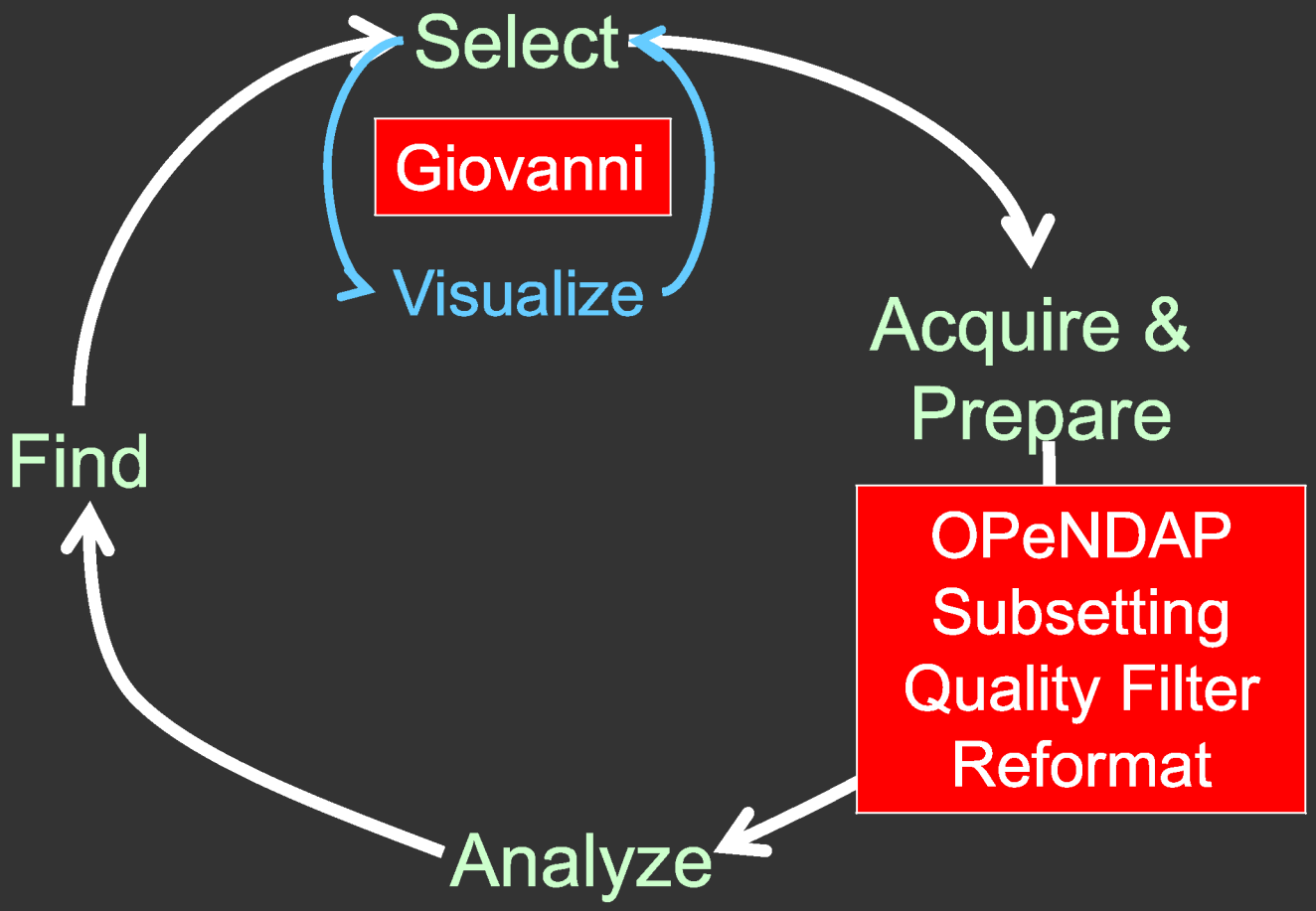
Giovanni

- Analysis and visualization server
- Workflow paradigm
- Steps for:
  - Fetching
  - Subsetting
  - Quality filtering
  - Regridding
  - Averaging
  - Visualization
- Output can be downloaded

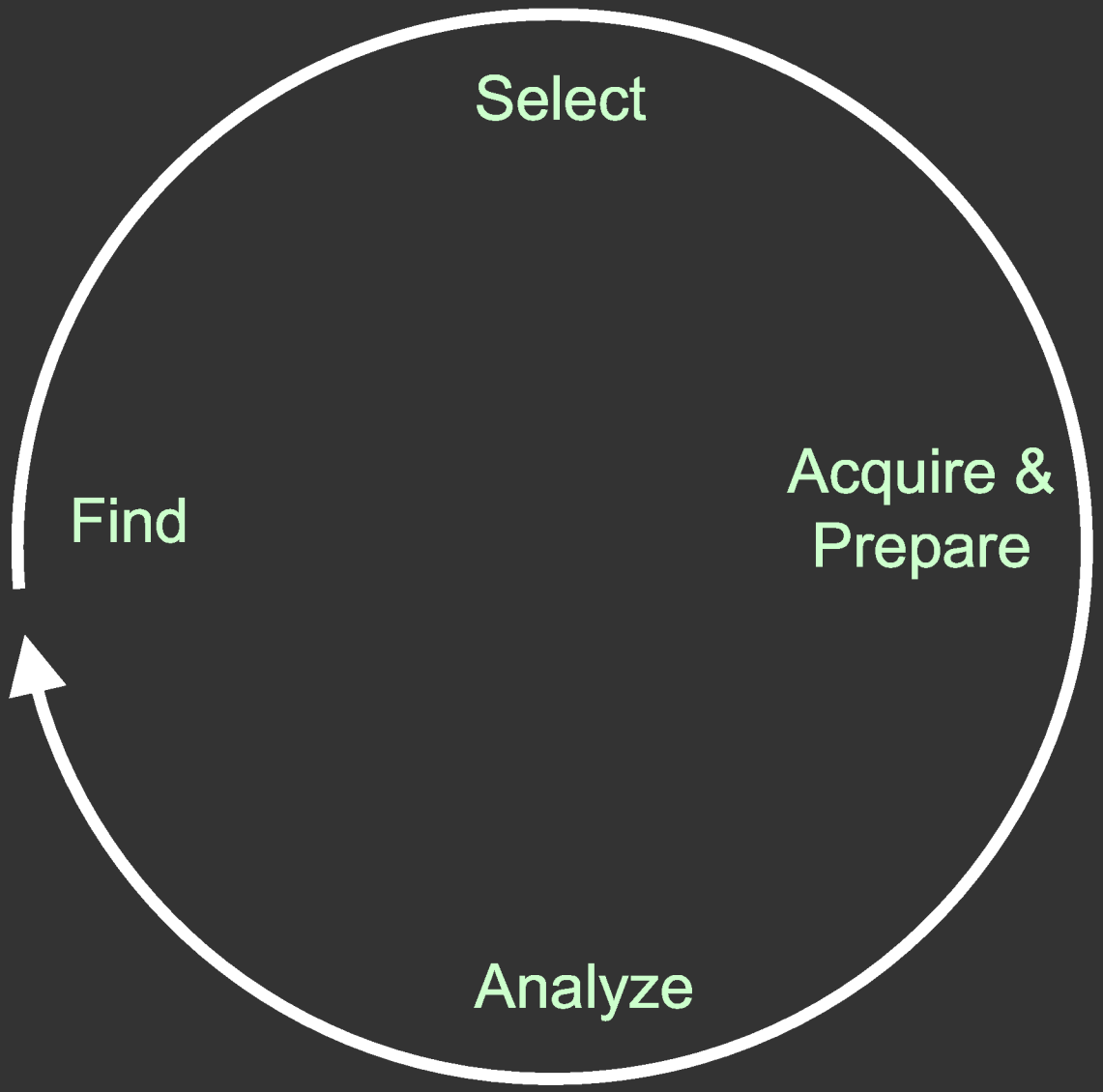
Example: Carbon Monoxide from 2010 Russian wildfires



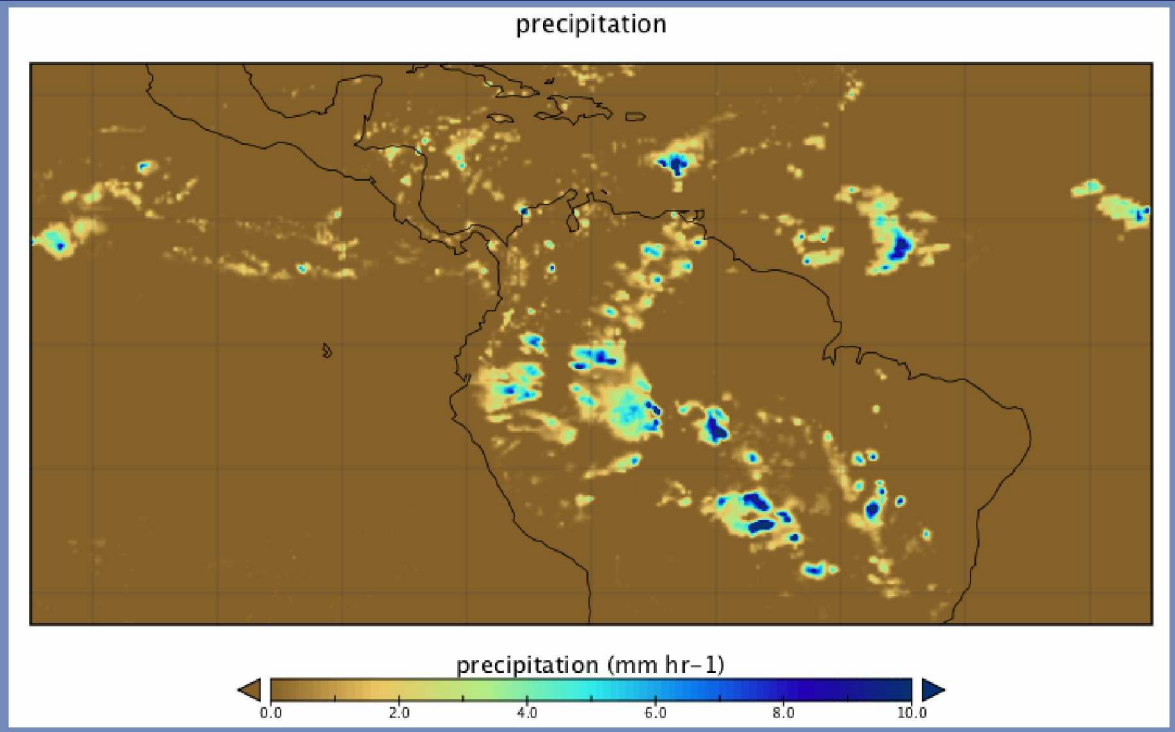
The Data Usage Cycle Refactored



Frontier: Seamless interaction of steps



Seamless Search and Analysis



Start: 2010-10-31 00:00:00

End: 2010-10-31 23:59:59

Area: 22.5 / -115 / -25 / -22.5

Measurement: Soil Moisture (SMAP)

Filter Quality?: X

Fetch