

# Optimal Access to NASA Water Cycle Data for Water Resources Management

NASA/Goddard Earth Sciences Data and Information Services Center (GES DISC)

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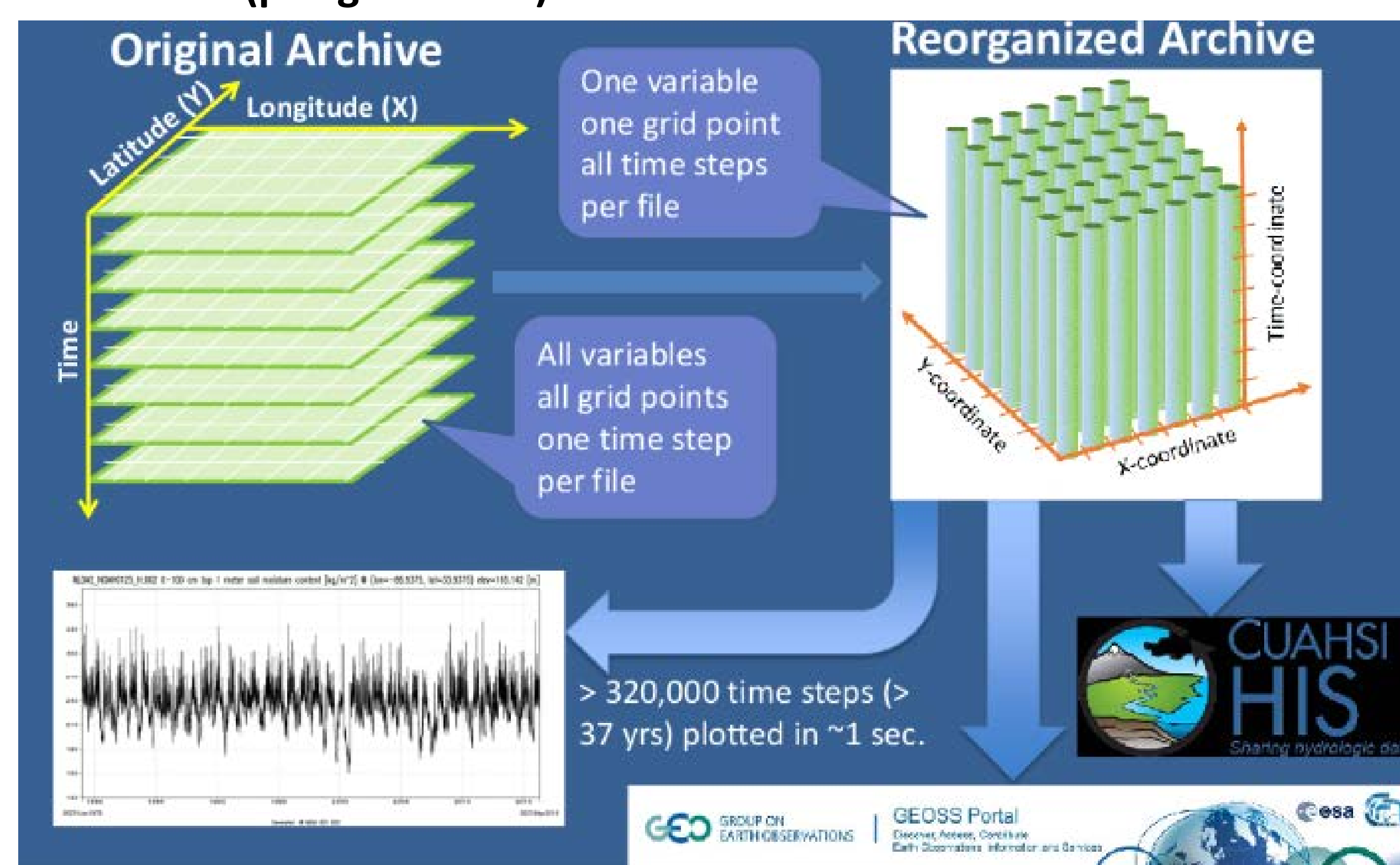
## Exposing NASA data rods to the world

### Summary

- “Digital Divide” in data representation between preferred way of data access by hydrology community (i.e., as time series of discrete spatial objects) and the common way of data archival by earth science data centers (i.e., as continuous spatial fields, one file per time step).
- Optimal approach to bridging the Divide is to reorganize data from the way they are archived to some way that is optimal for the desired method of data access.
- Selected data sets are reorganized into time series files, one per geographical “point,” termed “data rods.”
- Multiple methods of accessing data rods are available to the operational water resources community, including, directly, from the GES DISC archives via Web services, and the Data Rods Explorer, the newest addition to HydroShare Apps Library.
- Optimal reorganization of NASA earth science data, in the form of data rods, extends NASA data to the large and important water cycle user community.

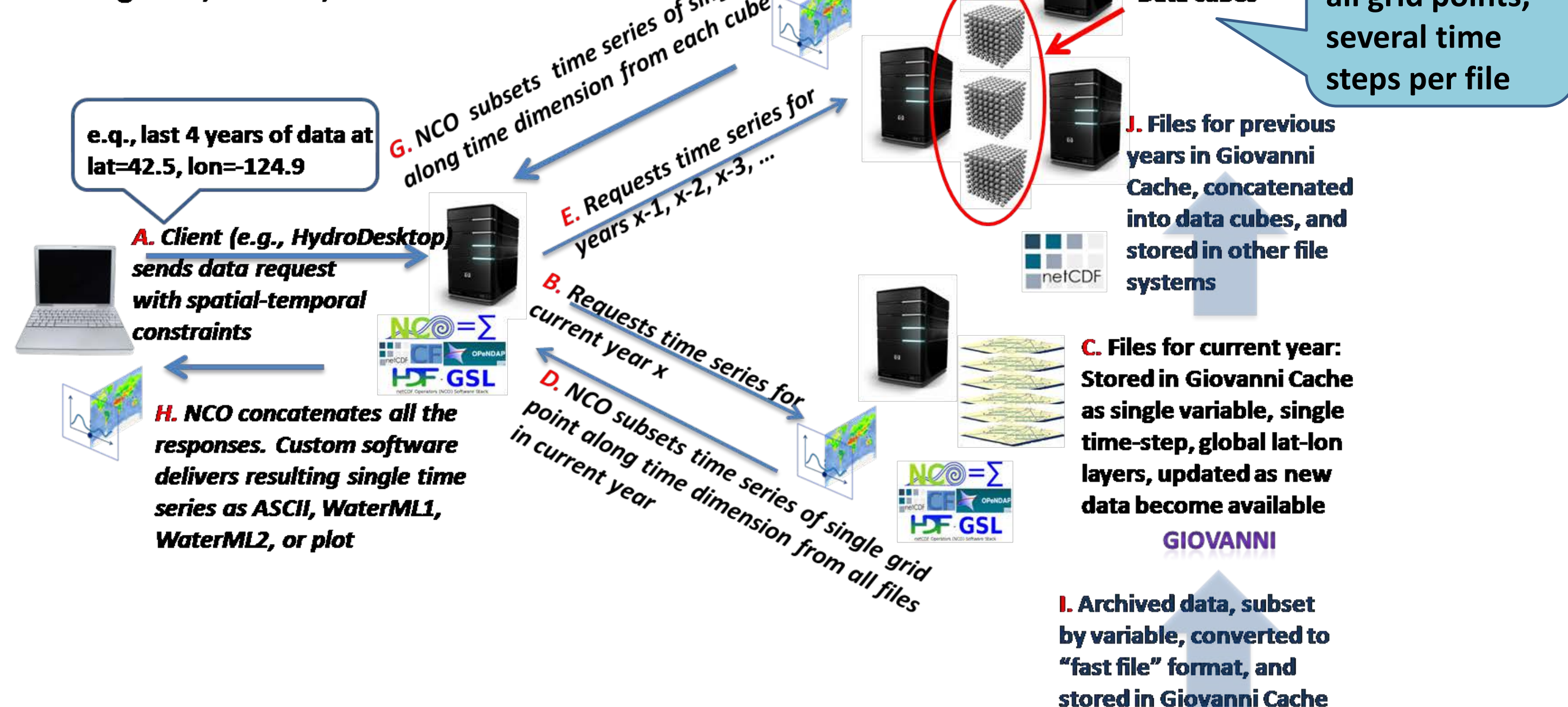
## Removing Barrier to Accessing NASA Data

### Data Rods (pre-generated)

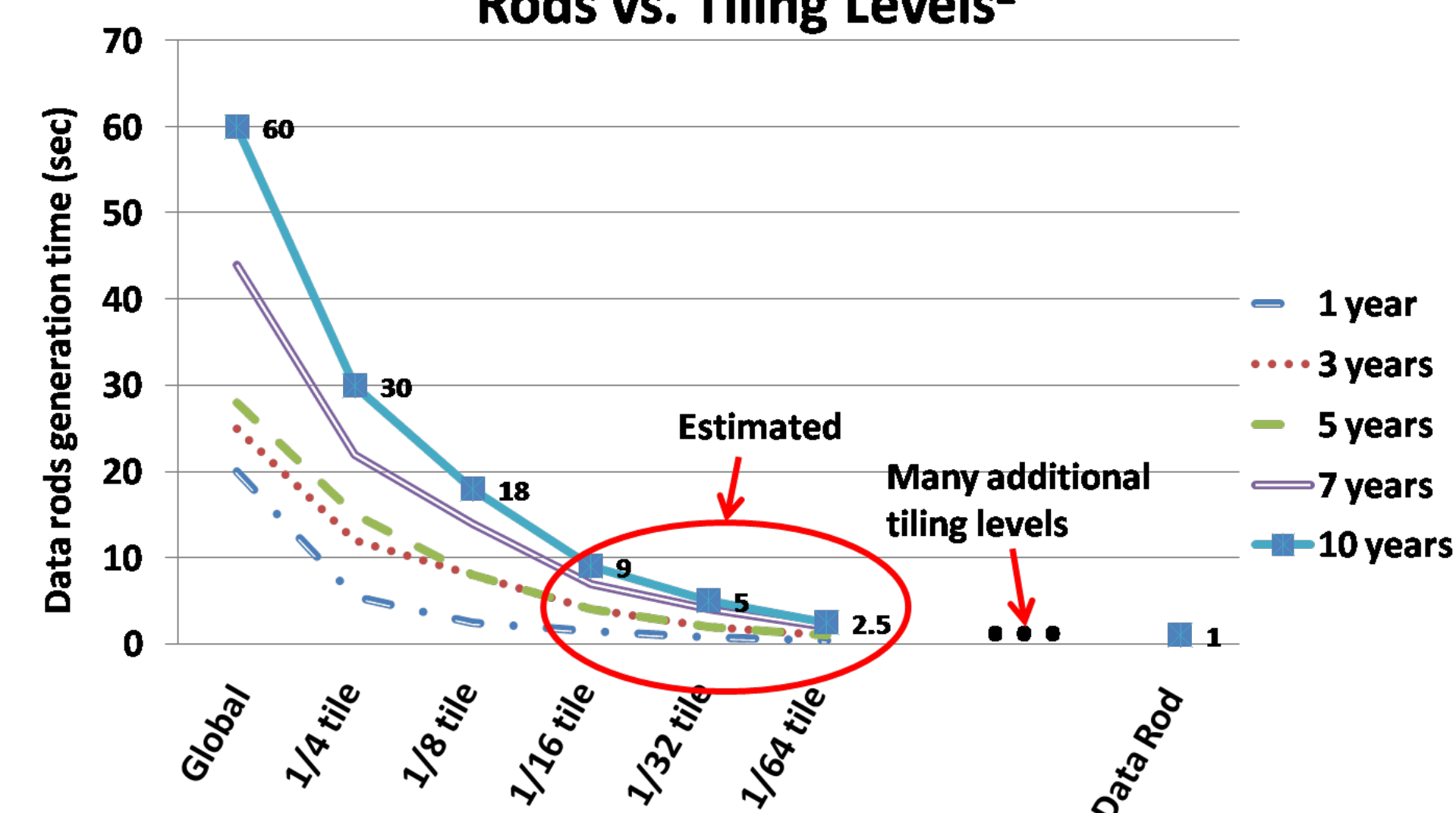


### Data Rods (virtual)

Global Level 3 (Gridded) Single Variable  
NASA Earth Science Data  
To  
Time Series (“Data Rods”)  
Using NCO, NetCDF, and Giovanni



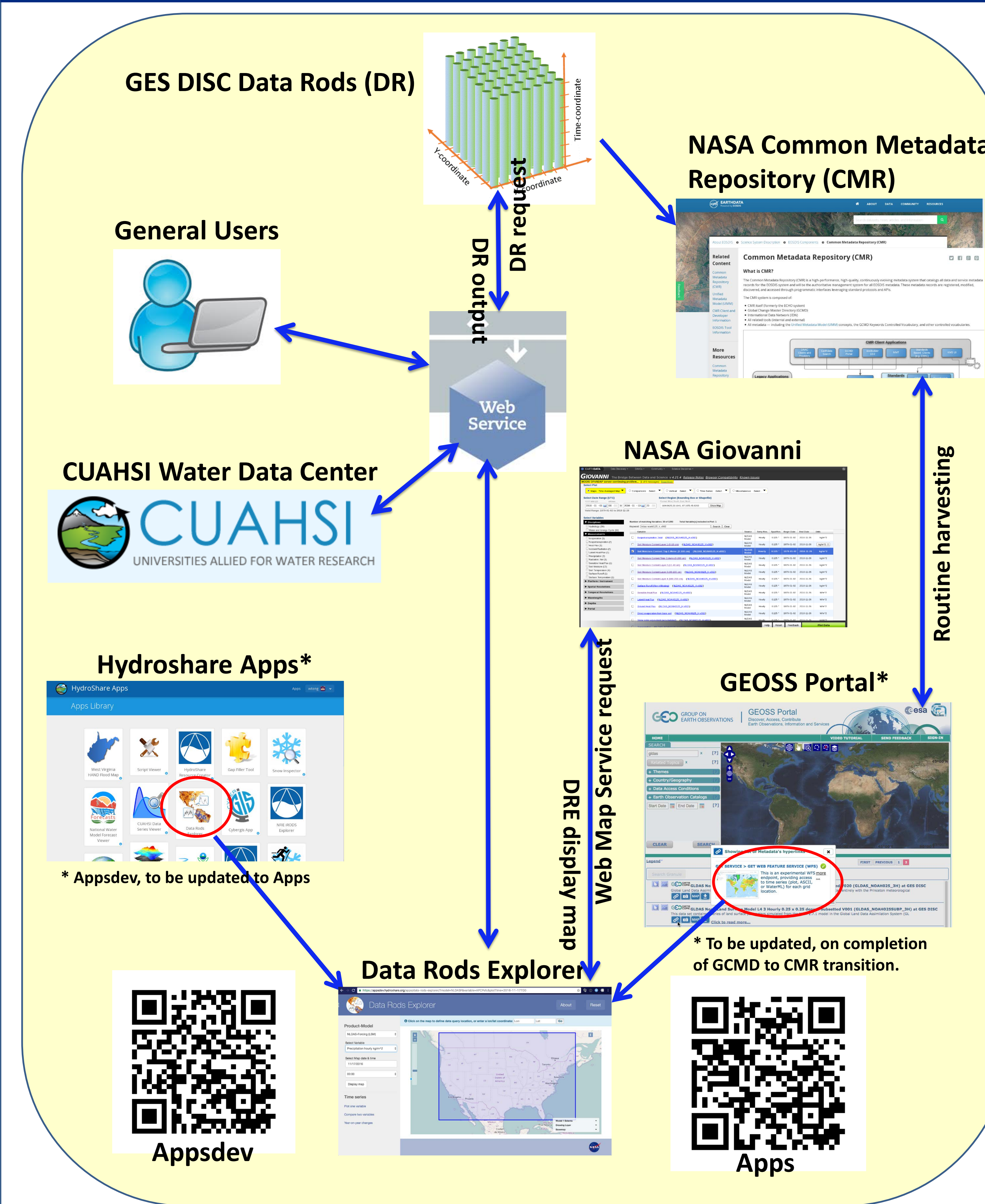
### Generation Time for TRMM<sup>1</sup> On-the-Fly Data Rods vs. Tiling Levels<sup>2</sup>



<sup>1</sup>Tropical Rainfall Measuring Mission <sup>2</sup>Tiling: Dividing the data set grid into subgrids (e.g., ¼ tiling for TRMM divides its global grid into 4 equal subgrids).

- Pre-generated “data rods” is one end member of a continuum of tiling levels; the other end member is “global” (no tiling).
- With increased tiling, (1) generation time for “tilted data rods” approaches that of pre-generated data rods and (2) length of data rods has decreasing effect on generation time.

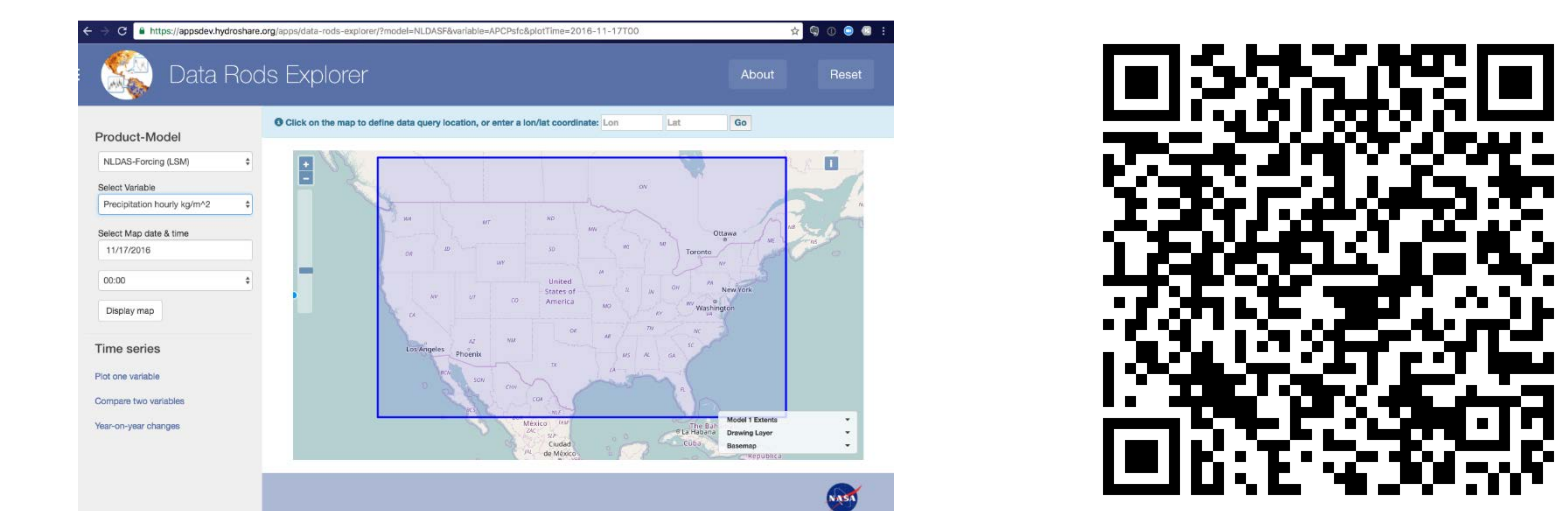
## Multi-Access to NASA Water Cycle Data



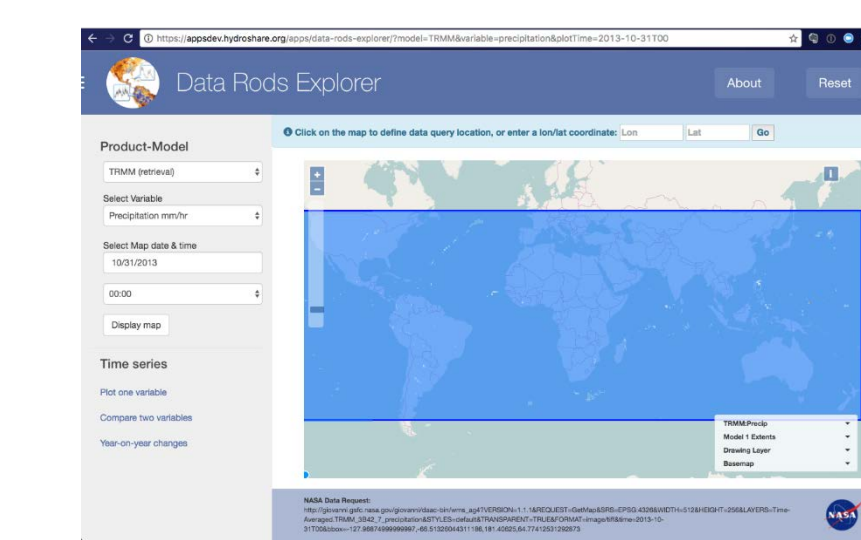
## Data Rods Explorer (DRE)

### Features and utilities

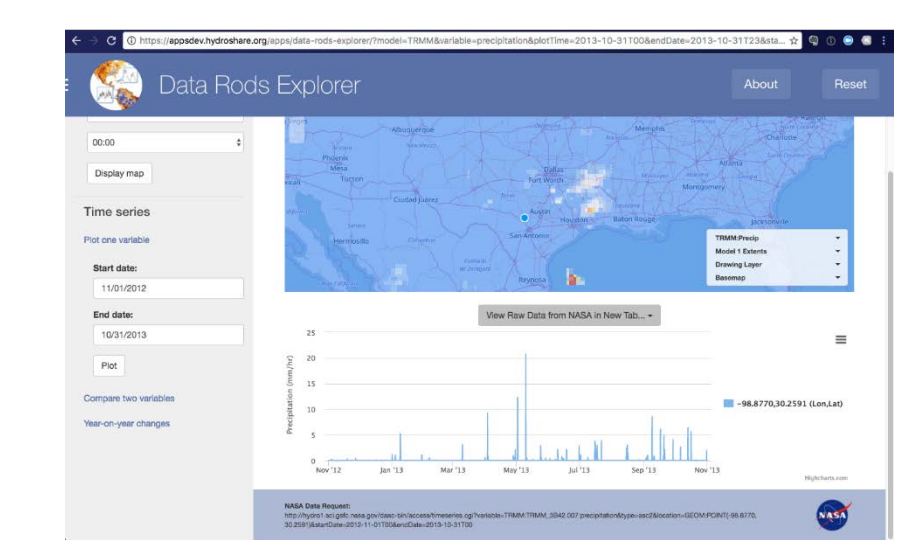
DRE initial startup w/ defaults



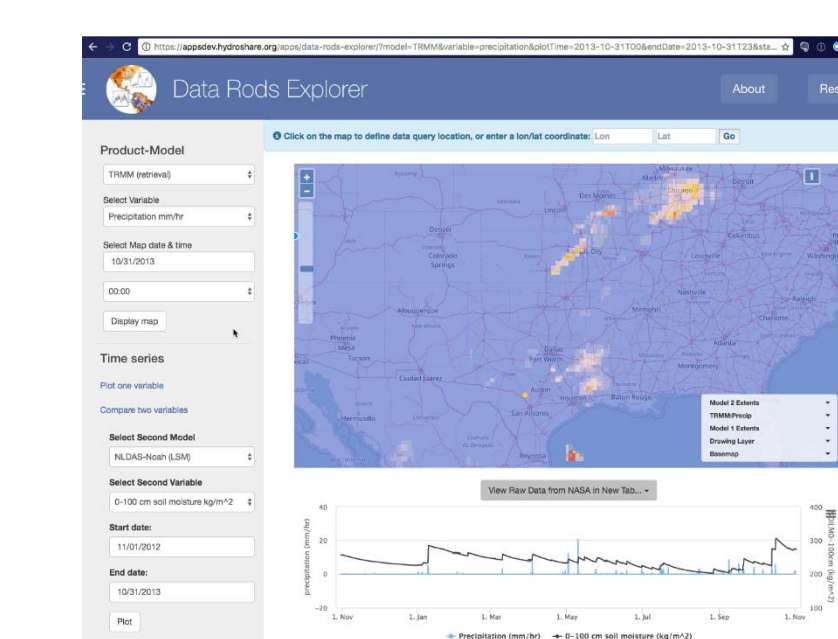
Display map of variable (TRMM precipitation)



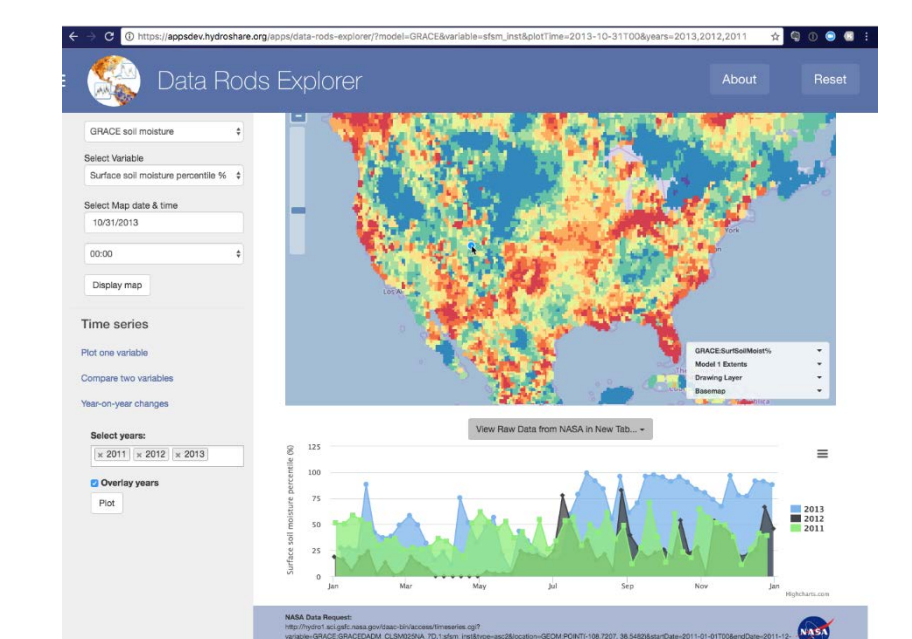
Plot time series of one variable (TRMM precipitation)



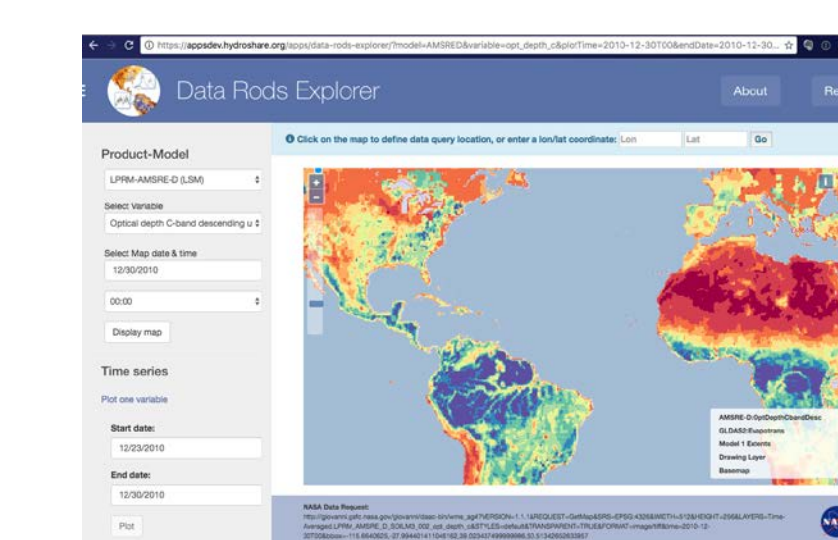
Compare time series of two variables (TRMM precipitation and NLDAS 0-100cm soil moisture)



Plot year-on-year changes of a variable (GRACE-derived soil moisture)



Overlay maps of two or more variables, w/ adjustable opacity (LPRM-AMSRE optical depth overlying GLDAS2 evapotranspiration)



Download options: (Top) Directly from NASA data rods services, as ASCII-text, plot, and netCDF. (Bottom) Via DRE's plotting tools.



### Data products available as data rods

| Data product             | Spatial resolution (deg) | Spatial coverage   | Temporal resolution | Temporal coverage | # variables |
|--------------------------|--------------------------|--------------------|---------------------|-------------------|-------------|
| NLDAS-2 forcing          | 1/8                      | N. America 53N-25N | 1 hour              | 1979-present      | 8           |
| NLDAS-2 Noah             | 1/8                      | N. America 53N-25N | 1 hour              | 1979-present      | 13          |
| GLDAS-1 Noah             | 1/4                      | Global 90N-60S     | 3 hour              | 2000-present      | 13          |
| GLDAS-2.0 Noah           | 1/4                      | Global 90N-60S     | 3 hour              | 1948-2010         | 13          |
| LPRM-AMSRE soil moisture | 1/4                      | Global             | 1 day               | 2002-2011         | 7           |
| TRMM precipitation       | 1/4                      | Global 50N-50S     | 3 hour              | 1998-present      | 1           |
| GRACE soil moisture      | 1/4                      | N. America         | 7 day               | 2003-2015         | 3           |
| MERRA-Land (in progress) | 0.5x0.625; 1.25x1.25     | Global             | 1 hour              | 1980-present      | 15          |

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