



**G · A · B · B · S**  
geospatial data analysis building blocks

# Broadening Access to Geospatial Capabilities

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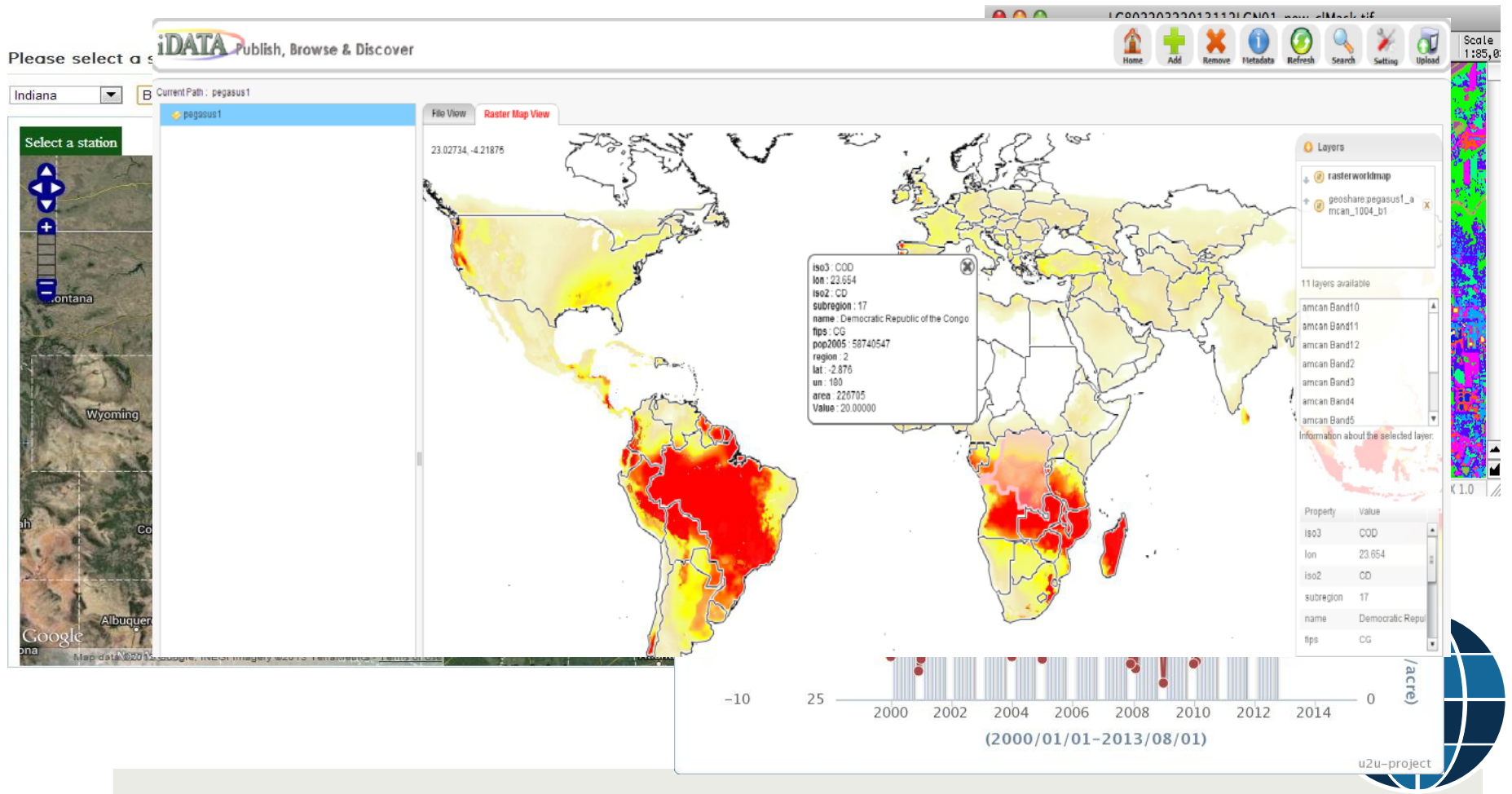
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# Driving Use Cases

- Easy deployment of geospatial tools



# Driving example

- Multi-scale and multi-disciplinary data and modeling for addressing hydrologic and ag economic issues

The screenshot displays a software interface for hydrologic modeling. The main window is titled "Montgomery" and shows a "Step 2: Select variables" dialog box. The "Output variables" list includes:

- PRECIP(mm): Precipitation
- SNOMELT(mm): Snow or ice melt
- PET(mm): Potential evapotranspiration
- ET(mm): Actual evapotranspiration
- SW(mm): Soil water content
- PERC(mm): Water that percolates past the root zone
- SURQ(mm): Surface runoff contribution to streamflow
- GW\_Q(mm): Groundwater contribution to streamflow
- WYLD(mm): Water yield
- SYLD(t/ha): Sediment yield
- ORGN(kg/ha): Organic N yield
- ORGP(kg/ha): Organic P yield
- NSURQ(kg/ha): Nitrate transported by the surface
- SOLP(kg/ha): Soluble P yield
- SEDP(kg/ha): Mineral P yield

Below the variable selection is "Step 3: Set data range" with a date range of 1/2009 to 12/2009. The main visualization area shows two plots: "Total Monthly Precipitation" (a bar chart) and "Surface Runoff (2009-11)" (a map). The precipitation chart shows monthly values from 1/09 to 12/09. The runoff map shows a spatial distribution of runoff in mm, with a color scale from 10.0 to 30.0. The map is overlaid on a geographic grid with latitude from 39.8 to 40.4 and longitude from -92.6 to -92.2. A "Value" dialog box is open, showing a list of models including "tomotoso", "Upper Iowa River near normal", "SWAT2009", "07060002", "United States", and "IA". A "My Models" sidebar on the right lists various models such as "NorthRaccoon\_Sensitivity", "NorthRaccoon\_River", etc. At the bottom, there are buttons for "Download Data", "Prev", "Start Animation", "Next", and "Close". A "Download Archive" button is also visible at the bottom left.



Enabling scientists, students and educators to create and share  
**interactive tools and models for processing, analyzing  
and visualizing geospatial data**

Overarching goal:

- Making it easy for scientists to share geospatial data and tools
- Reach broader user community
  - Anyone can create an online app and share
  - Anyone can share geospatial data



# Outcome

- The rapid tool development library RAPPTURE will support
  - geo-referenced data objects (maps, images, etc)
  - Easy way to share geospatial data, both in raw data, and visually and interactively
  - Easy way to share interactive tools that uses, and produces geospatial data
- Tool builder that supports geospatial data to further lower the barrier of creating interactive online tools
- Service interfaces to upload and share geospatial and other types of data in HUBzero
- Service interfaces to link tools and data
- Geospatial capabilities as part of core HUBzero open source release



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# Funding

- A National Science Foundation grant
- Data Infrastructure Building Blocks (DIBBs) program
- GABBs: 1 of 4 implementation awards in 2013
- \$4.5M, 4 years (10/2013 – 9/2017)
- Collaboration with other DIBBs and DataNet awards



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# Team (11+)

Carol Song, PI & Project Director

Larry Biehl (image processing and visualization)

Venkatesh Merwade (hydrologic modeling and data, apps)

Nelson Villoria (global geospatial data, applications)

Betsy Hillery (project manager)

Michael McLennan (HUBzero architect)

Rob Campbell (sr developer, data component)

Leif Delgass (sr developer, visualization)

George Howlett (sr developer, RAPPTURE extension)

Lan Zhao (research scientist, geospatial applications, data management)

Rajesh Kalyanam (spatial processing, management)

Graduate students in scientific domains

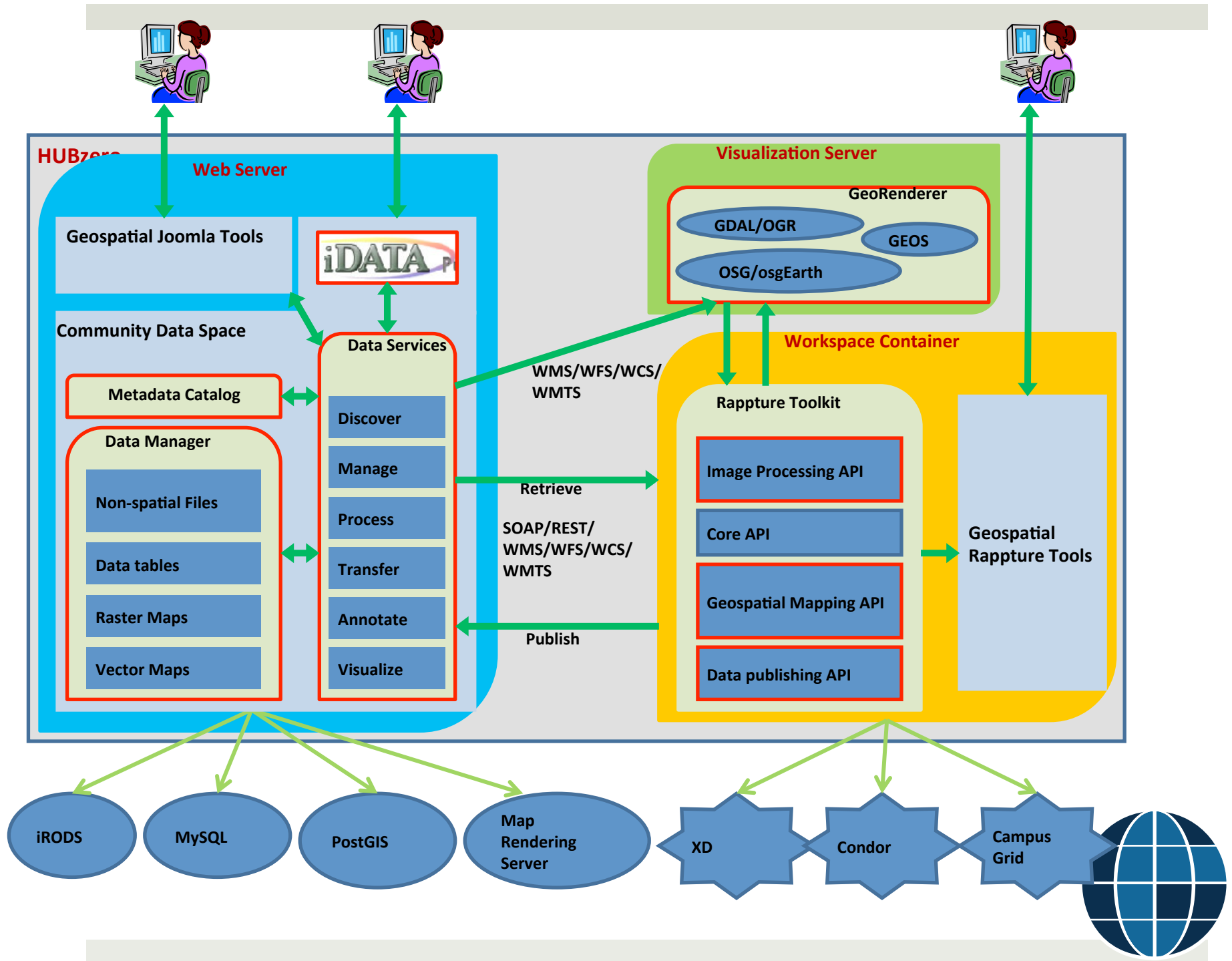


# Building on prior work

- ▣ **HUBzero** (Rappture, graphics rendering, collaborative tools)
- ▣ **iData** (tool for self service data sharing and management)
- ▣ **Multispec** (tool for analyzing multispectral/hyperspectral image data)
- ▣ **Geospatial hub projects** (DRINET, Geoshare, WaterHUB, U2U etc)
- ▣ Leveraging software developed elsewhere
  - ▣ iRODS
  - ▣ Globus data transfer







# Challenges

- Dealing with large and complex (often non-standard) data sets
- Peculiarity in data
- Extending the existing RAPPTURE model to support the new requirements of geospatial data and interactivity
- Map and image rendering in hub VM workspace
- Service interfaces
- Linking data – tools



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# What's to come?

- ▣ [New Super Hub](#) for your geospatial needs
- ▣ Demonstration video

