

# driNET: Drought Research Initiative Network

<http://drinet.hubzero.org>

**driNET** DROUGHT RESEARCH INITIATIVE NETWORK

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## Welcome!

DRINET is a research environment for collecting and disseminating local to regional scale drought information. Sign up here to publish models and tools, datasets, training and educational materials to share with stakeholders who will benefit from comprehensive evaluation of causal factors of droughts.

### Interoperability

**Research**

- [Drought Knowledge](#)
- [Impact on Water Quality](#)
- [Data Management](#)
- [Visualization](#)

**Student Projects**

- [Drought Visualization](#)

**Data**

- [St. Joseph Water Quality Data](#)
- [St. Joseph Watershed data](#)
- [Indiana Precipitation Data](#)
- [Precipitation and Temperature Average](#)
- [St. Joseph Stream Flow Data](#)

**Tools**

- [Streamflow Deficit Viewer](#)
- [HMM-based Drought Index Viewer](#)
- [JDI-Precipitation-Viewer](#)
- [Water Deficit Viewer](#)
- [Workspace](#)
- [More ...](#)

**Announcement**

- [Streamflow deficit viewer is available](#)
- [2011 Symposium on Data-Driven Approaches to Droughts](#)

**Collaboration**

- [User Groups](#)
- [Share with your colleagues](#)
- [Collaboration](#)
- [Other ways to collaborate](#)



# Overview

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- Objectives
- Data collections
- Interactive online modeling tools
- Metadata
- Education

# What is DRINET?

- Cyberinfrastructure for drought research and community engagement
  - ▣ **Research** environment for drought characterization, forecasting, decision making, risk assessment
  - ▣ Data integration, synthesis, and sharing
  - ▣ **Education** tools/modules
  - ▣ **Partnership** building among researchers and stakeholders
- HUBzero platform
- Data access, online simulation, visualization, metadata standardization, and cross disciplinary interactions

# Audience

- Researchers
  - Climatologists
  - Hydrologists
  - Agronomists
- Students
- State and local governments
  - Policy makers (e.g., water shortage task force)
  - Emergency response personnel
  - Planners
- Other professionals
  - Farmers, economists, medical personnel, teachers, etc.
- General public

# Data integration into HUBzero

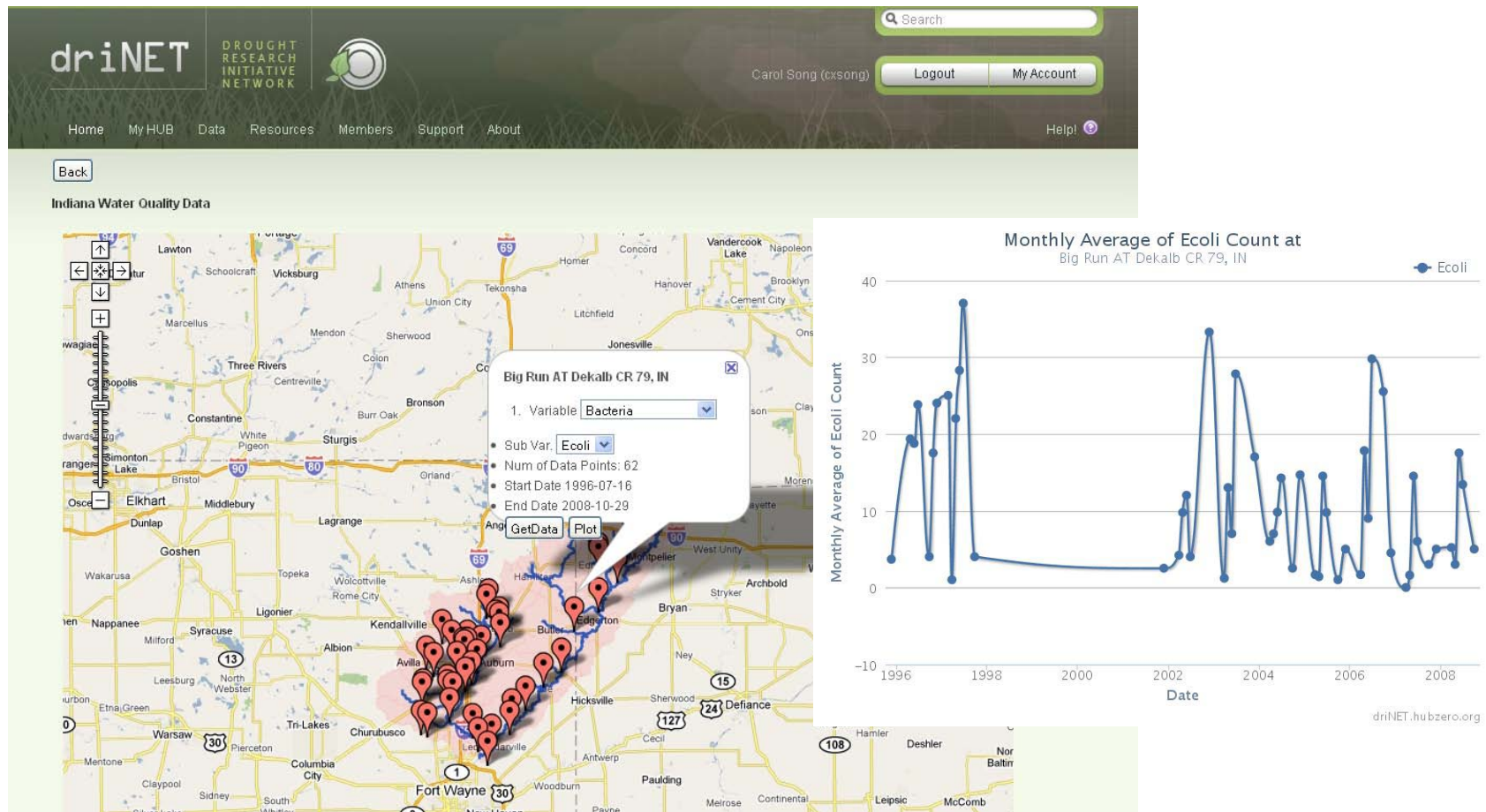
## Heterogeneous datasets, different formats and sources

- Precipitation and temperature average
- Indiana precipitation and streamflow
- St. Joseph watershed streamflow data
- St. Joseph watershed water quality data
- Upper Mississippi and Ohio River basins
  - ▣ **Daily surface** dataset of cooperative stations (from NCDC)
  - ▣ **Monthly streamflow** data (from USGS)
  - ▣ **Monthly temperature and precipitation** data (from USHCN)
  - ▣ **Global monthly soil moisture** data (from CPC) - soil moisture, runoff, precipitation, temperature, evaporation
- Real time water quality parameters for Massie Creek, Ohio

# Data integration into HUBzero

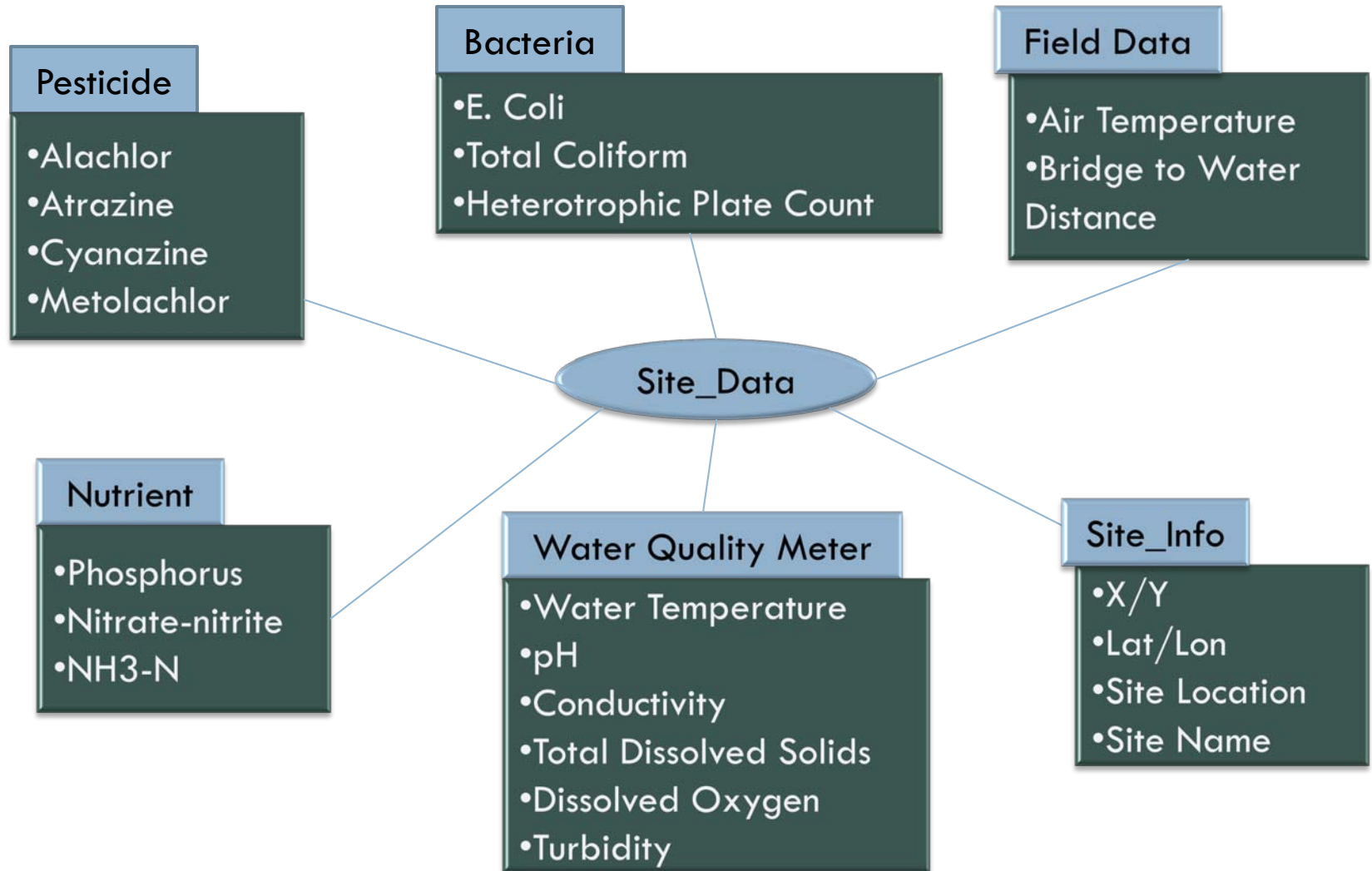
- file based vs. table based
- Local vs. remote
- Observation vs. model output
- Static vs. real-time
- Map based interface
- Dynamic data retrieval and visualization
- Technology: PHP, JavaScript, AJAX, GoogleMap, Web Service, MySQL, Geoserver, iRODS

# Datasets integrated into HUBzero



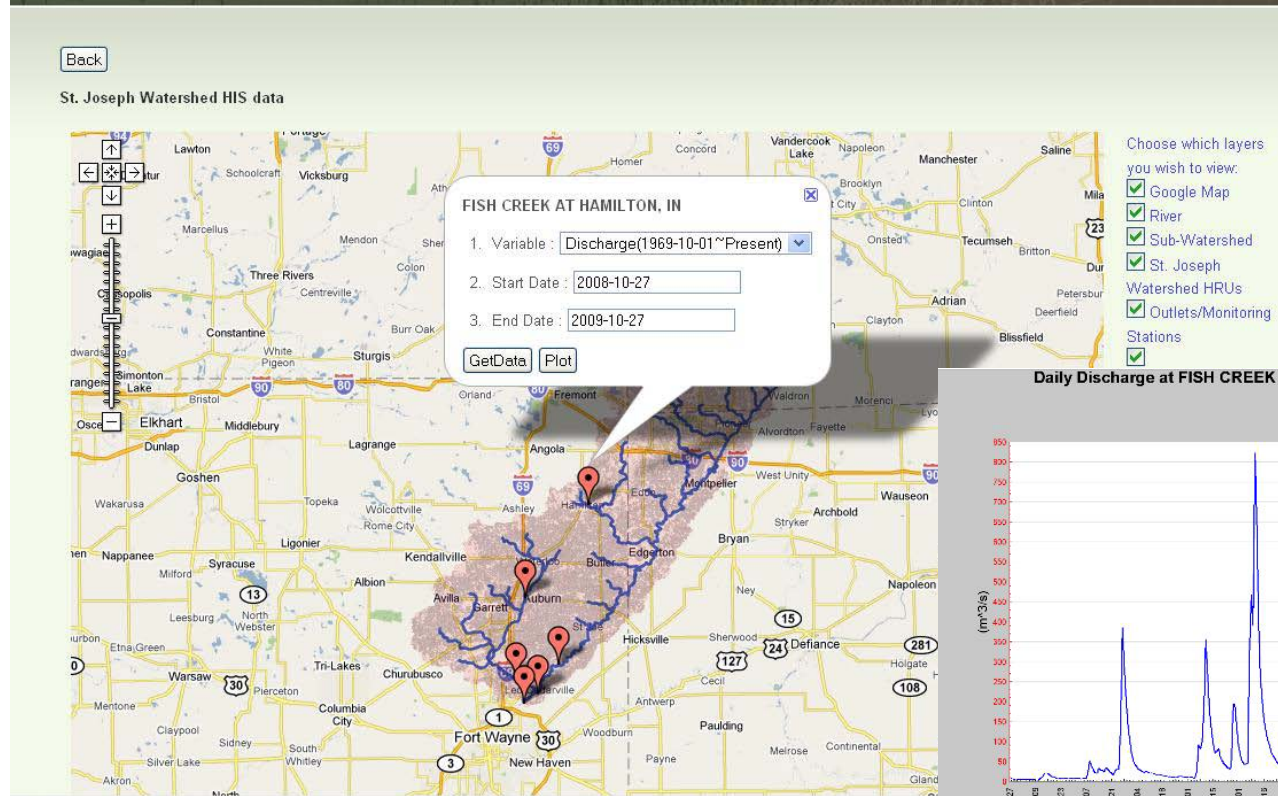
St Joseph watershed water quality data

# St Joseph watershed water quality data





# Datasets integrated into HUBzero



Stremflow data for St Joseph Watershed

# Datasets integrated into HUBzero

The screenshot displays the driNET web interface. At the top, the logo for the DROUGHT RESEARCH INITIATIVE NETWORK is visible, along with a search bar and user information for Carol Song (cxsong). The navigation menu includes Home, My HUB, Data, Resources, Members, Support, and About. A Help! icon is also present.

The main content area shows a file list on the left, with a 'Back' button above it. The file list includes various precipitation and temperature trace files for Illinois (IL), such as 'trace.IL-CD00.prcp.Annual.png', 'trace.IL-CD00.prcp.April.png', and 'trace.IL-CD00.tavg.Annual.png'. A file named 'trace.IL-CD00.prcp.February.png' is selected, and its details are shown in a light blue box:

File name	trace.IL-CD00.prcp.February.png
CD	00
format	png
state	IL
timeunit	February
variable	prcp
File size(Bytes)	21718

Below the file details, there are buttons for 'Quick View' and 'Download'. A line graph titled 'February Precipitation History with 5-year Tendencies' is displayed, showing precipitation data from 1855 to 2009. The graph includes a legend for 'Wet historical periods' (green), 'Drier historical periods' (orange), and 'Individual February precipitation value' (black dots). The x-axis is labeled with decades from 1900s to 1990s, and the y-axis represents precipitation levels. The graph shows significant variability in precipitation over the period, with notable peaks and troughs.

Time series of precipitation & temperature data

# Interactive online modeling tools

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- Web based interactive applications
- Geospatial data integration, analysis, and visualization
- GIS software
- Rapture, PHP and Flex applications

# DRINET Water Deficit Viewer

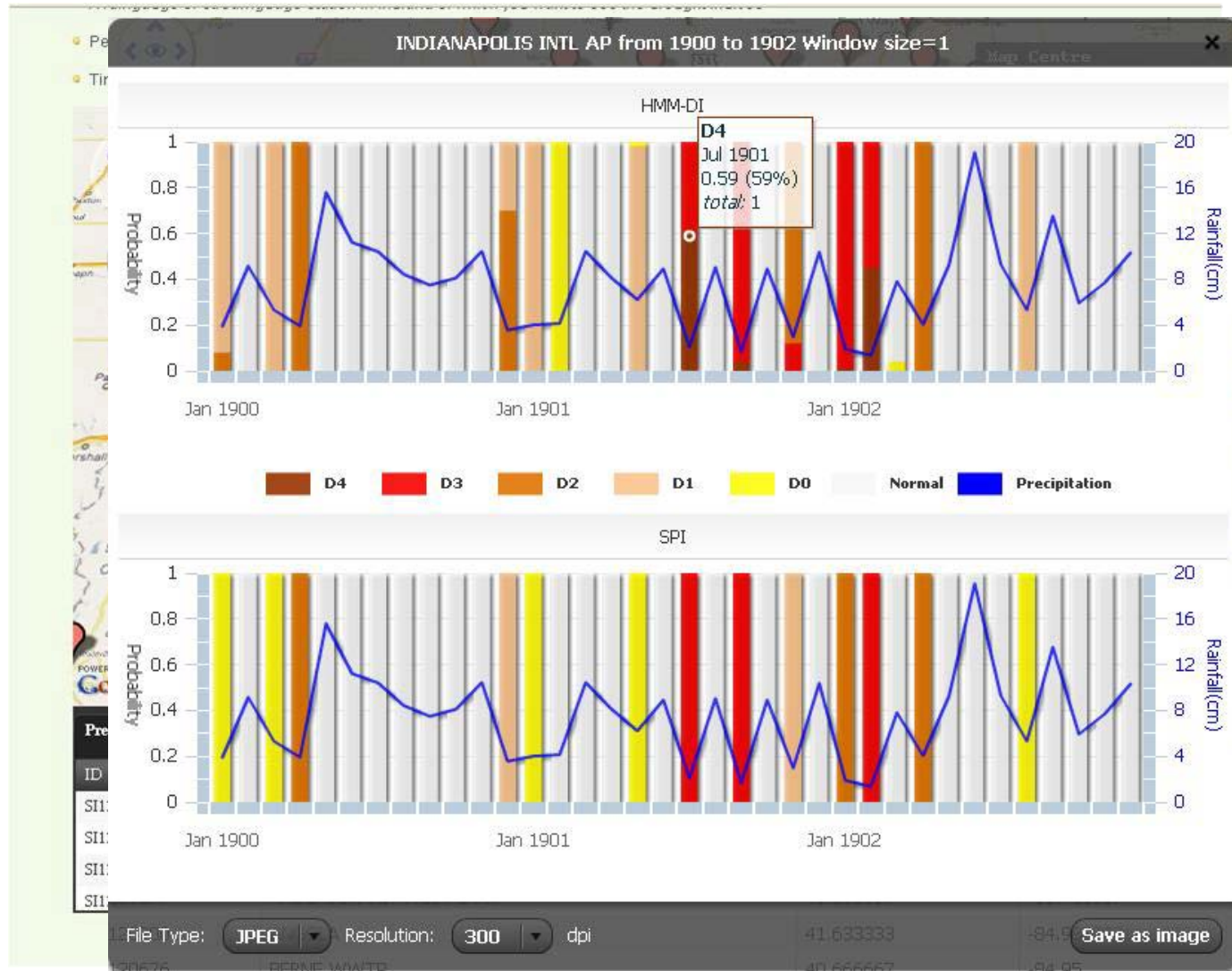
**Left Screenshot:**

- Simulate
- About this tool Questions?
- Result: Image Sequence
- Required future 07 month precipitation (inch) - 192207
- Valid Range: Jan 1921-Sep 2007. You can view upto 9 years of deficit images at once.
- Start Year: 1921
- Start Month: 1
- End Year: 1925
- End Month: 3
- Time Window: 7
- View Type: 1
- Selected Range: 1/1921 - 3/1925
- Frame = 18
- 1 result Parameters... Clear

**Right Screenshot:**

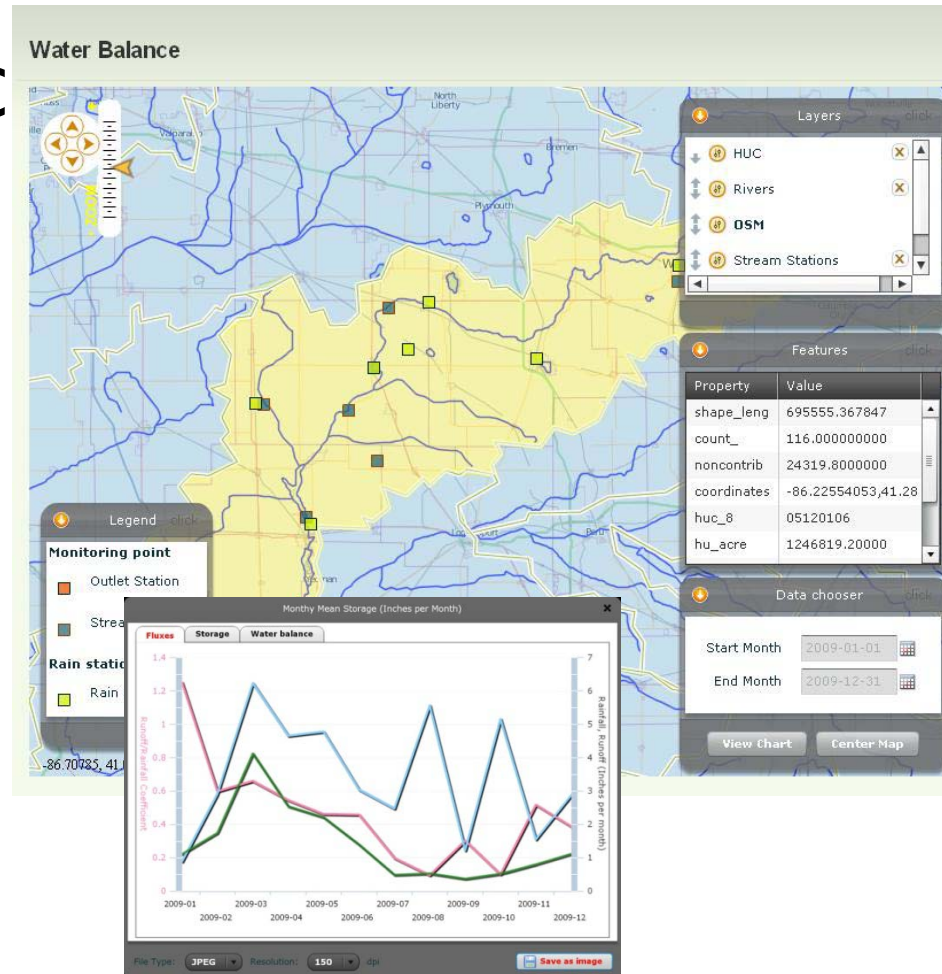
- Simulate
- About this tool Questions?
- Result: Image Sequence
- Prob. of drought-recovery in 07 month - 192210
- Range: Jan 1921-Sep 2007. upto 9 years of deficit images at once.
- 1921
- 1
- 1925
- 3
- 7
- 2
- Selected Range: 1/1921 - 3/1925
- Frame = 21
- 2 results Parameters... Clear
- Simulation = #2
- View Type = 2

# HMM-based Drought Index Viewer



# Water Balance Viewer

- Dynamic data retrieval from CAHUSI and NCDC data providers using web services
- Model calculation and visualization on-the-fly
- OGC(WMS, WFS), Flex, Web service



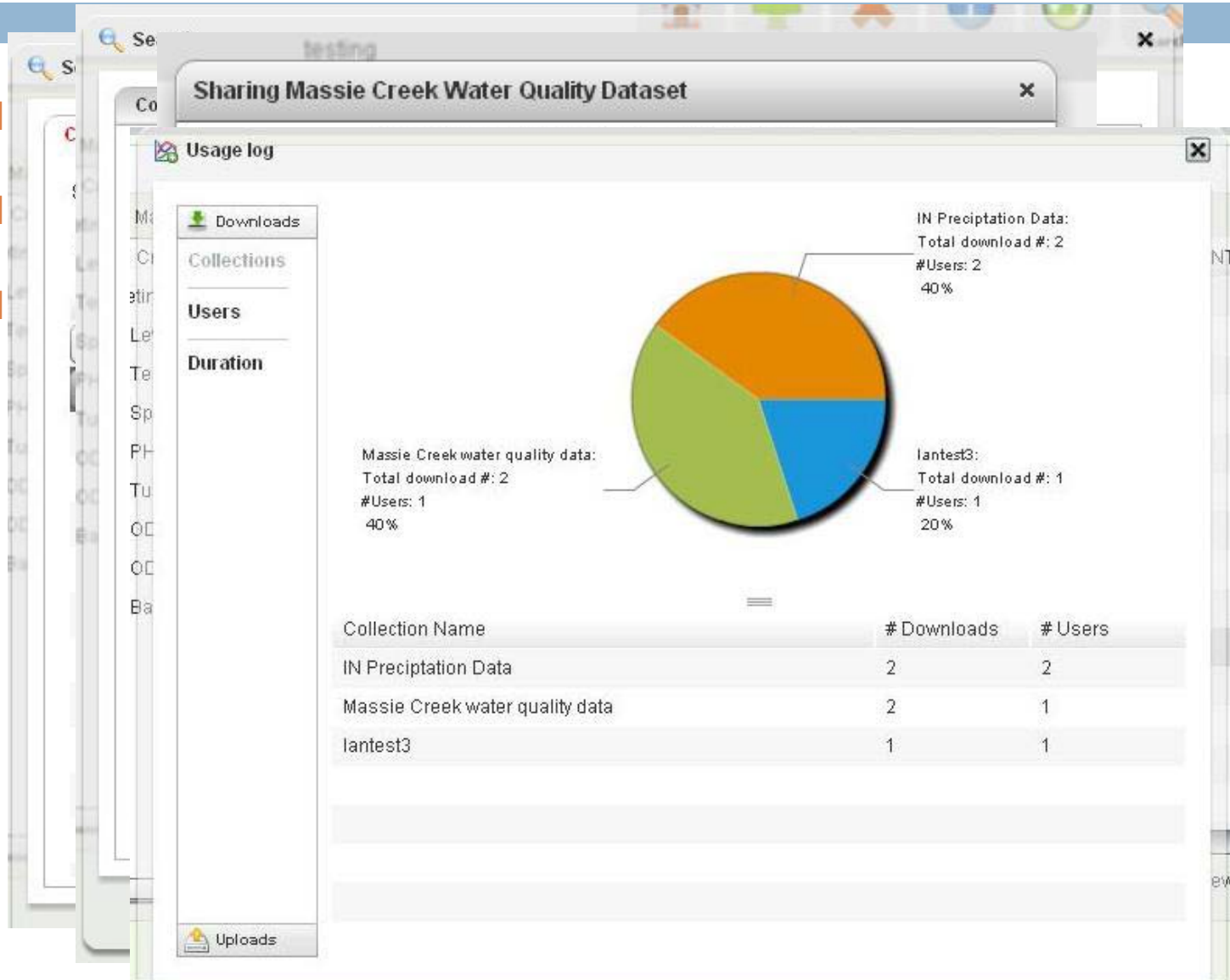
# iData – Publish, Browse and Discover

The screenshot displays the iData web application interface. At the top, there is a navigation bar with icons for Home, Add, Remove, Metadata, Refresh, Search, and Log. The main content area is titled "Data explorer" and shows the "Current Path : Massie Creek Water Quality Dataset". A sidebar on the left lists various data fields for selection, including Datetime, Avg Level (m), Avg Temp (C), Avg Sp Cond (uS/cm), Avg PH, Avg Turb+ (NTU+), Avg ODO Sat (%), Avg ODO (mg/L), and Avg Bat (V). The main table displays a list of data points with columns for Datetime, Avg Level (m), Avg Temp (C), Avg Sp Cond (uS/cm), Avg PH, Avg Turb+ (NTU+), and Avg ODO (mg/L). The table is currently showing 18 rows of data, with the 10th row (2010-10-01 03:0) highlighted. At the bottom, there are navigation buttons for "Prev" and "Next", a page number "1" out of "48", and a "View:" dropdown menu set to "20".

<input type="checkbox"/>	Datetime	Avg Level (m)	Avg Temp (C)	Avg Sp Cond (uS/cm)	Avg PH	Avg Turb+ (NTU+)	Avg ODO (mg/L)
<input type="checkbox"/>	2010-10-01 00:0	0.324	15.8	801	8.62	2.2	34
<input type="checkbox"/>	2010-10-01 00:3	0.325	15.75	801	8.62	2.4	35.1
<input type="checkbox"/>	2010-10-01 01:0	0.325	15.69	801	8.58	2.4	32.7
<input type="checkbox"/>	2010-10-01 01:3	0.326	15.64	802	8.6	2	27.1
<input type="checkbox"/>	2010-10-01 02:0	0.325	15.56	802	8.59	2.3	29.2
<input type="checkbox"/>	2010-10-01 02:3	0.325	15.5	803	8.55	2.4	26.1
<input type="checkbox"/>	2010-10-01 03:0	0.325	15.42	803	8.53	2.3	24
<input type="checkbox"/>	2010-10-01 03:3	0.324	15.33	803	8.51	2.4	22.3
<input type="checkbox"/>	2010-10-01 04:0	0.323	15.23	803	8.51	2.3	23.4
<input type="checkbox"/>	2010-10-01 04:3	0.322	15.14	804	8.54	2.4	22.7
<input type="checkbox"/>	2010-10-01 05:0	0.321	15.04	804	8.53	2.5	21.8
<input type="checkbox"/>	2010-10-01 05:3	0.32	14.95	804	8.46	2.5	19.9
<input type="checkbox"/>	2010-10-01 06:0	0.32	14.85	804	8.43	2.4	18.4
<input type="checkbox"/>	2010-10-01 06:3	0.319	14.75	804	8.45	2.3	15.5

# iData – Publish, Browse and Discover

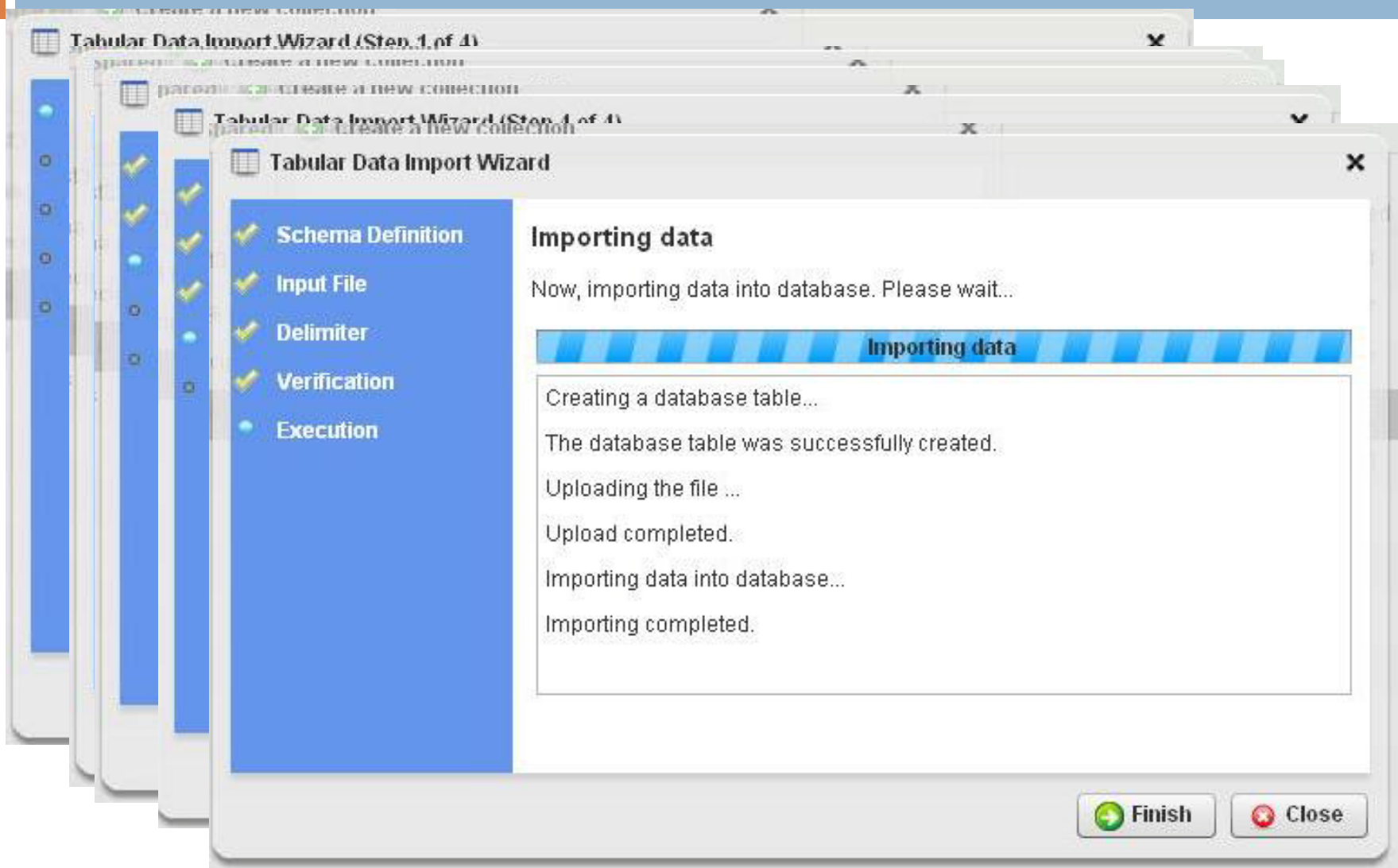
- 
- 
- 



making



# iData – Publish, Browse and Discover



# iData – Publish, Browse and Discover

- Data repository
  - iRODS server
  - MySQL
- Programming API
  - Flex 4.0
  - PHP for application logic
  - AMFPHP – Flex/PHP communication

# Metadata

- Data interoperability
- Diverse datasets and missing/existing metadata
- Use existing standards, provide flexibility
- Directory Interchange Format (DIF)
  - Compatible with ISO 19115 and CSDGM standards
  - Required elements, highly recommended elements, optional elements
  - NASA Global Change Master Directory  
<http://gcmd.gsfc.nasa.gov>

# Metadata

<Entry\_ID> 243912 </Entry\_ID>

<Entry\_Title>Real time data collection of water quality parameters for the Massie Creek, Ohio</Entry\_Title>

<Data\_Set\_Citation>

<Dataset\_Title>Real time data collection of water quality parameters for the Massie Creek, Ohio from October 1, 2010 to October 20, 2010.</Dataset\_Title>

<Dataset\_Series\_Name>Real time data collection of water quality parameters for the Massie Creek, Ohio</Dataset\_Series\_Name>

<Dataset\_Release\_Date>02/22/2011</Dataset\_Release\_Date>

<Dataset\_Release\_Place>auto - Purdue University, West Lafayette, IN</Dataset\_Release\_Place>

<Dataset\_Publisher>driNET</Dataset\_Publisher>

<Parameters>

<Category>EARTH SCIENCE</Category>

<Topic>TERRESTRIAL HYDROSPHERE </Topic>

<Term>WATER QUALITY/WATER CHEMISTRY</Term>

Need some way to include the data variables in the metadata. How and to what extent? Uniformity?

<Variable\_Level\_1>Water Level</Variable\_Level\_1>

<Variable\_Level\_2>Water Temperature</Variable\_Level\_2>

<Variable\_Level\_3>Water ph</Variable\_Level\_3>

<Variable\_Level\_4>Dissolved Oxygen</Variable\_Level\_4>

<Variable\_Level\_5>Water Turbidity</Variable\_Level\_5>

<Variable\_Level\_6>Conductivity</Variable\_Level\_6>

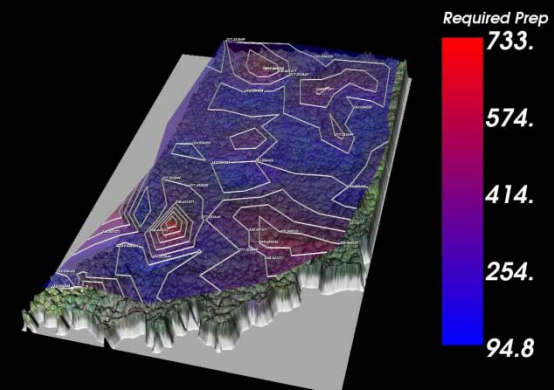
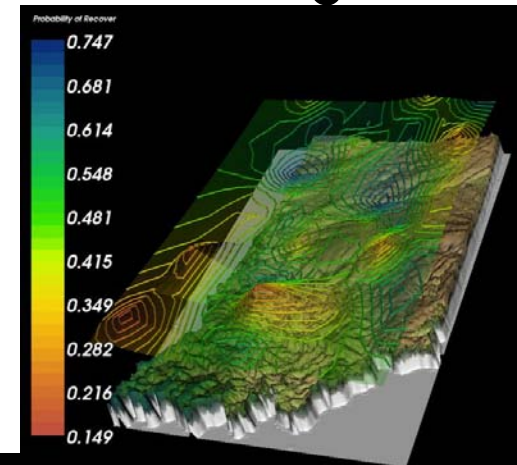
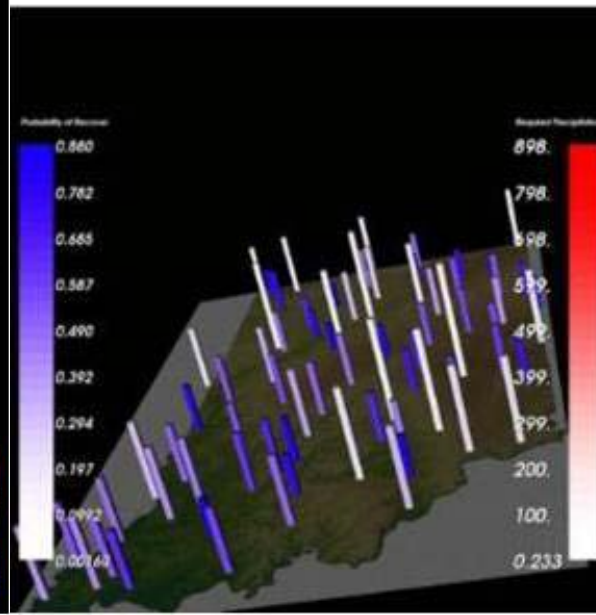
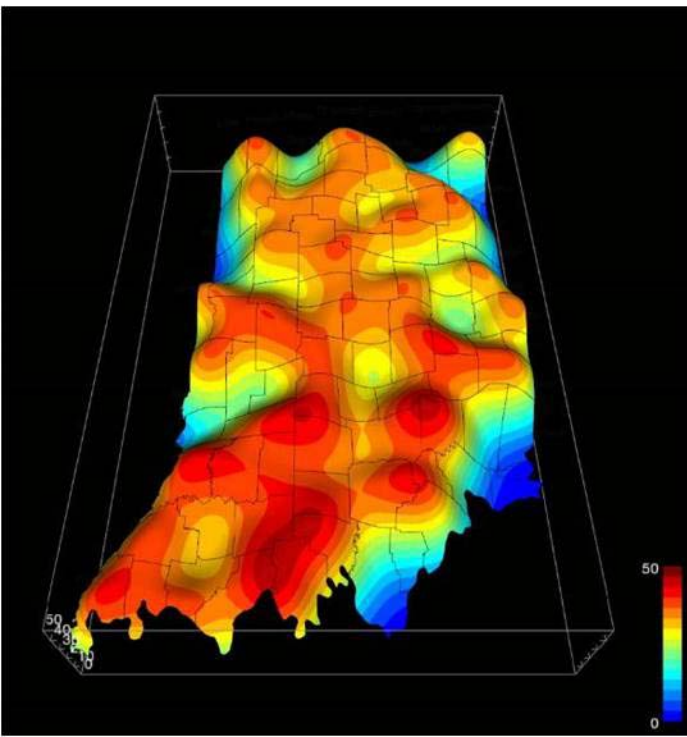
</Parameters>

# Educational Use

- AGRY 59800 - African Development Activities
- GIS software highly interactive course, examine agricultural, cultural, economic, environmental, and social aspects of sub-Saharan Africa
- 38 members from Purdue University, Ivy Tech Community College in Lafayette, Moi University in Eldoret, Kenya, and the University of Fort Hare in Alice, South Africa
- Group, forum, wiki, resource contribution/sharing, access control

# Educational Use

- CS 530 – Introduction to Scientific Visualization
- Student project to develop methods for visualizing drought prediction data



# Questions

- DRINET: <http://drinet.hubzero.org>
- Contact:
  - Carol Song ([carolxsong@purdue.edu](mailto:carolxsong@purdue.edu))
  - Lan Zhao ([lanzhaop@purdue.edu](mailto:lanzhaop@purdue.edu))
- Team:

Carol X. Song, Lan Zhao, Jaewoo Lee, Rao S. Govindaraju, Dev Niyogi, Jacob R. Carlson, Indrajeet Chaubey, Daniel Aliaga, Christoph Hoffmann