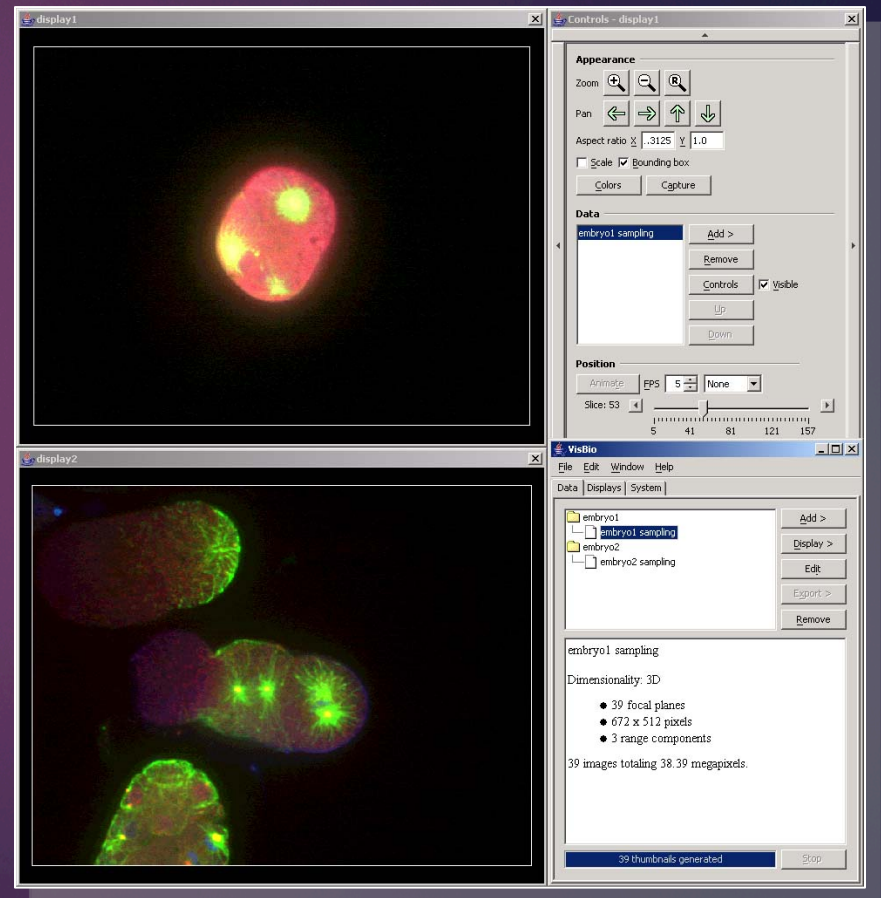# Visualization Notes

ILYA ZASLAVSKY

SAN DIEGO SUPERCOMPUTER CENTER

LMI WORKSHOP, HANOI, AUG 18-22, 2014

What is Information Visualization?

▶ Information visualization is the use of interactive graphical interfaces to display, measure, and understand large amounts of data.

▶ Information visualization combines the aspects of graphics, human-computer interaction, and human-information interaction.

Many visualization examples

- Many visualization systems, component of data analysis packages or separate

- Many purposes:
  - Better understanding of large volumes of data, "visual data mining"
  - Better interpretation and more efficient decision-making via "actionable" data summaries
  - Understanding dynamics, causes and effects
  - Part of workflows, eg for quality control
  - Alert/warning systems
  - Management dashboards
  - A way to communicate meaning of data, "tell a story"
  - Education, engaging different audiences, esp 'visual learners'

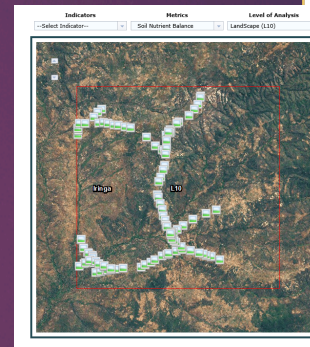# Interesting aspects

▶ Integrated visual analysis of data and images

▶ Cross-linked representation of scale-dependent data components: maps, charts, narratives, images; across scales

▶ Active visualization: encouraging users to experiment with and understand phenomena

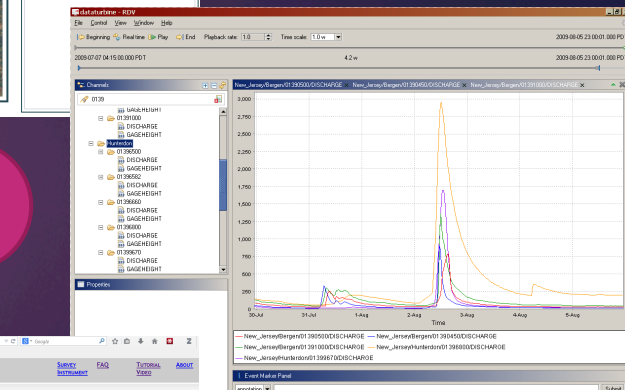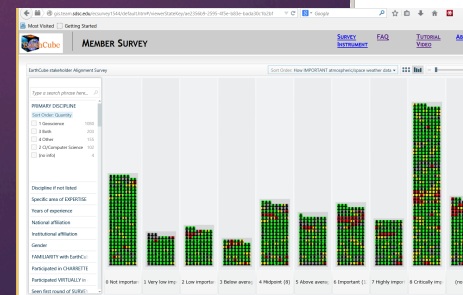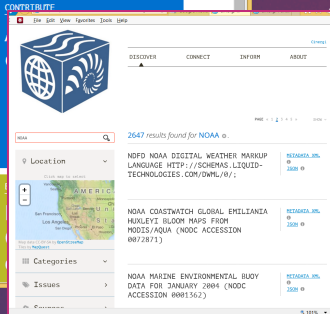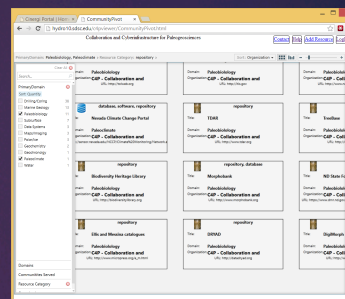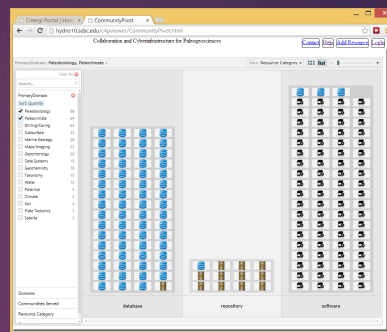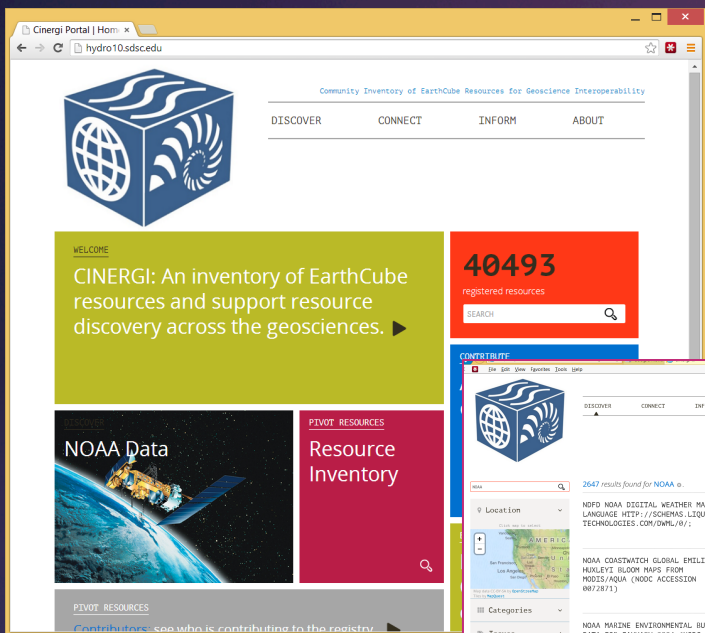▶ Better learning via new visual metaphors of traditional analyses, and animation
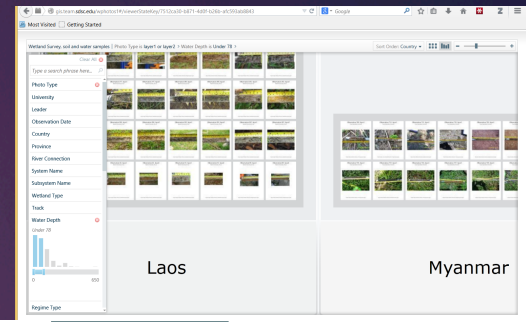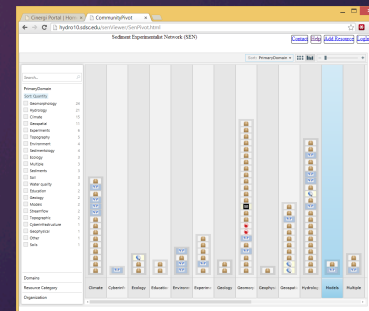
Metadata publishing in CINERGI

Domain Inventories

C4P RCN

SEN RCN

High-level assets

Domain workshops
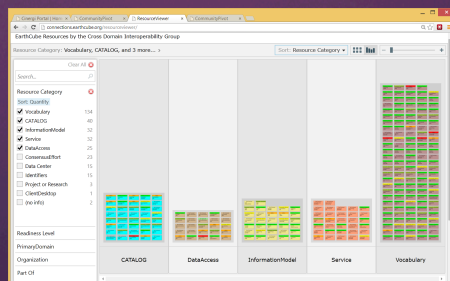
Catalogs

CINERGI

Community **In**ventory of **E**arthcube **R**esources for **G**eoscience **I**nteroperability

Demonstrations

1. **Visual analysis of data and images**
   - ▶ EarthCube Member Connections and Inventories
   - ▶ Soil samples in LMI wetlands
2. **Cross-linked representations**
   - ▶ Ecosystem services dashboard
3. **Real time data viewing**
   - ▶ Open Source Data Turbine
4. **New visual metaphors and animation**
   - ▶ Online collaborative survey data analysis

Open Source DataTurbine: streaming data middleware
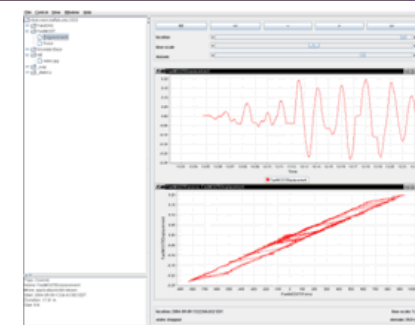
- Scalable, secure, programmable, versatile for different data types and vendor interfaces, developer community, with many applications written (e.g. data viewers and plug-ins); integrates with R, Kepler, CUAHSI HIS, cloud file sharing.

- Typical scenarios:

CS loggers

Loggernet

CS loggers

NI loggers

RBNB Data Turbine

DBMS

Monitoring and management apps

Other proprietary or in-house
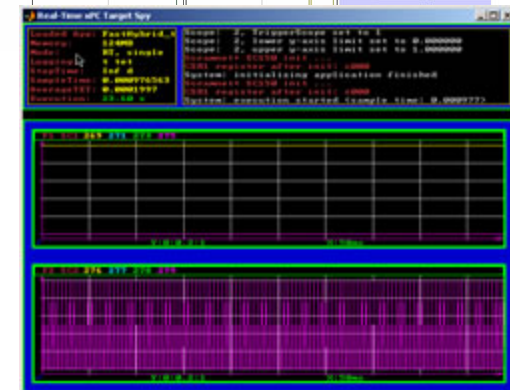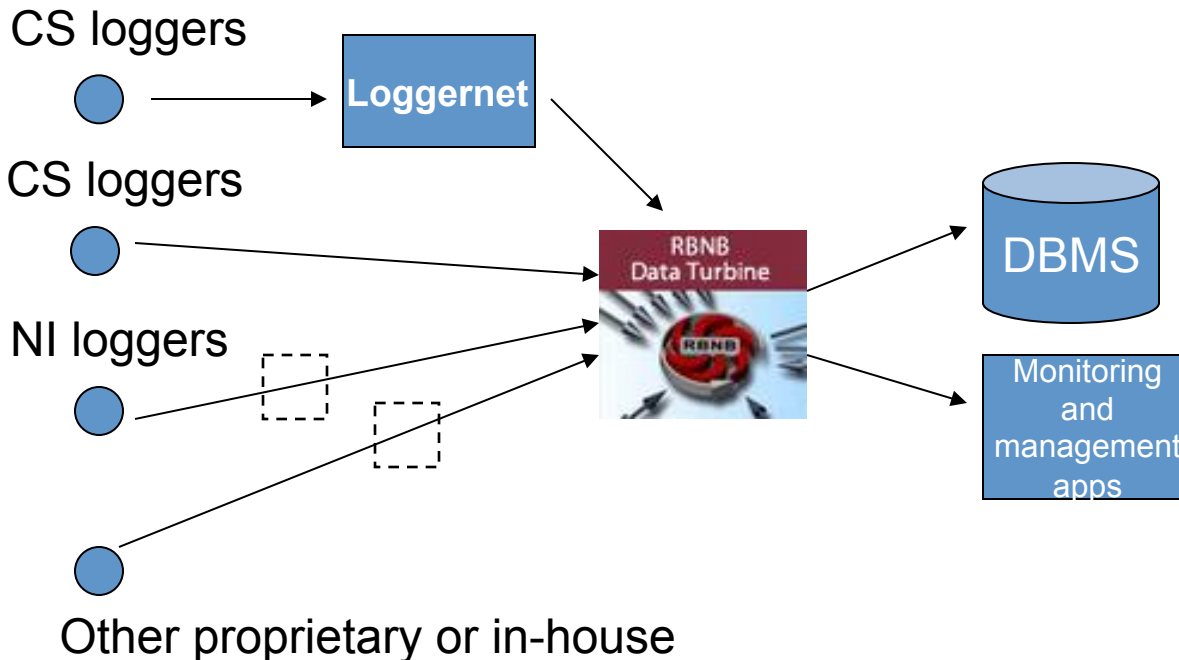
USGS NWIS Real Time CUAHSI Service

OSDT Custom Source
-Updated on timed intervals
-8000+ Sites

Passing USGS realtime data via OSDT

Data Turbine

RDV

Custom ODM Sync
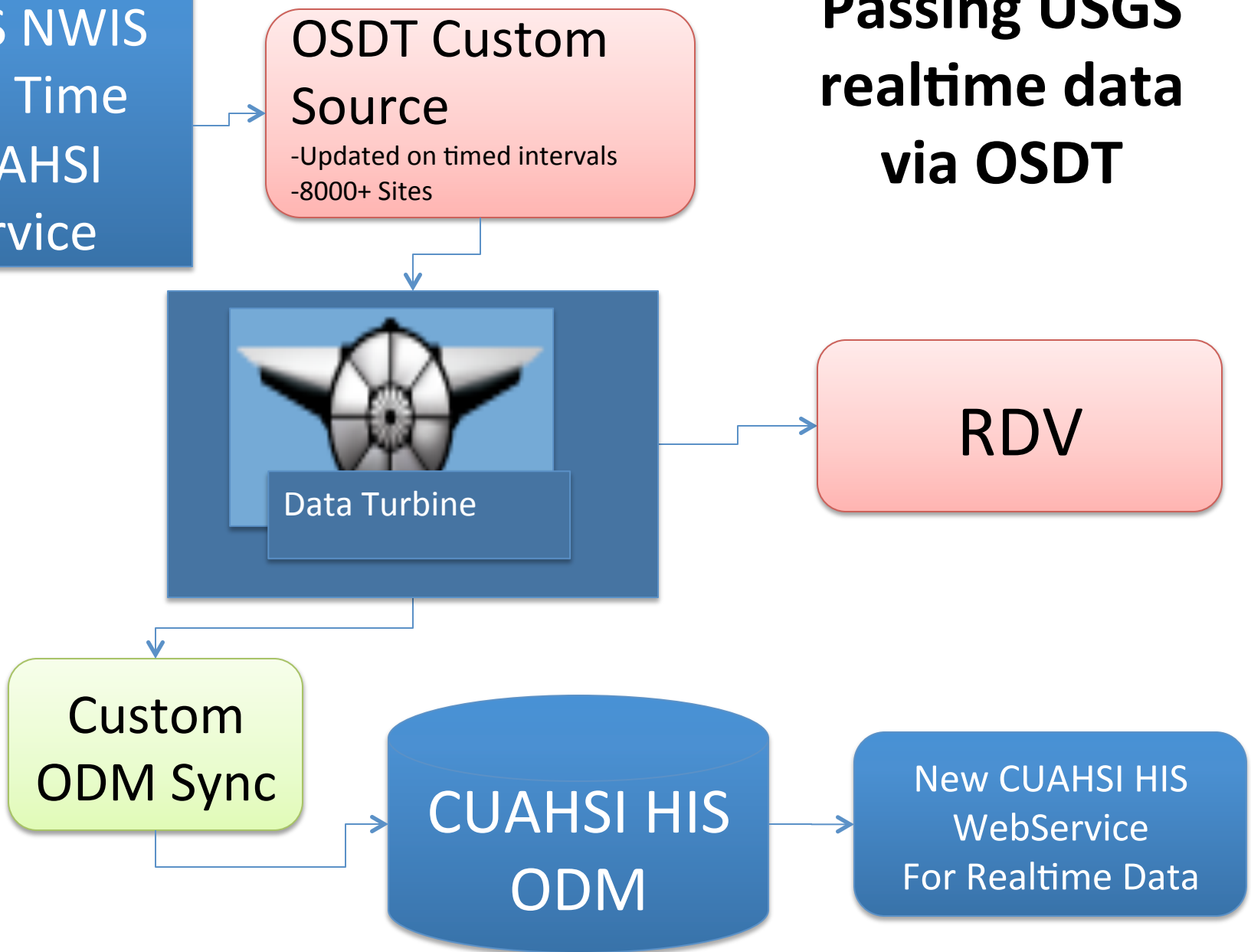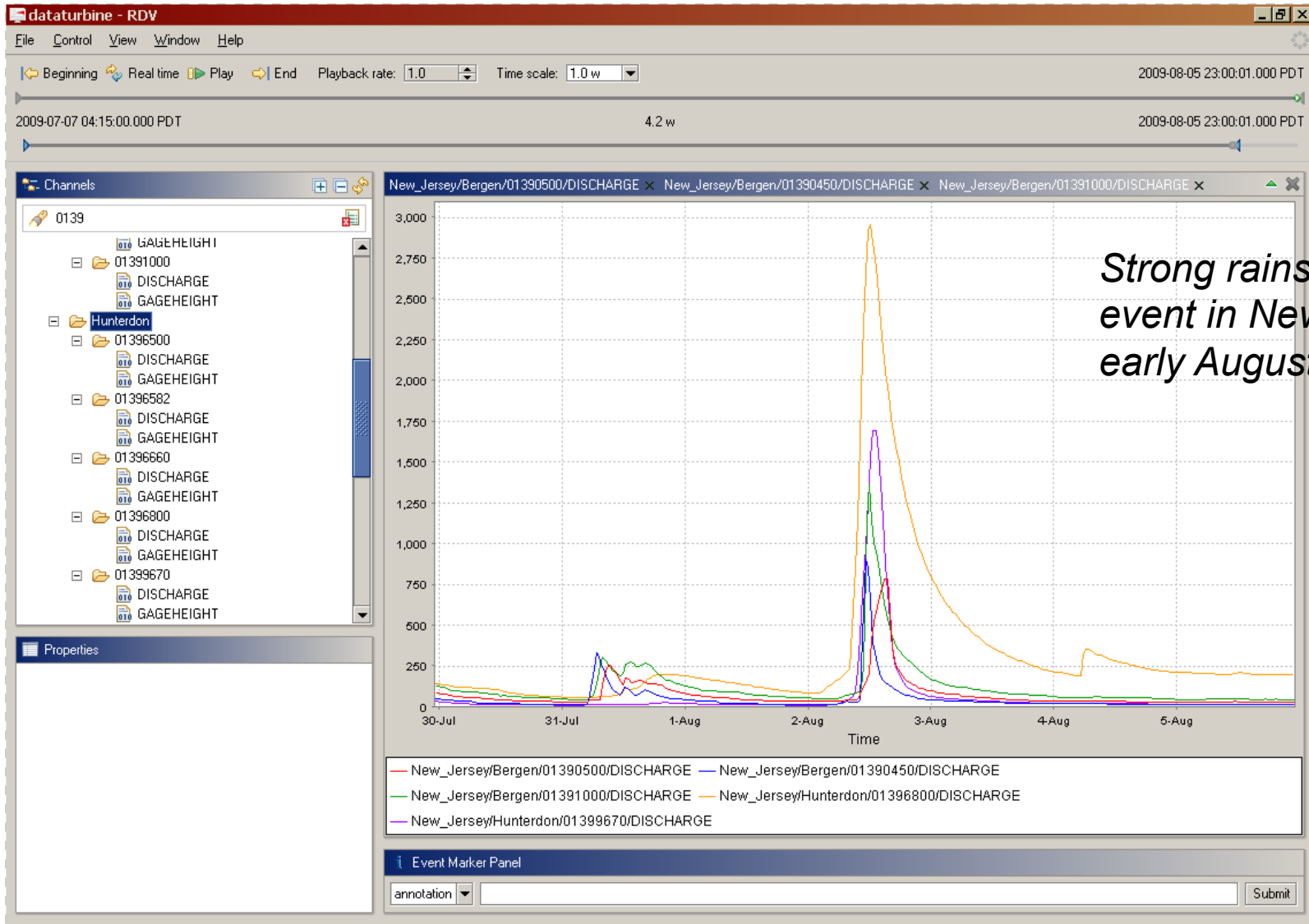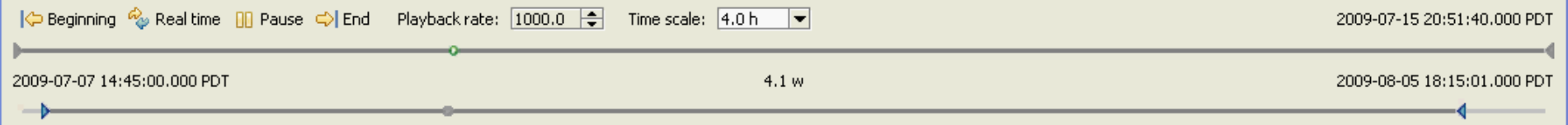
CUAHSI HIS ODM

New CUAHSI HIS WebService For Realtime Data

RDV: Realtime Data Viewer

*Strong rainstorm event in New Jersey, early August 2009*

dataturbine - RDV

File   Control   View   Window   Help

◁ Beginning   🔄 Real time   ⏸ Pause   ⇨ End   Playback rate: 1000.0 ⏶⏵   Time scale: 4.0 h ▾   2009-07-15 20:51:40.000 PDT

2009-07-07 14:45:00.000 PDT   4.1 w   2009-08-05 18:15:01.000 PDT

Channels

🚀

- ☐ 📁 01645704
  - 📊 DISCHARGE
  - 📊 GAGEHEIGHT
- ☐ 📁 01645762
  - 📊 DISCHARGE
  - 📊 GAGEHEIGHT
- ☐ 📁 01646000
  - 📊 DISCHARGE
  - 📊 GAGEHEIGHT
- ☐ 📁 01654000
  - 📊 DISCHARGE
  - 📊 GAGEHEIGHT
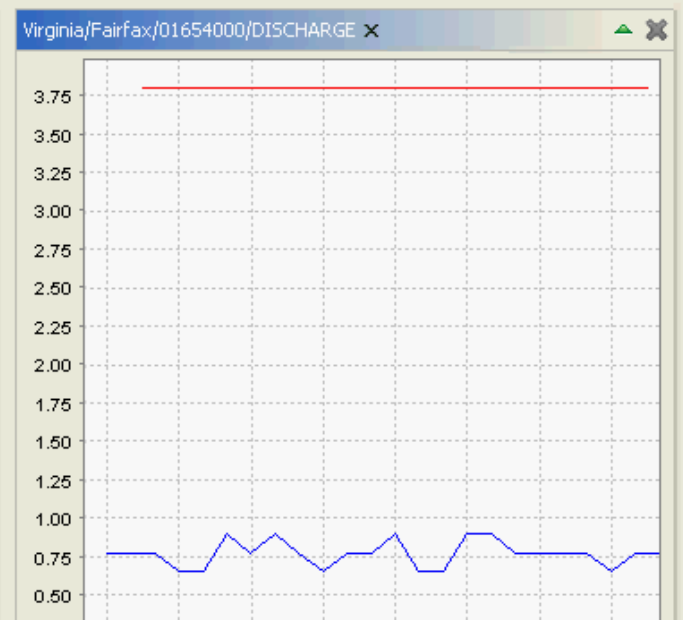- ☐ 📁 01656903
  - 📊 DISCHARGE
  - 📊 GAGEHEIGHT

Properties

Virginia/Fairfax/01656903/DISCHARGE
Numeric Data

Begins Tuesday, July 7, 2009 2:10.00.000 AM
Lasts 4.2 w
4 bytes

Virginia/Alexandria/01653000/DISCHARGE ✕

(Graph: Y-axis 0.0 to 20.0, X-axis Time 17:00 to 20:30)
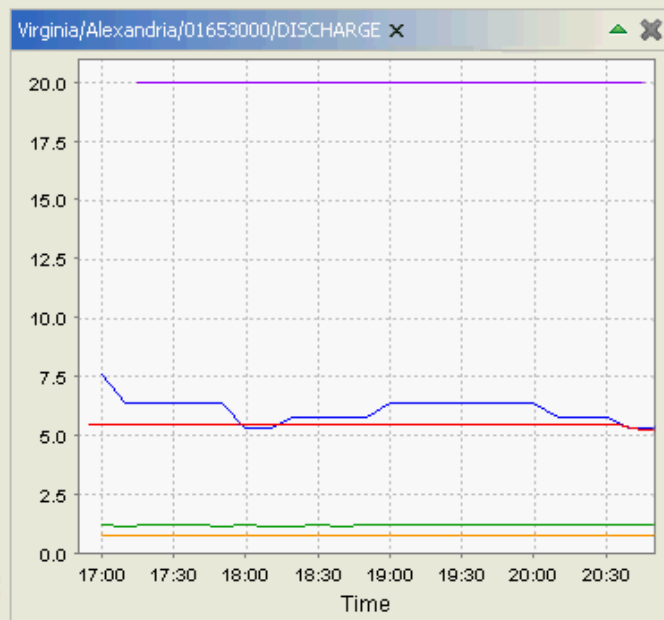
— Virginia/Alexandria/01653000/DISCHARGE
— Virginia/Arlington/01652500/DISCHARGE
— Virginia/Fairfax/01645704/DISCHARGE
— Virginia/Fairfax/01645762/DISCHARGE
— Virginia/Fairfax/01646000/DISCHARGE

Virginia/Fairfax/01654000/DISCHARGE ✕

(Graph: Y-axis 0.00 to 3.75, X-axis Time 17:00 to 20:30)

— Virginia/Fairfax/01654000/DISCHARGE
— Virginia/Fairfax/01656903/DISCHARGE

Event Marker Panel

annotation ▾ [   ]   Submit