Temporally Dynamic Representations of Continuous Monitor Data through Animated Graphing

9th National Monitoring Conference

Cincinnati, OH

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Continuous Monitors in the Delaware Basin

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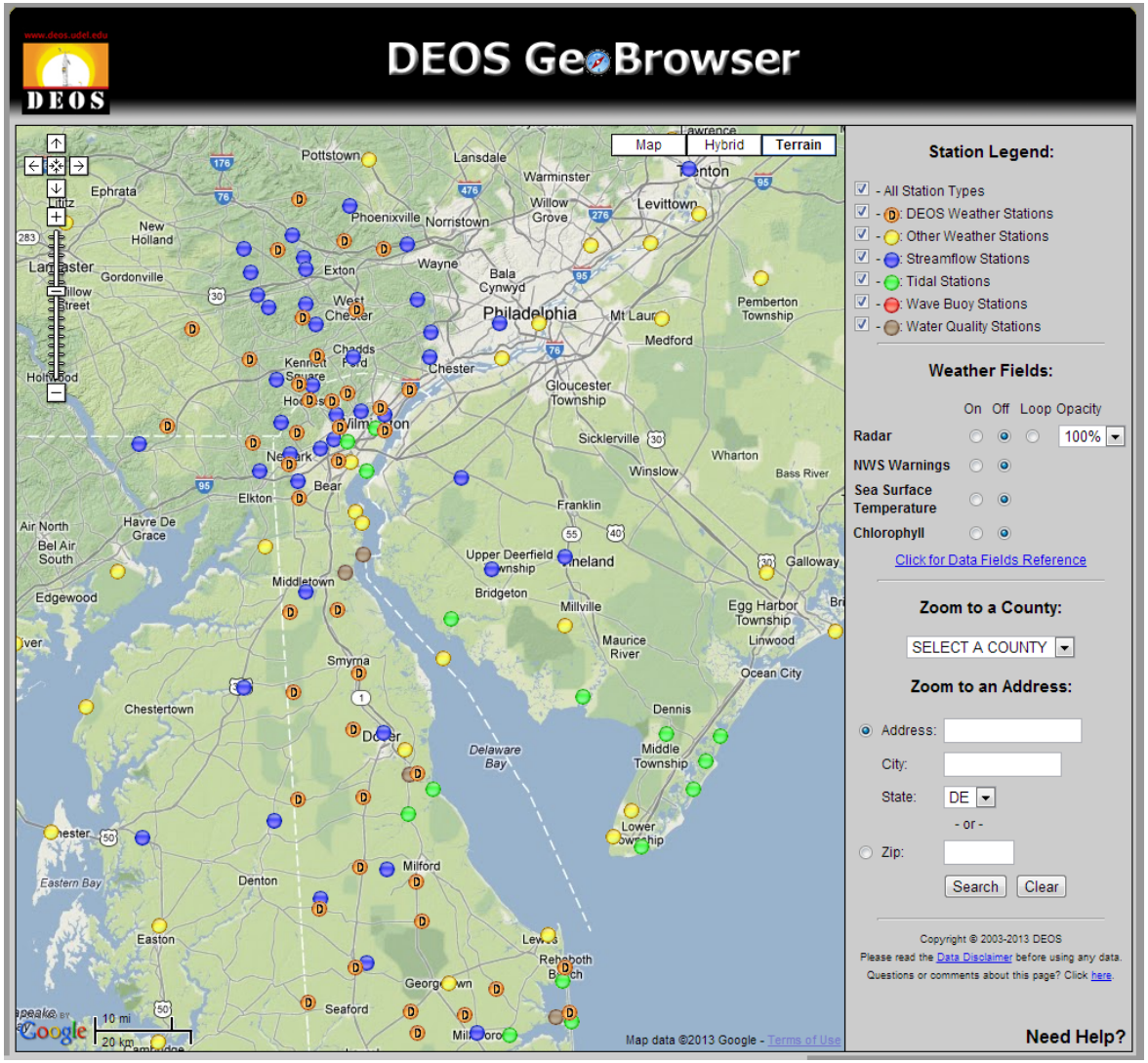
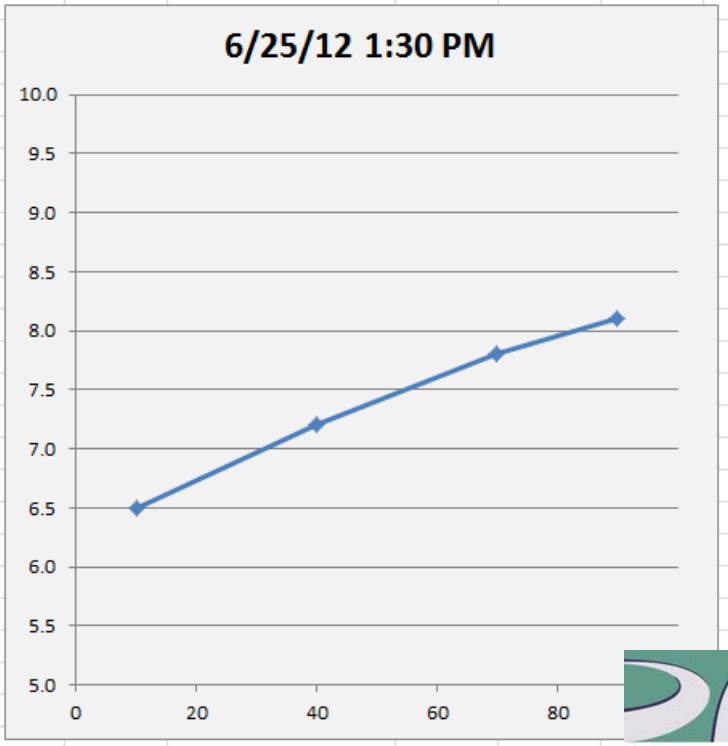


- **USGS**
  - Flow and Stage
  - Water Quality
- **NOAA (PORTS)**
  - Water surface elevations
  - Salinity
  - Water Temperature
  - Current
  - Meteorology
- **NOAA (NWS)**
  - Hydrologic predictions
  - Quantitative precipitation forecasts

‘Continuous’ Monitor Data

	A	B	C	D	E	F	G	H	I	J	K
1											
2		Dissolved Oxygen (mg/L)						6/25/12 1:30 PM			
3	Date & Time	RM 90	RM 70	RM 40	RM 10		RM	DO (mg/L)			
4	6/25/12 12:00 AM	8.1	7.8	7.2	6.5		90	8.1			
5	6/25/12 12:30 AM	8	7.6	7.1	6.6		70	7.8			
6	6/25/12 1:00 AM	7.9	7.4	7.0	6.7		40	7.2			
7	6/25/12 1:30 AM	7.8	7.2	6.9	6.8		10	6.5			
8	6/25/12 2:00 AM	7.7	7	6.8	6.9						
9	6/25/12 2:30 AM	7.6	6.8	6.7	7						
10	6/25/12 3:00 AM	7.5	6.6	6.6	7.1						
11	6/25/12 3:30 AM	7.4	6.4	6.5	7.2						
12	6/25/12 4:00 AM	7.3	6.2	6.4	7.3						
13	6/25/12 4:30 AM	7.2	6	6.3	7.4						
14	6/25/12 5:00 AM	7.1	5.8	6.2	7.5						
15	6/25/12 5:30 AM	7	5.9	6.1	7.6						
16	6/25/12 6:00 AM	6.9	6	6.0	7.7						
17	6/25/12 6:30 AM	6.8	6.1	5.9	7.8						
18	6/25/12 7:00 AM	6.7	6.2	5.8	7.9						
19	6/25/12 7:30 AM	6.6	6.3	6.0	8						
20	6/25/12 8:00 AM	6.5	6.4	6.2	8.1						
21	6/25/12 8:30 AM	6.4	6.5	6.4	8.2						
22	6/25/12 9:00 AM	6.3	6.6	6.6	8.3						
23	6/25/12 9:30 AM	6.2	6.7	6.8	8.4						
24	6/25/12 10:00 AM	6.4	6.8	6.9	8.2						
25	6/25/12 10:30 AM	6.7	7.0	6.9	7.9						
26	6/25/12 11:00 AM	6.9	7.1	7.0	7.7						
27	6/25/12 11:30 AM	7.2	7.3	7.0	7.5						
28	6/25/12 12:00 PM	7.4	7.4	7.1	7.2						
29	6/25/12 12:30 PM	7.6	7.5	7.1	7.0						
30	6/25/12 1:00 PM	7.9	7.7	7.2	6.7						
31	6/25/12 1:30 PM	8.1	7.8	7.2	6.5						
32											
33	Go										
34											
35											



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Why animate continuous data?

- More explicit representation of sequence;
- Immediately intuitive experience of very dense data sets;
- Combine and synchronize disparate data sets;
- Improved conceptual model of environmental processes;
- Templates facilitate processing of new data sets;

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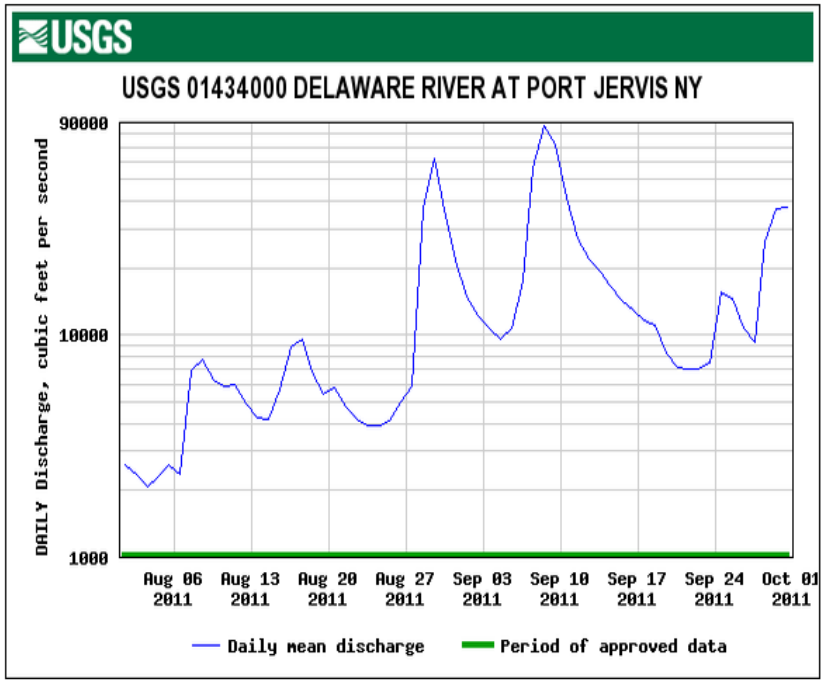
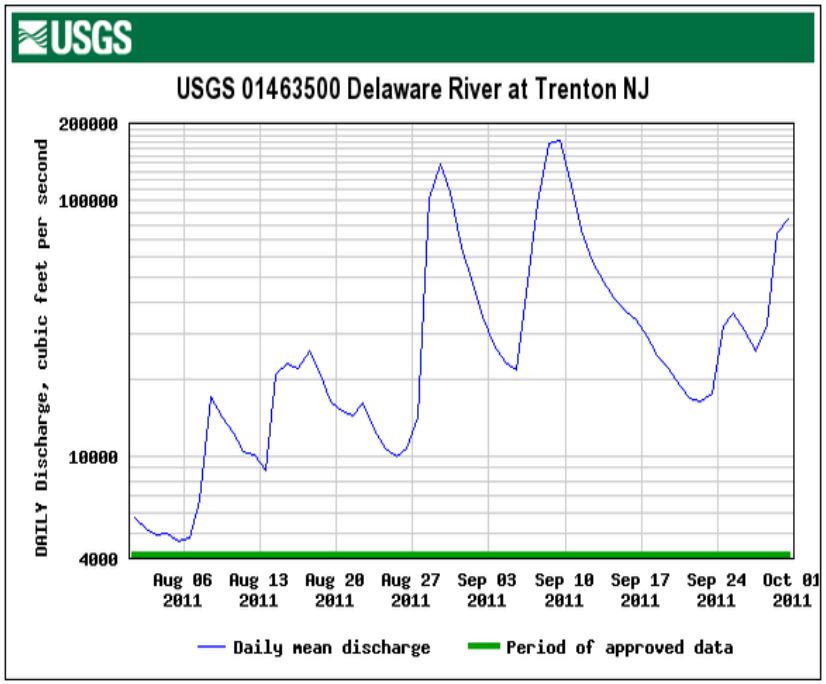
Sequence

- USGS Gages
- Hurricane Irene and Tropical Storm Lee
- When was flood threshold exceeded at different gages?
- Text book flood wave?

Video Link





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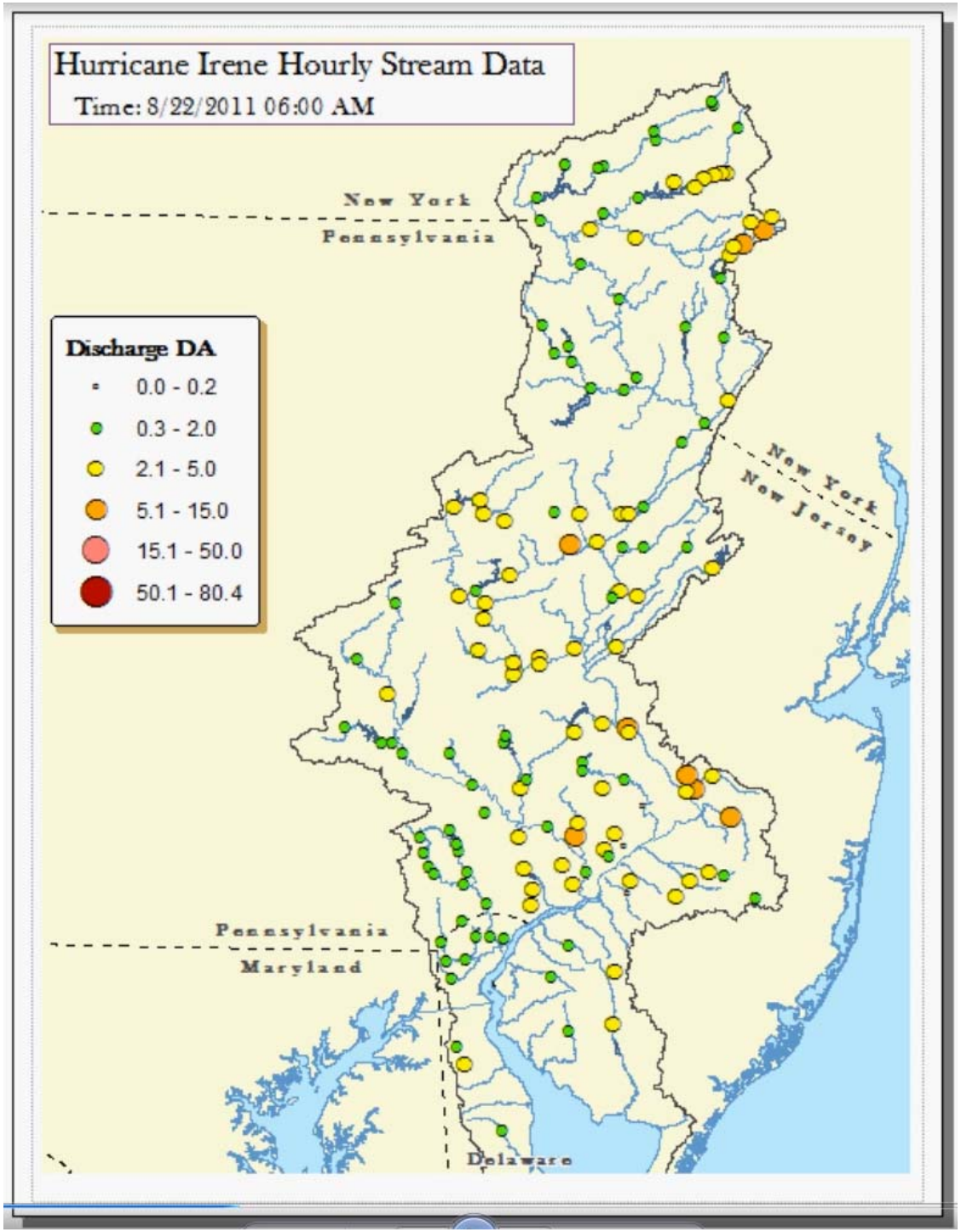
Sequence (whole basin)

- Automated program that pulls and processes data from all the gages in the basin.

Video Link



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Intuitive experience of dense data

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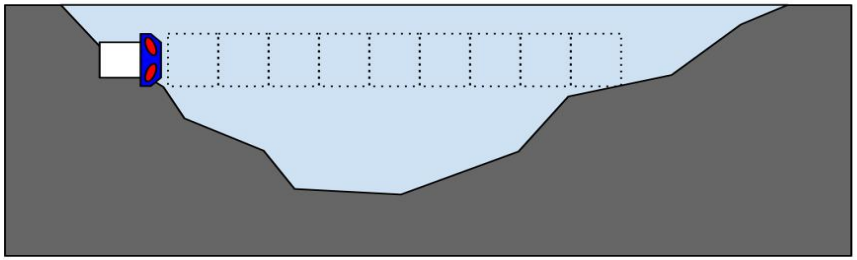
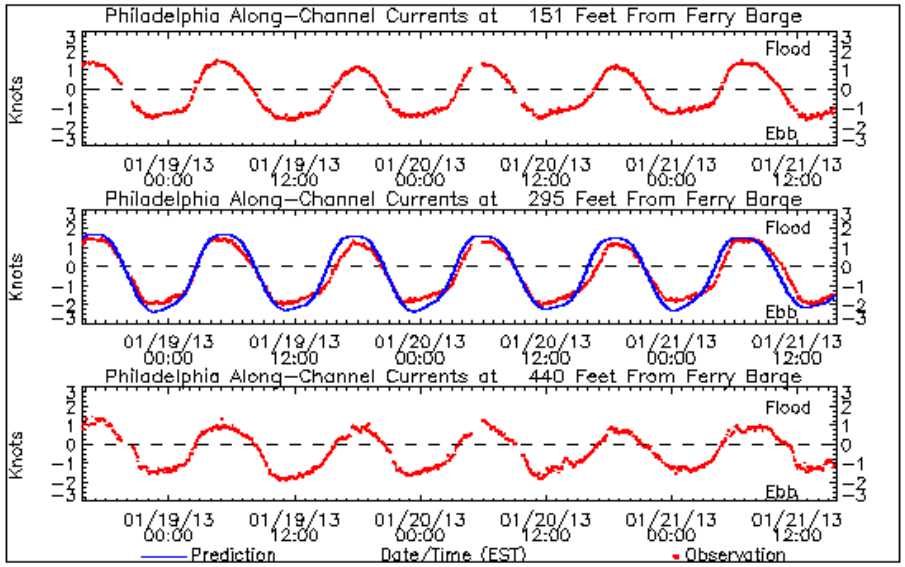
NOAA-PORTS

Side-Looking ADCP at Philadelphia





Video Link

The process for these images

- Uses VBA Excel;
    - the programming language behind MS Excel;

1. Create a static graph;
2. Read the data into arrays;
3. Step through the arrays, reading data back into the spreadsheet cells corresponding to the graph, updating the graph at each step;
4. Capture video using a video screen capture utility (Fraps).

5. Most code downloadable at http://adventuresindata.blogspot.com/

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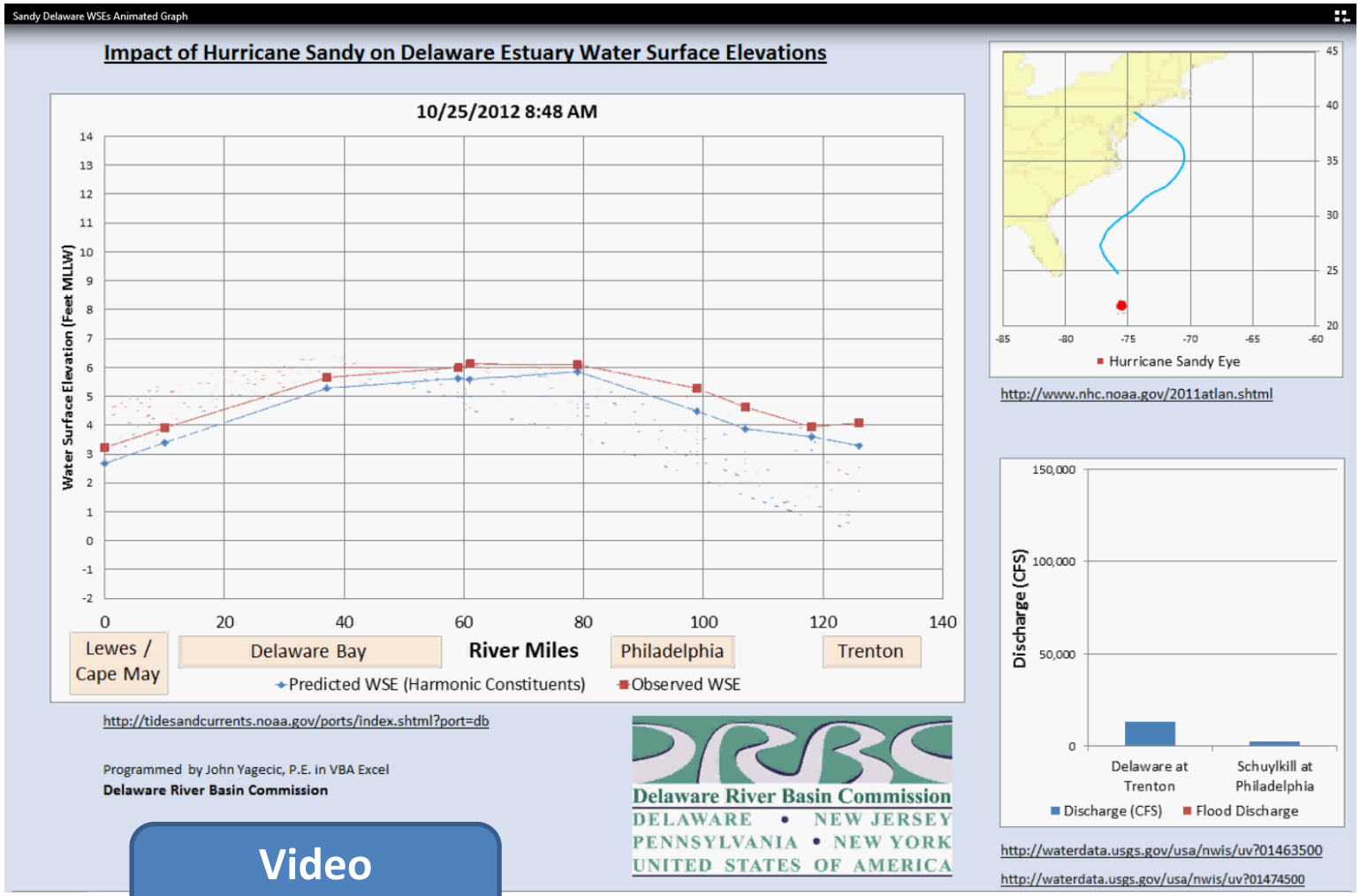
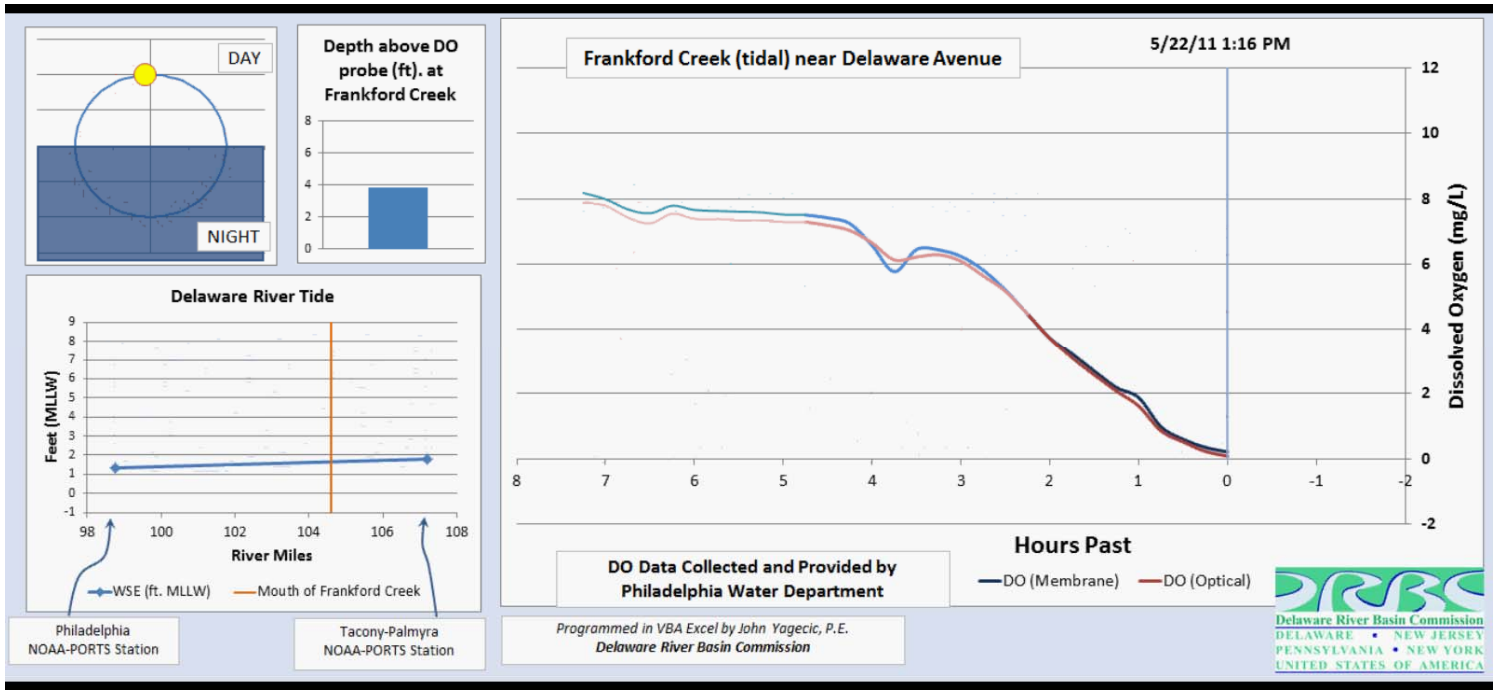
Improved Conceptual Model of Environmental Processes

Water Surface Elevations During Hurricane Sandy



Synchronization of Disparate Data Sets



- **Dissolved Oxygen measurements – Philadelphia Water Department;**
- **Tidal Elevations – NOAA PORTS**
- **Daily sunrise, sunset, solar noon**

Video Link

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Questions?

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