USGS
science for a changing world

Applied Physics Laboratory
University of Washington

Project Team: John Fulton, Dave Bjerklie, Toby Minear Scott Wright
U.S. Geological Survey
Gordon Farquharson
Applied Physics Laboratory – U of Washington

Our Story: Mine data at the reach-, regional-, and continental-scale; collect; and process riverine and reservoir data.

Leverage ground-based platforms including USGS streamgaging and stage-only stations, surface-water velocity radars, and hydroacoustic sites to support hydrodynamic models

Calibration and validation of SWOT and AirSWOT data: water surface elevations and derivatives: velocity, slope, streamflow, and reservoir storage.

Objectives and Approach

Scale

Reach-scale that coincides with SWOT elevation postings and conceptualized as a CV, where energy is dissipated and hydraulic variables are averaged.

Data Mining and Analysis

7,500 USGS gaging stations

- Stage and discharge
- Stage-only
- Index sites

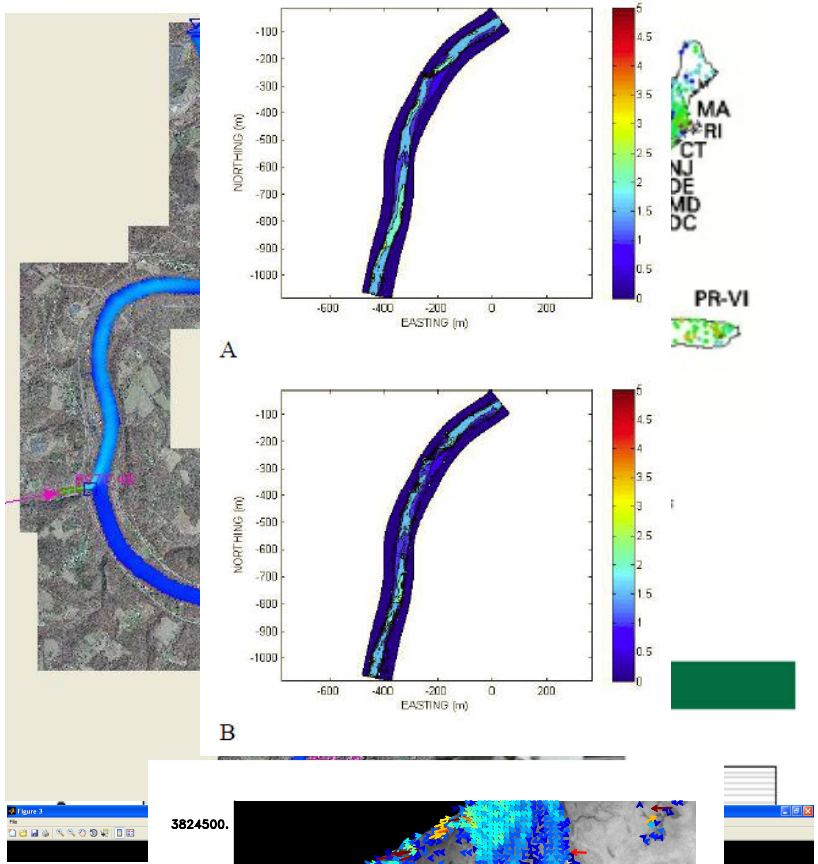
CWCM and microASAR

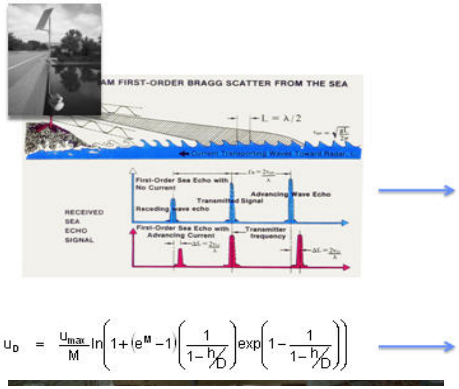
- Surface-water, mean velocit
- Information Entropy
- Most probable state - robus
- variables for different settin
- Inversion modeling to gener

Calibration and Validation

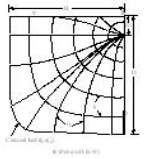
Measure parameters that ad
forecasts by reducing uncerta

- Velocity
- Surface water elevation and s
- Streamflow
- Bathymetry

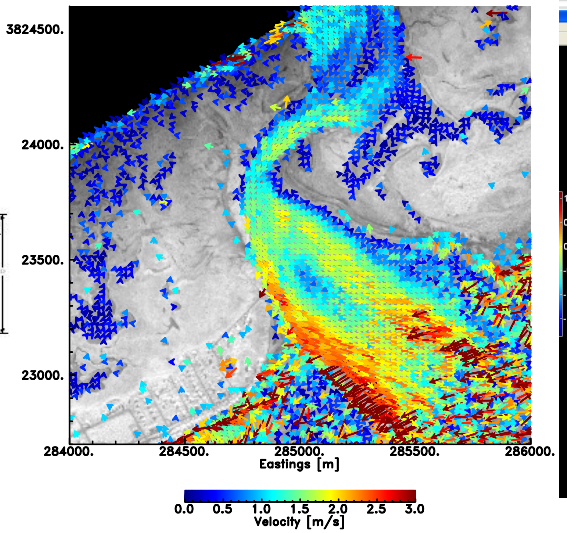




$$u_D = \frac{u_{max}}{M} \ln\left(1+(e^M-1)\left(\frac{1}{1-h/D}\right)\exp\left(1-\frac{1}{1-h/D}\right)\right)$$



$$Q = \phi\, u_{max} A$$



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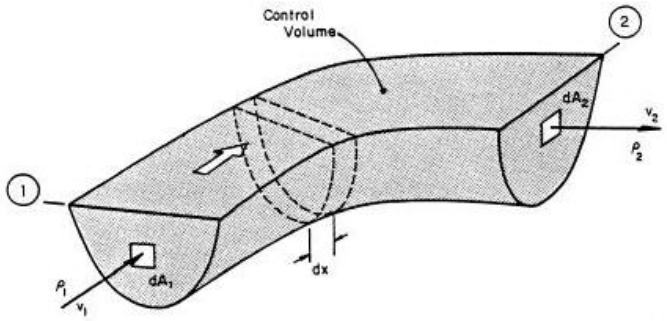

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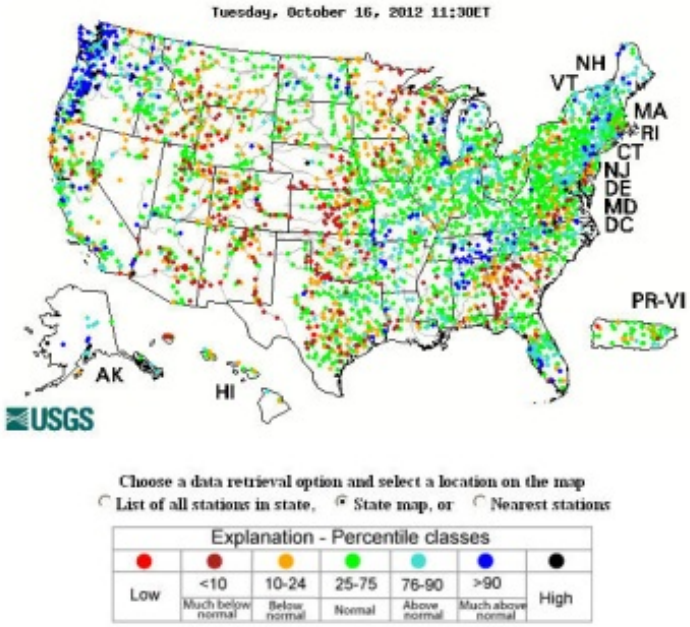

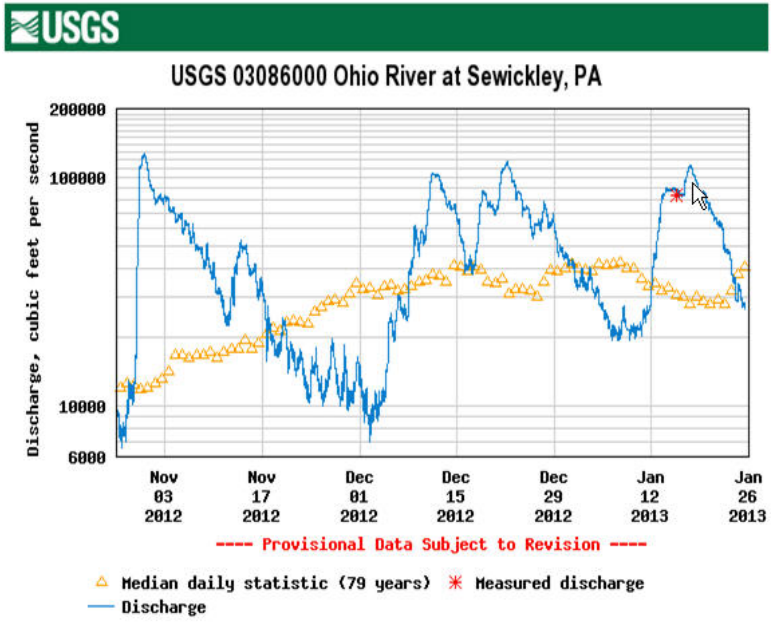

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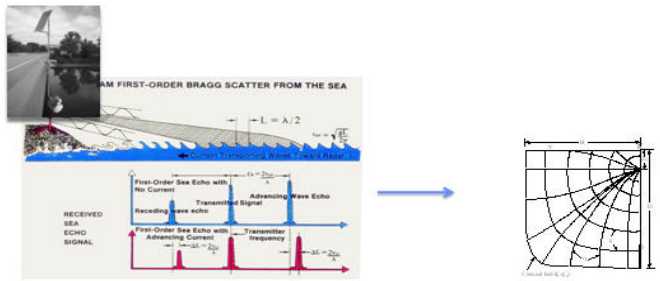

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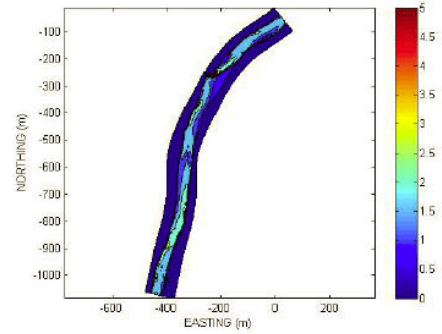

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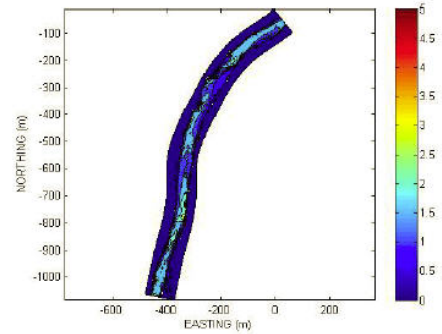

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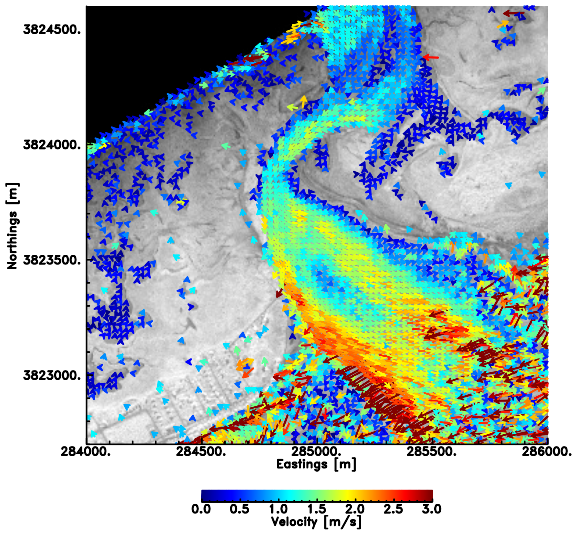

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Calibration and Validation

Measure parameters that add credibility to model forecasts by reducing uncertainty

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- Surface water elevation and slope
- Streamflow
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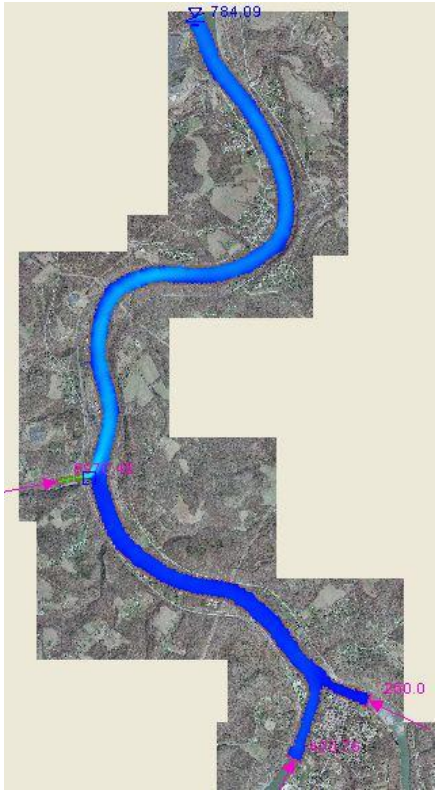

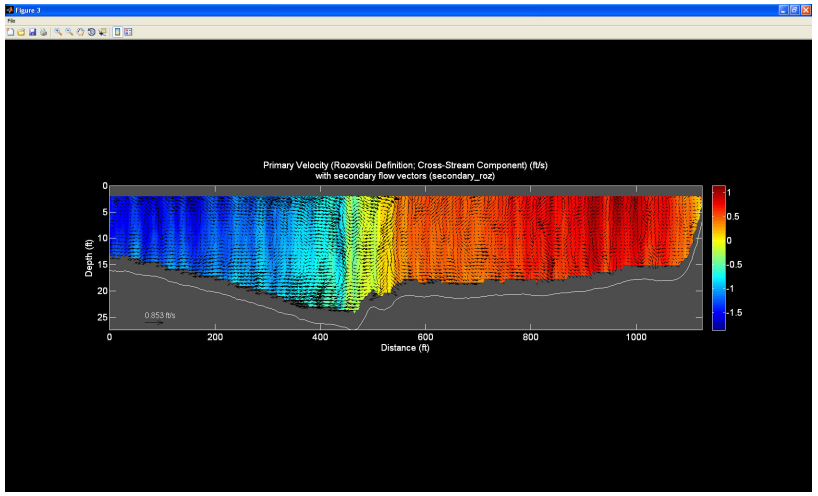

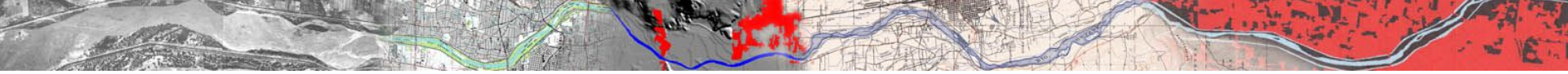

Phase-A SWOT Issues

NAWQA, ADAPS, Hydroacoustic and NWIS dBs.

Width, depth, velocity, streamflow, surface slope and Manning's n

ADCPs provide the cross-sectional depth and velocity field at varying discharges at specific cross-sections.

Bankfull hydraulic data sets obtained from the literature including width, depth, velocity and in some cases reach-average water surface slope and meander length.

Reach specific studies and data collection efforts

Ohio River, Mississippi River, Sacramento River, Connecticut River

Radar sites – using bridge and airborne deployments.

Analysis and modeling of data, characterization of hydraulic relations, field collection and modeling of unique comparative and calibration data sets.

Error analysis