

Approach

- Three-pronged approach
 - Fundamental Research
 - Technology Development
 - Education
- Multidisciplinary
- Organizational Involvement
 - Beacon Institute for Rivers and Estuaries
 - Clarkson University
 - IBM, Inc.
 - Other academic, private, non-profit, and public
 - General Electric, Inc. Limnotech, Inc., St. Regis Mohawk Tribe Env. Div.
- Funding through State, Federal and private entities
 - NSF, Syracuse CoE, NOAA

Fundamental Research

- Identify and understand critical variations and interactions in environmental drivers that will enable forecasting the state of Hudson River and Estuary systems for the advancement of science and the benefit of society
 - These drivers are biotic (biodiversity, invasive organisms, infectious diseases, biogeochemistry), abiotic (geochemistry, hydrology, climate), and social (economics, land institutions land-use and land-cover change)
- Develop a comprehensive computer model that will allow us examine various pathways of water sustainability (and resource utilization), against the backdrop of land-use variability and changing climate patterns
 - Capacity to output water levels at the watershed scale accompanied by bio-geochemical processes
 - Based on existing US EPA watershed delineation scheme
 - Basin-wide water quality studies
- Assess the socio-economic implications of the various pathways and examine the potential effects of intervention through policy and public education

REON Development Framework

- Invoking “Smart Sampling”
 - Real time - Long-term (years to decades)
 - Multiple Scales (um – 100s km, seconds – decades)
 - Very high frequency
 - Minimize Human Factors
 - In situ
 - On board Logic & Control
 - Data Telemetry
 - Auto (QA/QC), In situ calibration, Robotic system to protect and maintain sensors & Improve duty cycle
 - Real time GIS “visualization of large data sets”
 - Data Management - Cyber-infrastructure
 - Cost effective
- Year-round deployment
 - Sub-surface vertical profiling system

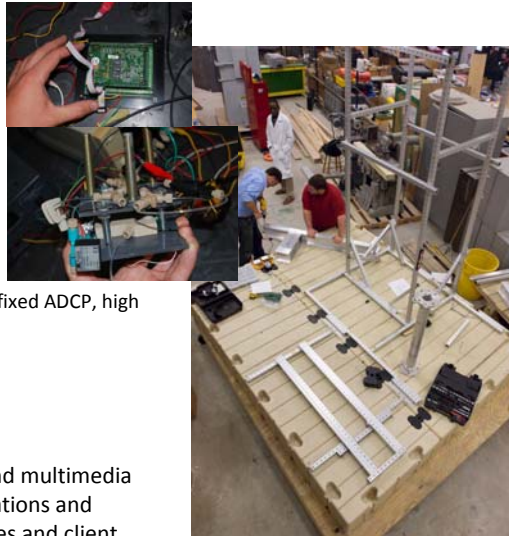
REQUIRES NEW TECHNOLOGY

Technology Development

- Center for Advanced Environmental Technology
- Old Main Building, Downtown Potsdam
 - Comprise approximately 13,000 sq.ft. of space
 - Will provide engineering functions in support of the REON efforts
 - Design, fabrication, construction, testing and eventual commercialization of technology
 - 2500 sq.ft. of high-bay space for assembly
 - 225 sq.ft. (15 ft. deep) test- tank
 - 5000 sq.ft. for offices and meeting rooms
 - 5500 sq.ft. of technology development and testing/ instrument calibration facility
 - Facility will also support undergraduate and graduate education, post-doctoral research and instruction by providing hands-on experiential opportunities for students
 - Facility will include
 - Pre-deployment and post-deployment testing, cleaning, and re-calibration
 - Robotics laboratory with capacity to accommodate up to 20 electronic workbenches
 - A wet-chemistry unit occupying 500 sq.ft. of space
 - Support the development of new and innovative chemical and biological sensors
 - Cybercollaboratory to facilitate exchange and dissemination of information

Technology Development

- Beacon
 - Laboratory at Potsdam
 - Denning's Point
- Clarkson
 - Sensors
 - Aquatic water quality
 - Precipitation
 - Atmospheric
 - Deployment Platforms
 - Fixed robotic, mobile robotic, fixed ADCP, high frequency radar
 - Deployment Schemes
- IBM
 - Cyberinfrastructure (CI)
 - Integration of real-time data and multimedia streams from measurement stations and sensors, with databases, services and client interfaces tuned to handling observational data
 - Data QA/QC

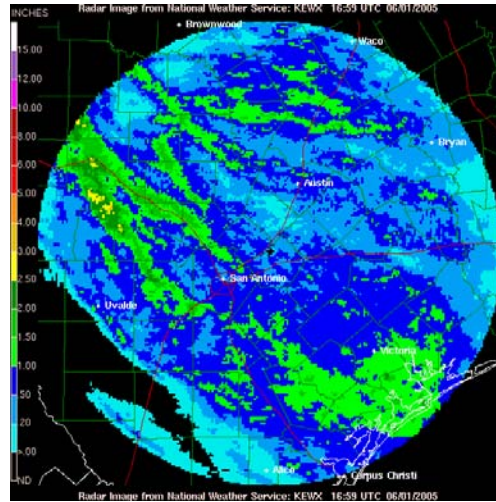
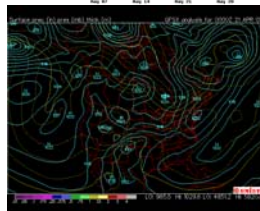
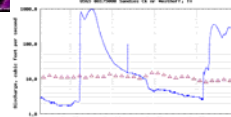
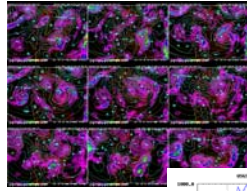


Technology Development

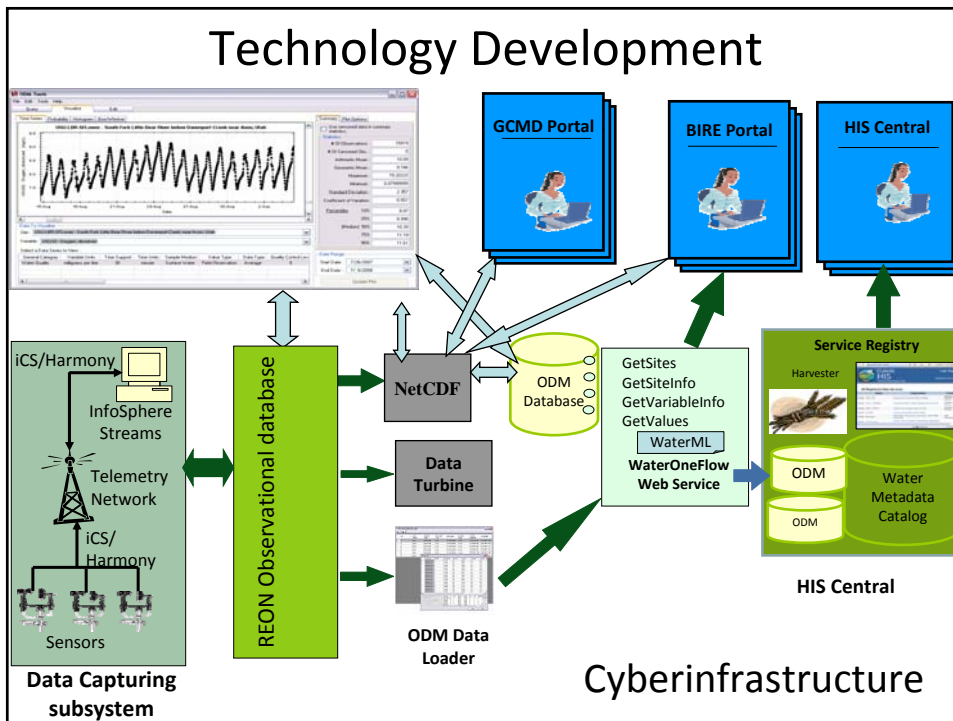
- Sensor Network Functionality
 - Data Operations
 - Interface Operations
 - System Management
 - Event-Triggered Sensing and Actuated Sampling
 - Sensor and Sensor Network Metadata
- Network Communications
 - Architecture and Interface Standards
 - Communications Options
- Sensor Needs
 - Aquatic Systems
 - Terrestrial and Subsurface Systems
 - Atmospheric Systems

Technology Development

Ingestion of NEXRAD/Doppler Radar into hydrologic model



Technology Development



Education and Outreach

- State of the art facility at Denning's Point
 - Serve as an environmental observatory operation and control center
 - 6000 sq.ft. will be dedicated to various laboratories equipped to perform several functions
 - Providing teaching and instruction in several K-16 STEM (science, technology, engineering and math) areas
 - Teachers, industry practitioners, policy makers will have access to instructors from collaborating educational institutions for short courses, earning CEU (continuing education units) credits and teachers certification and workshops
- Administration, auditorium and utilities
 - Approximately 3400 sq.ft. with Guest Offices to accommodate visiting scientists
 - Cybercollaboratory to facilitate exchange and dissemination of information with other researchers, the general public and stakeholders
- 2600 sq.ft. of space will include 3D visualization facilities
 - Provide an immersive learning environment incorporating live data feed from the REON sensor nodes and output from predictive models
 - Providing simulation capabilities for dynamic virtualization of sensor deployment platforms

Education and Outreach

- Workforce development
 - Tech Valley High School
 - ITEST (SENSE IT)
 - K-16
 - CEU



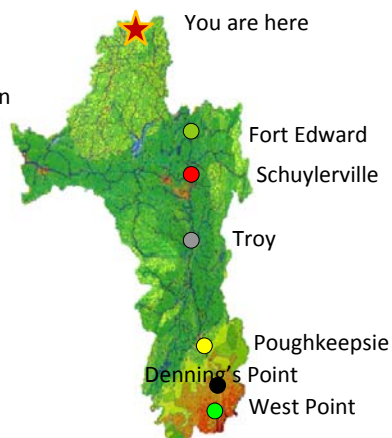
Education and Outreach

- **Student Enabled Network of Sensors for the Environment using Innovative Technology (SENSE IT)**
 - Focus its efforts in the Hudson River Valley and the St. Lawrence River Valley regions in New York State
 - 3,000 high school students from three distinct residential population areas, rural (Potsdam), urban (Troy), and suburban (Beacon) and span a socioeconomic and racial spectrum
 - 60 teachers in the region engaged in summer workshops and training

REON Network Nodes

Fixed platform

- CTD
- Particle size distribution
- Met Station
- 3- ch. fluorometer
- Optical DO
- ADCP



ADCP



Mobile platform

• Varied Land Usage

- Urban
- Suburban
- Wilderness
- Rural

• Forest to Sea

• White Water to Blue Water

Proposed Collaborative Framework

- Environmental Engineering & Monitoring
 - Basin-wide monitoring and water quality modeling
- Water Resources and Hydrology
 - Understanding the system dynamics
 - Predicting fate & transport
- Geosciences
 - Studying impact of predicted future climate variability on water quality and marshland
- Social, Behavioral and Economic Sciences
 - Socio-economic impact of change in land-use pattern in Hudson River Watershed
- Biological Sciences
 - Impact of land-use variability and changing climate on aquatic health
- Education
 - Education and Outreach

