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Water Quality Monitoring: Sensing and Analysis

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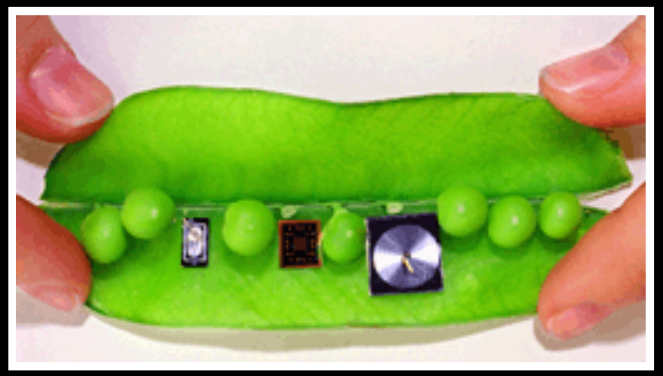
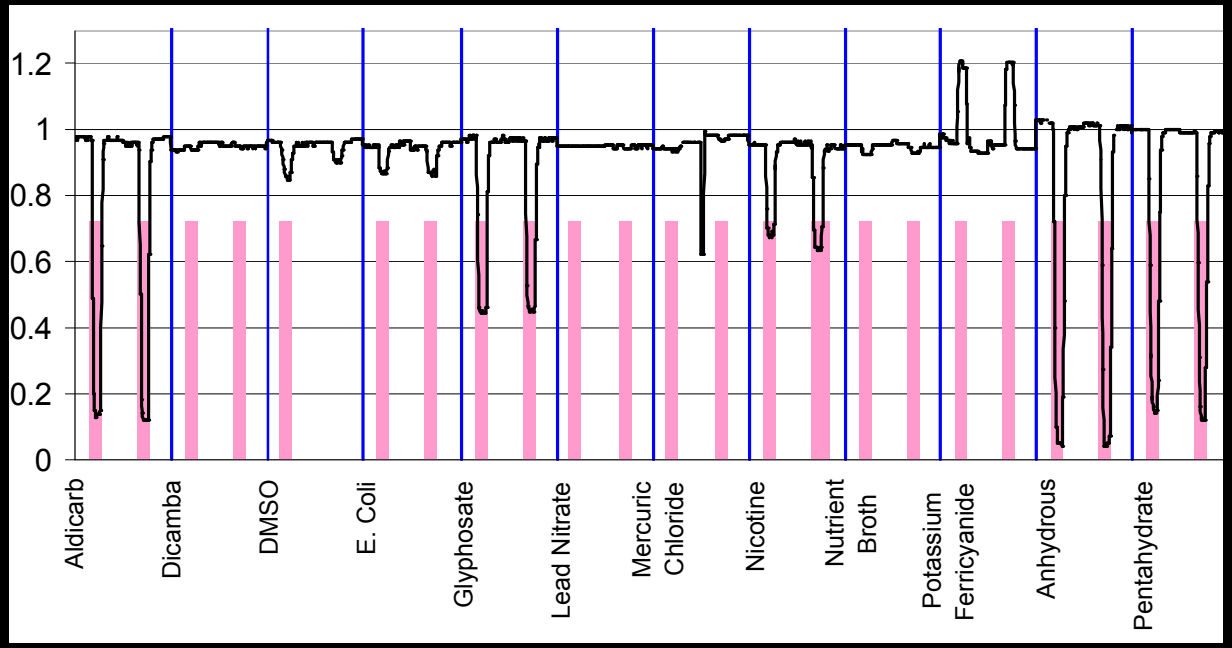
Water Quality Sensors

The Goal:



The Reality:

Water Quality Changes



Hall, et al., 2007,On-line water quality parameters as indicators of distribution system contamination, AWWA Journal

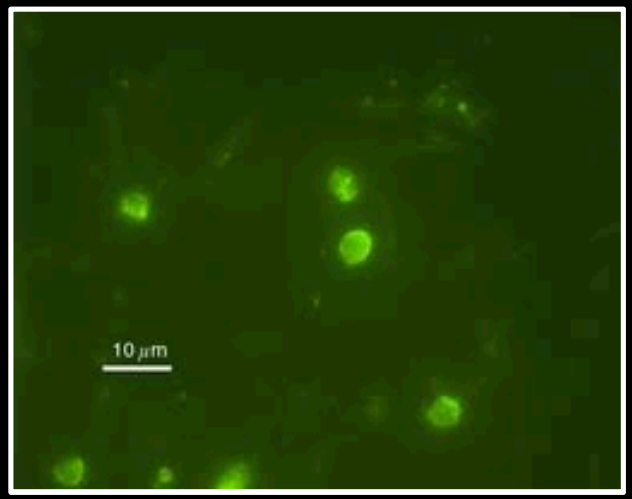
Ongoing Sensor Developments

Light My Way

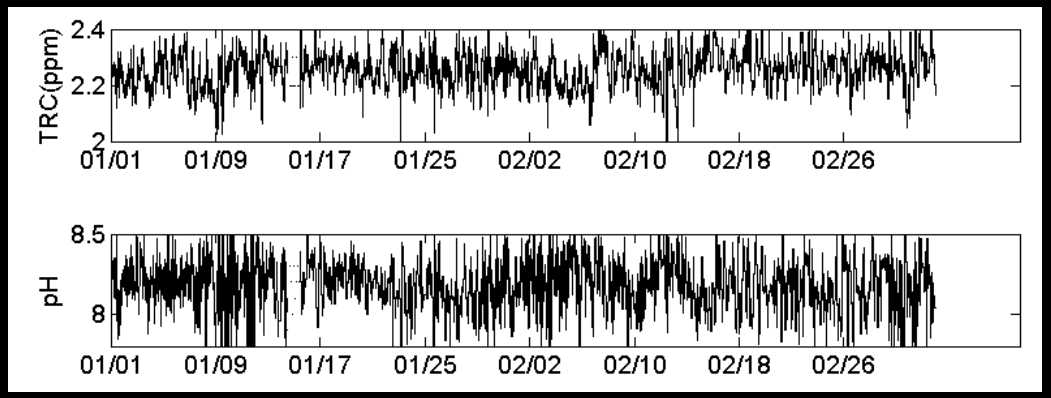
Multispectal and refractive index approaches

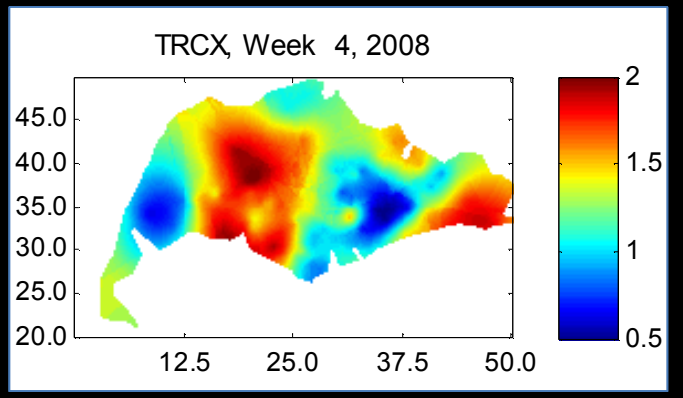
Biologicals

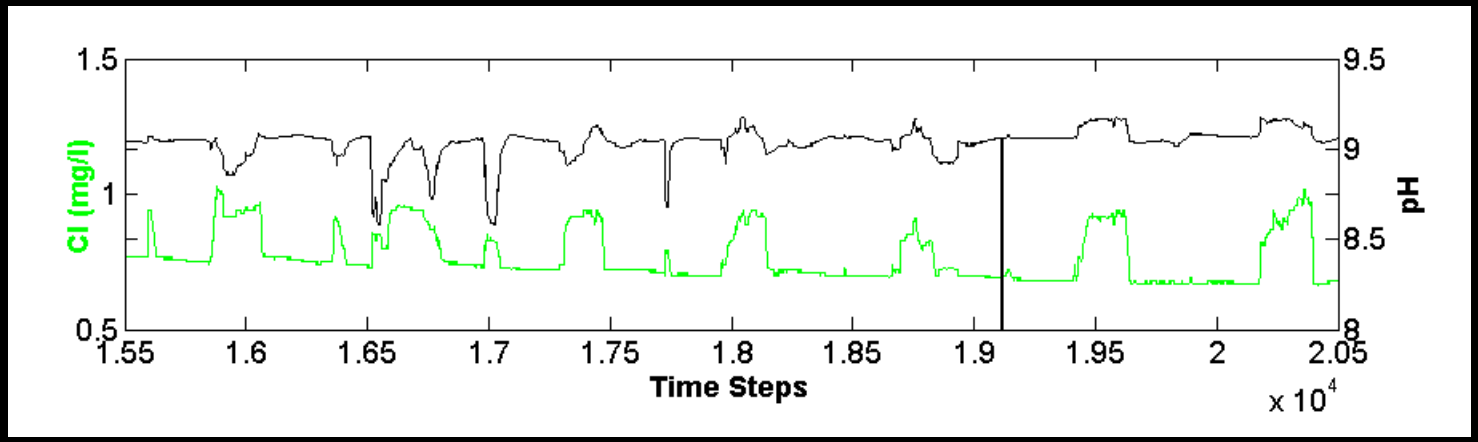
Particulates, Pre-concentration



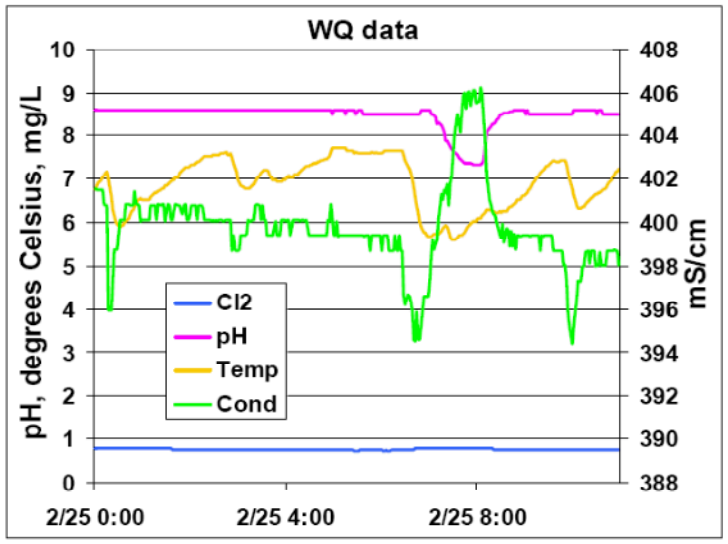
Variability

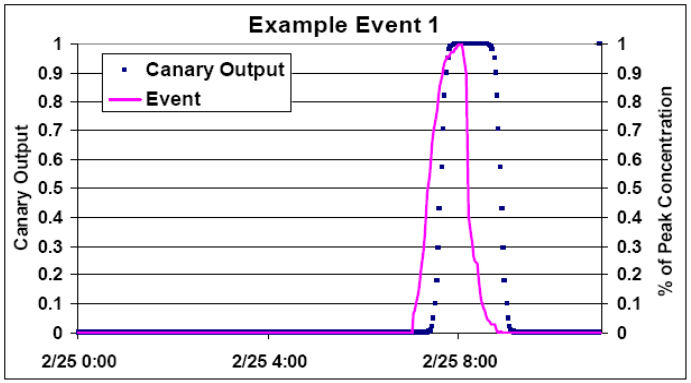






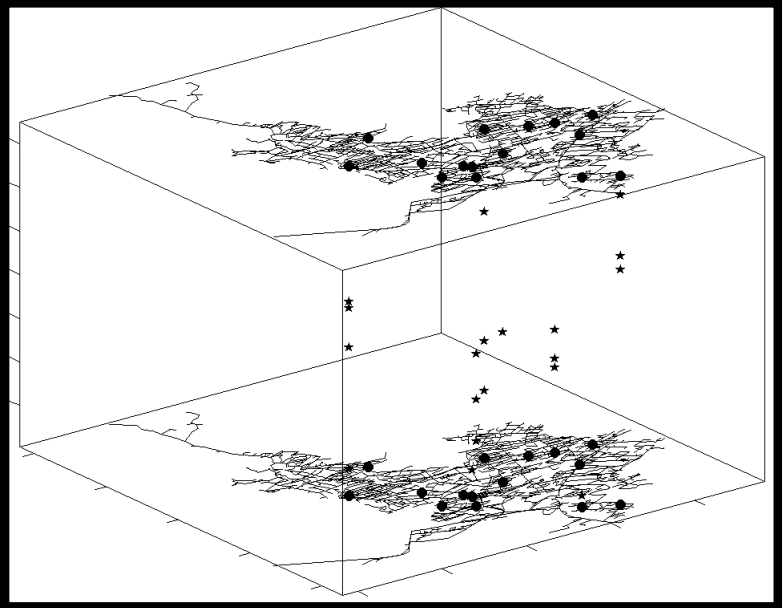
Single-Station Monitoring



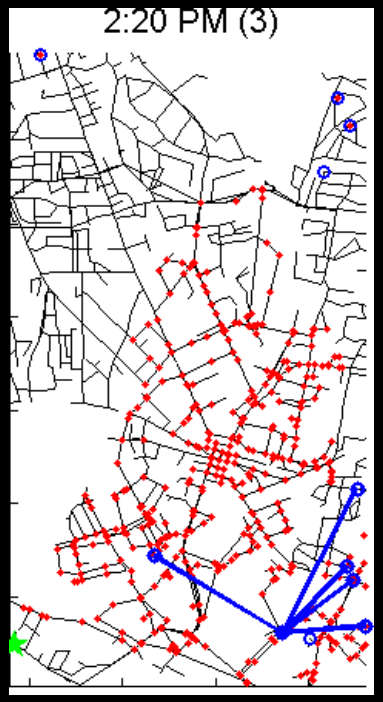


Water Quality Event Detection Systems for Drinking Water Contamination Warning Systems: Development, Testing and Application of CANARY, EPA/600/R-010/036

Distributed Detection



20 Sensors



- Contaminated node
- Sensing node
- Sensing node within a cluster
- Contaminant Source

Examples shown here at time of detection for a plume size of 1500 nodes

Holy Grail: Network model driven, real-time data assimilation and calibration

Koch and McKenna, 2011, **Distributed Sensor Fusion in Water Quality Event Detection,** *ASCE-JWRPM*

Outstanding Challenges

- Rapid, accurate and robust, compound-specific water quality sensors
  - Biological contaminants
- Inexpensive, robust, low-power, networked sensors that provide low-precision detection of water quality changes
- A system model with real-time spatial-temporal updates of water quality
  - Reactive chemical predictions
  - Unknown demands

Team

- Sandia National Laboratories
  - David Hart
  - Bill Hart
  - Kate Klise
  - Mark Koch
  - Cindy Phillips
  - Eric Vugrin
- US EPA NHSRC
  - Regan Murray
  - Terra Haxton
  - John Hall
  - Katie Umberg