

# UCLA

## Posters

### Title

CON 0: CENS Contaminant Transport Observation and Management (Contam) Research Overview

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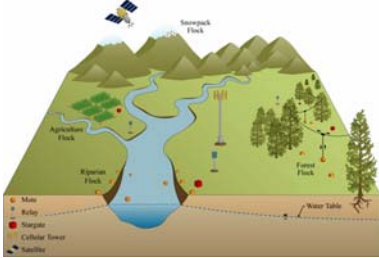
## CENS Contaminant Transport Observation and Management (Contam) Research Overview

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### Introduction: Multiscale observation of distributed contaminants in environmental systems

#### Integrating multiscale observations using remote and embedded networked sensing



The embedded networked sensing (ENS) problem being addressed by the contaminant transport application domain projects is the design of sensor networks supporting physical and chemical observations within and between environmental media, including land, air and water. An interdisciplinary approach is needed because it is difficult to conceive of an effective spatiotemporal sampling plan without domain-specific knowledge and network programming tools are not yet user-friendly enough to see widespread use amongst application domain experts. The contaminant transport observation projects are evolving from controlled test beds to specific real-world deployments to a proposed large, multiscale water quality observation and management network. The current emphasis is on the soil domain which is by nature a rich context for ENS development because of the natural heterogeneity of such media and the inherent cost and technical challenges of deploying sensor networks in these environmental media.

### Problem Description: Finding optimal network configurations to safely manage

#### 1. Contaminant Source Assessment

Use laboratory test beds with simplistic sensing demands (temperature) in order to develop spatiotemporal design strategies

#### 2. Soil Pylon Sensor Array Design and Validation

Create a robust, modular soil sensor array design; use sensing to automatically hone simulators; then us feedback-control to balance irrigation and fertilization with groundwater protection

#### 3. Multiscale Soil Sensor Network Deployment

Attack test cases at multiple scales to challenge the hardware-software designs: field scale agricultural and single plant rhizosphere test beds

#### Future Directions

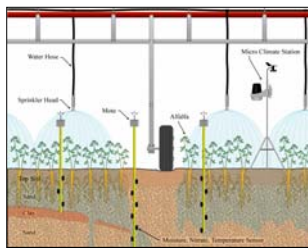
To maximize the impact of the contaminant observation systems being developed here, we will expand our approach to:

- (1) **New modality** in soil, aquatic sediment, riparian and forest modular ENS systems
- (2) Creating the cyberinfrastructure to enable **multiscale environmental observatory designs** fusing of ENS-level data streams with larger scale embedded and remote (aerial/satellite) sensing

### Proposed Solution: Multiscale ENS design with process simulation and management

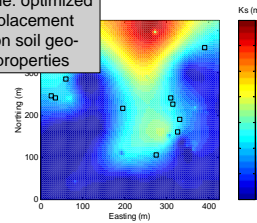
#### Soil Pylon Design and Validation

Observing moisture and nitrate propagation during irrigation with reclaimed wastewater in Palmdale, CA

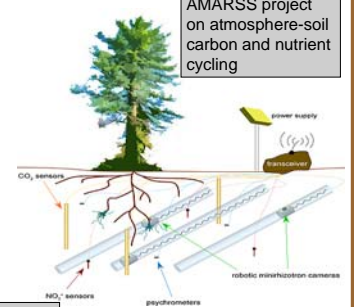


#### Tailoring the ENS design to multiple scales

Palmdale: optimized sensor placement based on soil geo-spatial properties

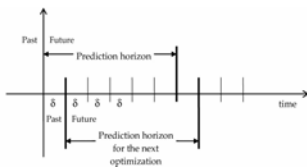


AMARSS project on atmosphere-soil carbon and nutrient cycling

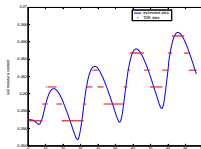


Field-testing CENS nitrate microsensors at Palmdale

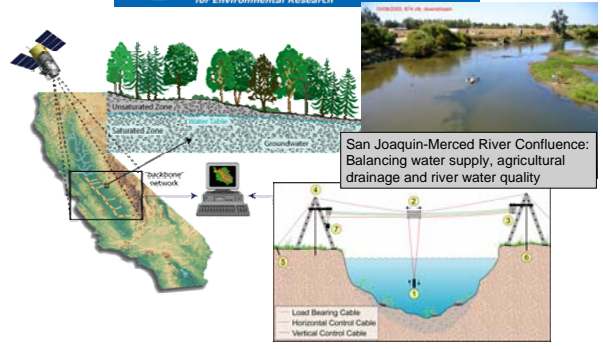
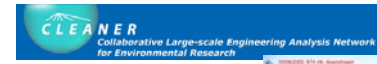
#### Feedback Control for Optimal Irrigation



Sensor data used to feedback to models, enabling calibration, forecasting and management of contaminant transport



#### Long term vision: multiscale observatories



San Joaquin-Merced River Confluence: Balancing water supply, agricultural drainage and river water quality

#### Rapid Deployment and Filter Fault-Filtering

An intensive 12-day deployment of pylons examined subsurface water quality associated with arsenic contamination in Bangladesh

