Tracer Technology and Research

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ARL Laboratory Review
May 3-5, 2011
Science Goals

- Evaluate atmospheric dispersion models
  - Air quality applications (chronic exposure)
  - Toxic releases (acute exposure)
- Improve model parameterizations
- Fill knowledge gaps in complex environments—cities, complex terrain, coastal areas
- Study atmospheric processes with instrumented balloons
  - Originally tracers for dispersion applications
  - Lagrangian observation platforms for air quality and hurricane boundary layer
Approach: Bag Samplers

Time integrated concentrations
12 bags each
Analysis not in real time
Approach: Field Deployment and Analysis

- Release Mechanism
- Sampler Deployment
- Sample Analysis
Approach: Fast Response Samplers

1 s response time

Mobile

Near real time analysis
Balloon Systems

Tetroon

Hurricane balloon

2006 cover Bulletin of the AMS
Major Accomplishments and Findings

- Participated in all major U.S. field studies
- Added ability to detect multiple perfluorocarbon tracers
- Greatly expanded urban tracer datasets
- Observed rapid vertical transport in high-rise areas
- Observed “upwind” and “lateral” urban transport
- Provided new information on the effect of roadway sound barriers on pollutant concentrations
- Developed guidance for first responders in urban areas
- Developed low-cost prototype detector for measuring concentration fluctuations
“Upwind” Dispersion of Plume

Urban 2000    Salt Lake City
Dispersion Effects of Roadway Sound Barrier

2008 collaboration with EPA

Mock sound barrier
1 ton straw bales

Concentration ratio barrier to non-barrier neutral case
Indicators of Success

- 9 journal publications since 2000 (17 conference papers)
- 8 NOAA Technical Memorandums since 2000
- Over 150 paper citations
- 2007 NOAA Bronze Medal
- Patent for prototype fast-response detector (X-6)
- Widespread media coverage
- Requests for collaboration from external organizations
Collaborators

- **Federal**
  - Department of Defense
  - Environmental Protection Agency
  - Department of Energy
  - Department of Homeland Security

- **Academia**
  - University of Utah
  - Washington State University
  - National Center for Atmospheric Research
  - Desert Research Institute

- **Private Sector**
  - Hanna Consultants
  - Northrop Grumman
Future Directions

- Need for new generation of tracers with lower Global Warming Potential (GWP)
  - Low background, easy to detect, nontoxic
  - Both integrated and real-time sampling
  - Inexpensive to release and analyze
- Lower cost fast-response measurements
  - Current systems cost > $30K and require constant supervision
  - X-6 prototype detector
- Urban dispersion, chemical cartography