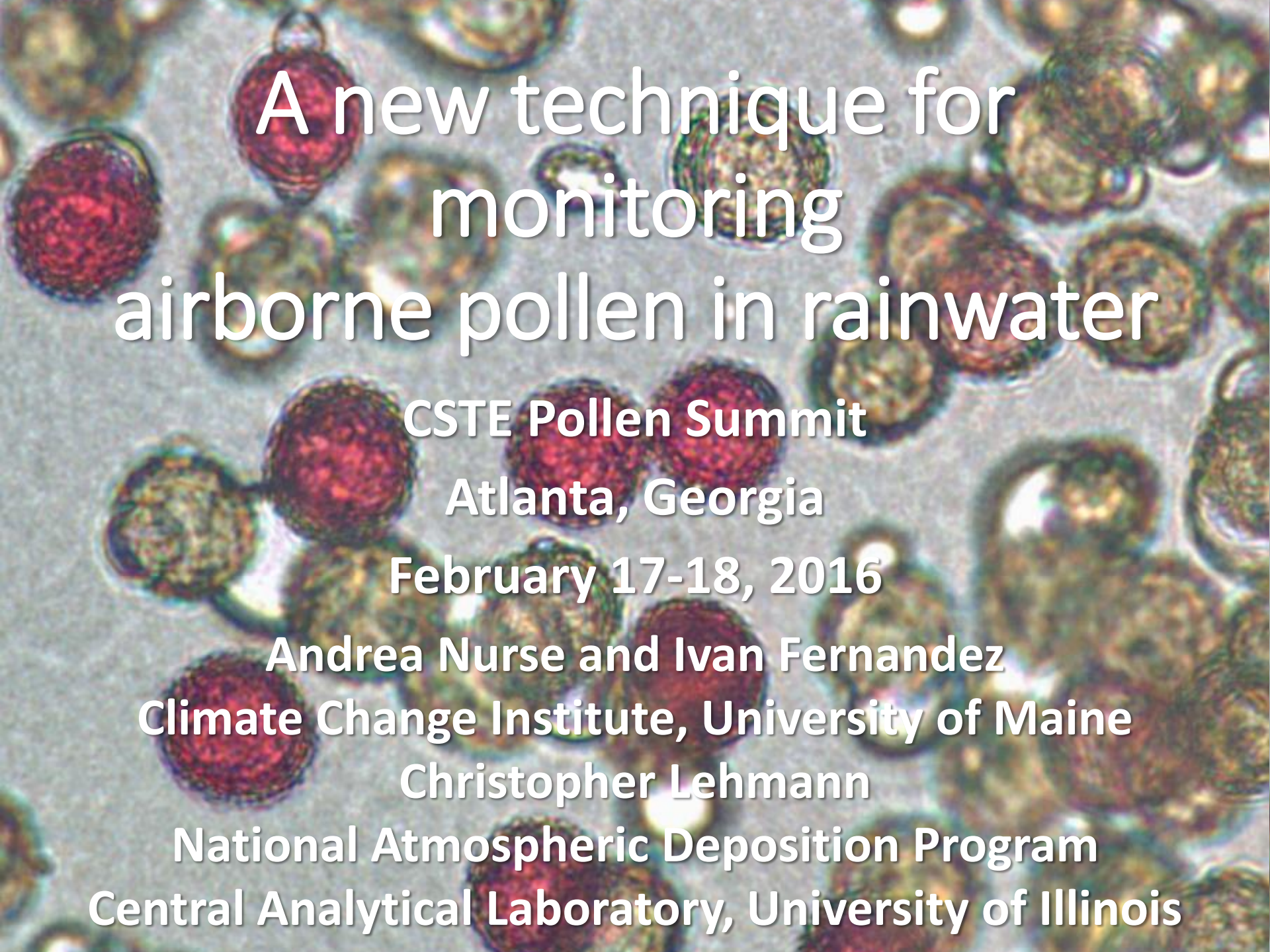


A microscopic image showing numerous pollen grains in rainwater. The grains are spherical and have a textured, granular surface. Some grains are a deep red color, while others are a mix of green and yellow. They are scattered across the frame, with some appearing in sharp focus and others slightly blurred in the background.

A new technique for monitoring airborne pollen in rainwater

CSTE Pollen Summit

Atlanta, Georgia

February 17-18, 2016

Andrea Nurse and Ivan Fernandez

Climate Change Institute, University of Maine

Christopher Lehmann

National Atmospheric Deposition Program

Central Analytical Laboratory, University of Illinois

Rotor Rod capture of airborne pollen

Advantages:

1. Real time monitoring
2. Quantitative and qualitative analysis

Disadvantages:

1. Expensive – sampler cost \$1720 plus ongoing supplies and personnel time
2. Limited number of sites
3. Inconsistent reporting
4. Little quality control



The National Atmospheric Deposition Program (NADP) monitors precipitation chemistry at 250 sites in the U.S. and Canada.



http://nadp.sws.uiuc.edu/cal/images/CO96_NTN_small.jpg



NADP is administered by the University of Illinois Central Analytical Laboratory.



.45 μ m Polyethersulfone membrane filter

- Rain water collected every 7 days
- Sent to Central Analytical Laboratory
- Particulates filtered out
- Water analyzed for N, S, acidity, etc.



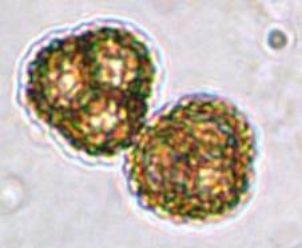
The website for additional information: nadp.isws.illinois.edu/NADP/



.45um Polyethersulfone membrane filter

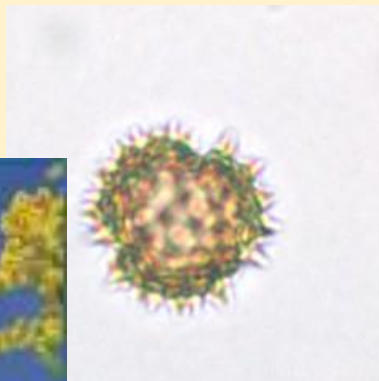
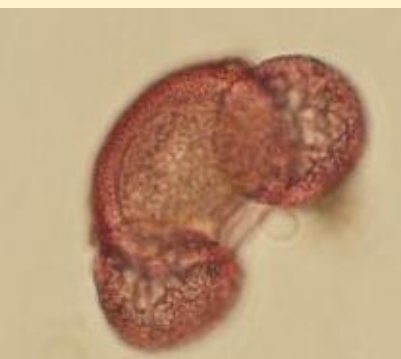
Reverse filtration – wash pollen from filter: 89% recovery (n=1)

- ❖ Soak filter in 5% KOH to loosen pollen cells
- ❖ Rinse 5% KOH through filters under pressure
- ❖ Centrifuge to concentrate pollen cells
- ❖ Add measured quantity of microbeads and safranin stain
- ❖ Wash pollen cells in deionized water to remove KOH
- ❖ Wash pollen cells in ethanol to remove water
- ❖ Add silicon oil for storage



Dissolve filters in n-methyl-2-pyrrolidone for 100% pollen recovery

- ☐ Soak filters in NMP 5 minutes at room temperature. Vortex. Centrifuge. Repeat until filter dissolved.
- ☐ Wash with glacial acetic acid to remove all water.
- ☐ Wash with deionized water
- ☐ Disarticulate pollen cells with 5% KOH and 10% HCl
- ☐ Add known quantity of microbeads and safranin stain
- ☐ Wash with deionized water
- ☐ Dehydrate with tertiary butyl alcohol
- ☐ Store in silicone oil



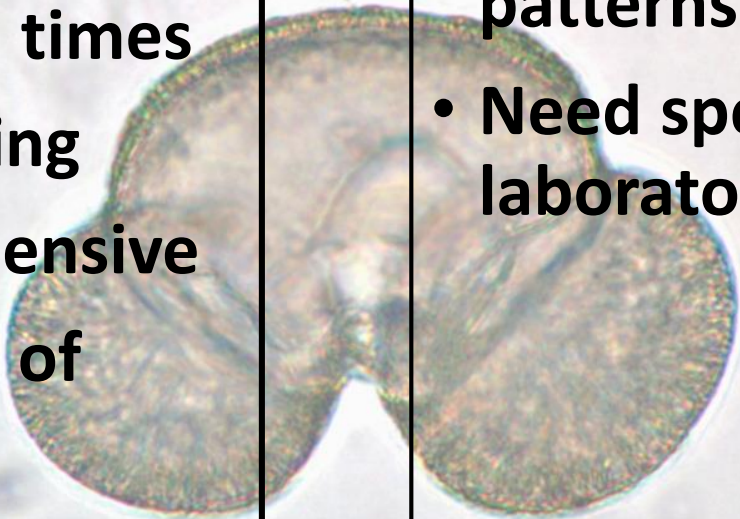
Advantages

- 250 monitoring sites
- Expand phenology studies – bloom times
- Central processing
- Relatively inexpensive
- Standardization of reporting
- Quality control

Disadvantages

- Quantitative studies limited by precipitation patterns
- Need specialized laboratory equipment

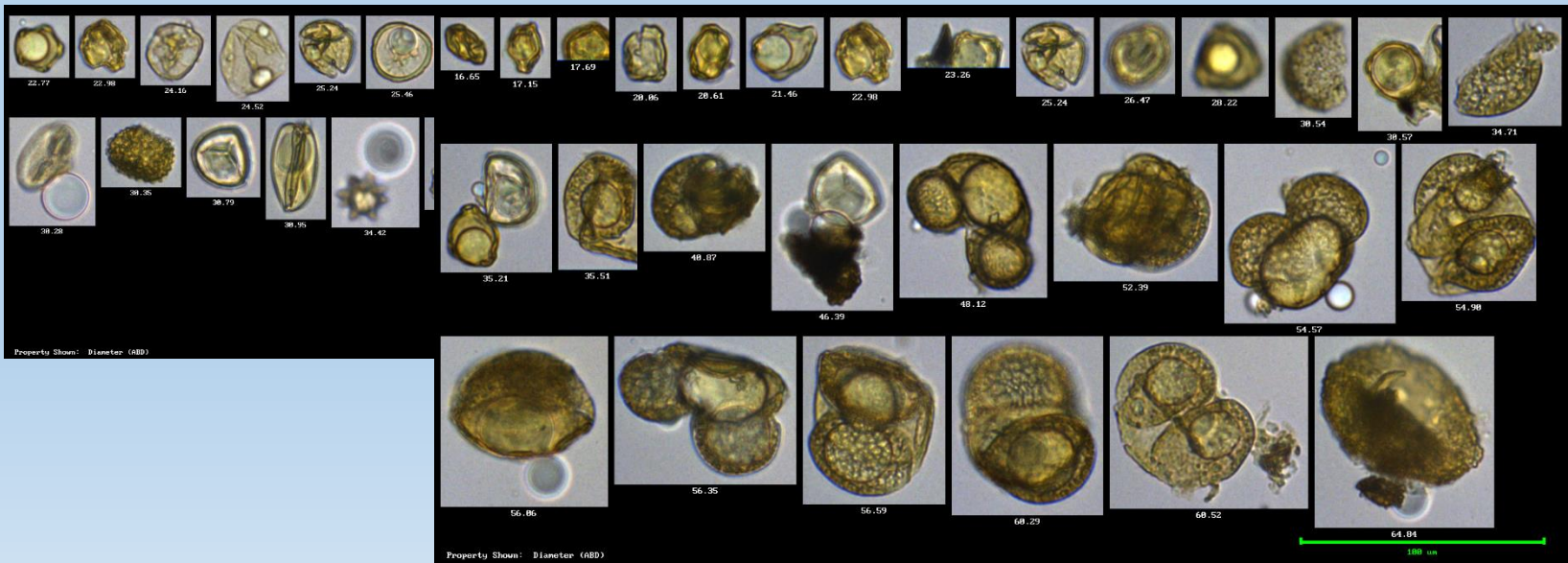
100 μ m

A microscopic image of a diatom, a single-celled organism with a silica-based cell wall. The diatom is elongated and has a complex, symmetrical internal structure. A red horizontal line with arrows at both ends is drawn across the middle of the diatom, with the text "100 μ m" written above it in red.

FlowCam



<http://photos.labwrench.com/equipmentPhotos/9000/9572-7201-m.jpg>



Questions / Options/ Challenges

- ✓ What is the scope of the next logical study?
- ✓ Are there funds available?
- ✓ Is there funding for a graduate student?
- ✓ What are the technical questions going forward?
- ✓ ???

