

# Biomass Burn Observation Project BBOP

## Trees



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# ARM

CLIMATE RESEARCH FACILITY

**BROOKHAVEN**  
NATIONAL LABORATORY

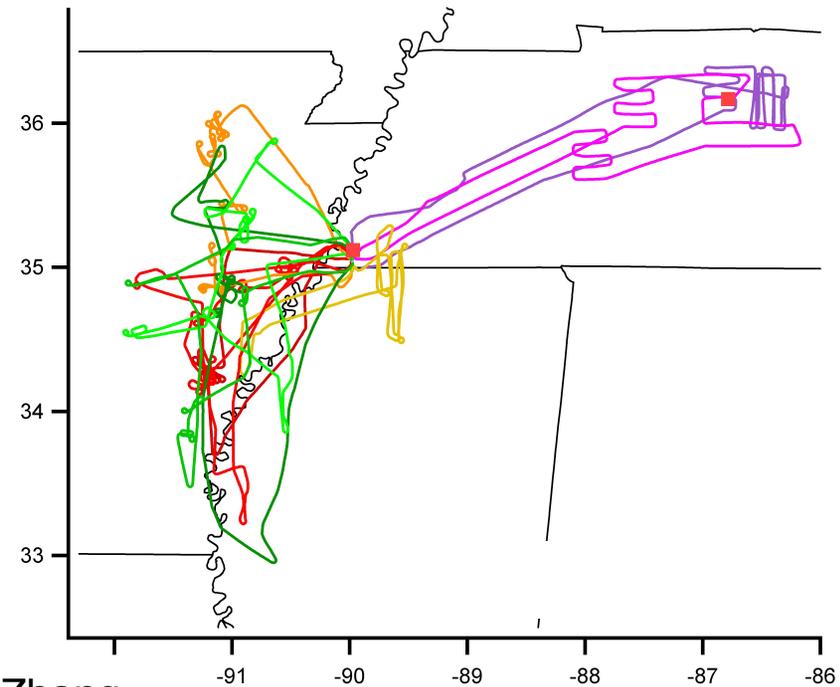
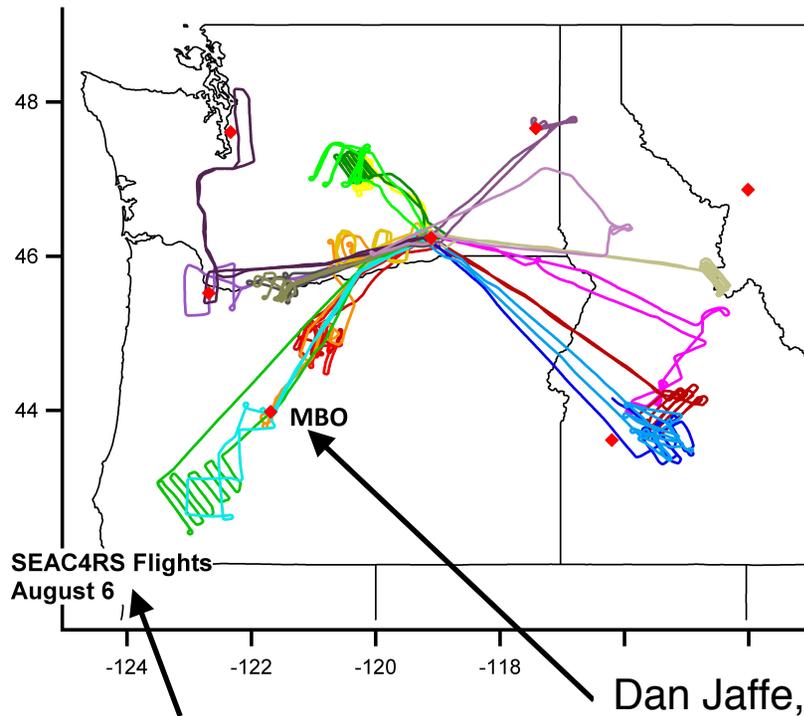
*a passion for discovery*



# Flights

**Wildland Fires:** Shrub, Forest  
**Urban:** Seattle (3), Portland (2),  
Spokane (2)  
**MBO** (3)  
**SEAC4RS:** Joint mission Aug., 6

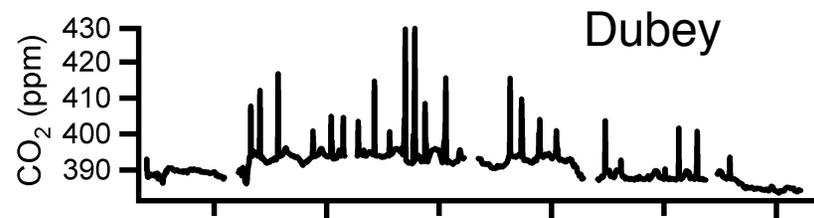
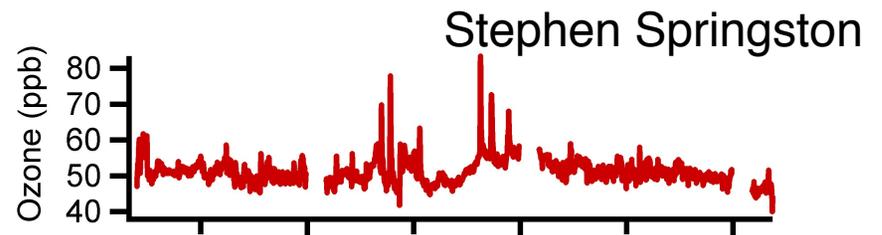
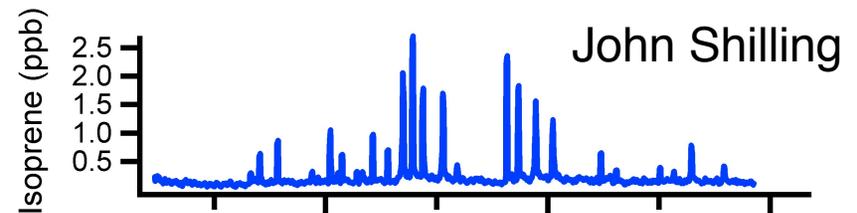
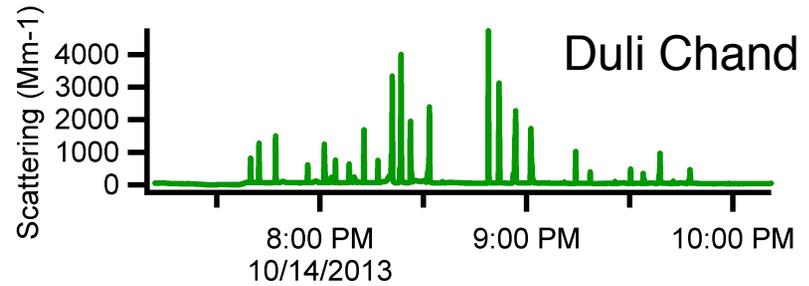
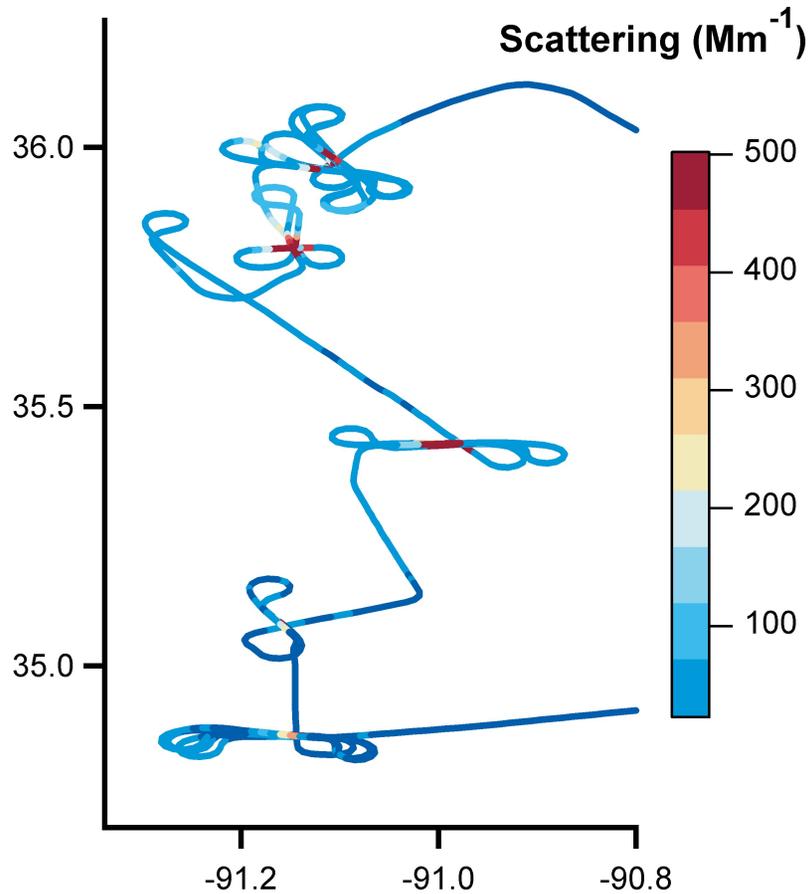
**Prescribed Agricultural burns:**  
rice, soybean  
**Urban:** Nashville (2), Memphis (2)



Dan Jaffe, Qi Zhang

Bob Yokelson, Rich Ferrare, Ralph Khan, Charles, Ichoku

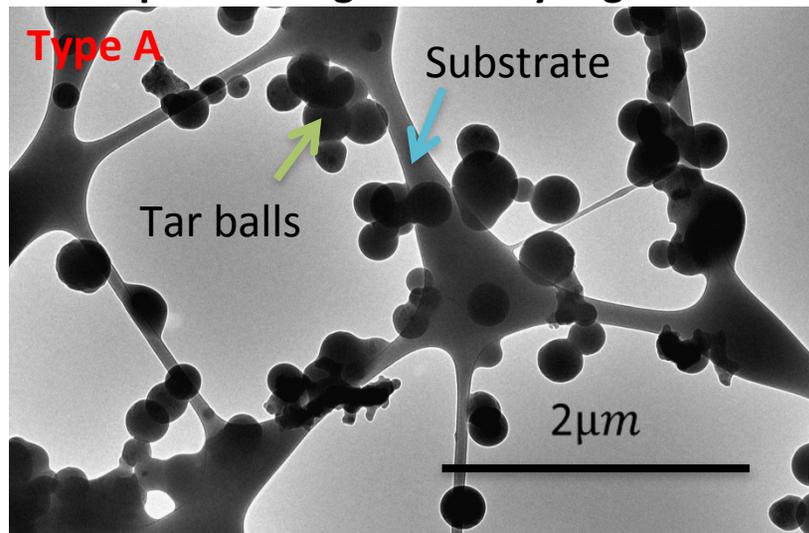
# Prescribed Ag. Burns



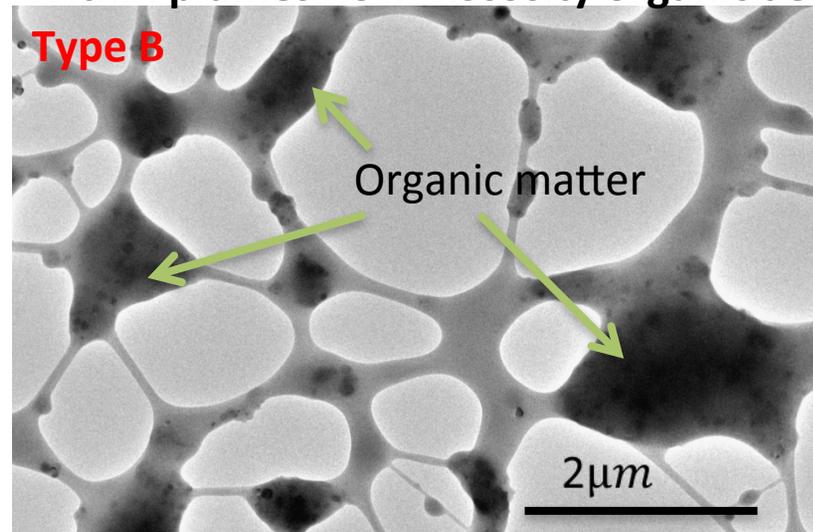
Transmission electron microscopy– Peter R. Buseck (ASU) and Kouji Adachi (MRI)

**1. Viscosity differences in wildfires: A. Tar balls; B. Other organic particles**

External to plumes: high-viscosity organic aerosol Within plumes: low-viscosity organic aerosol

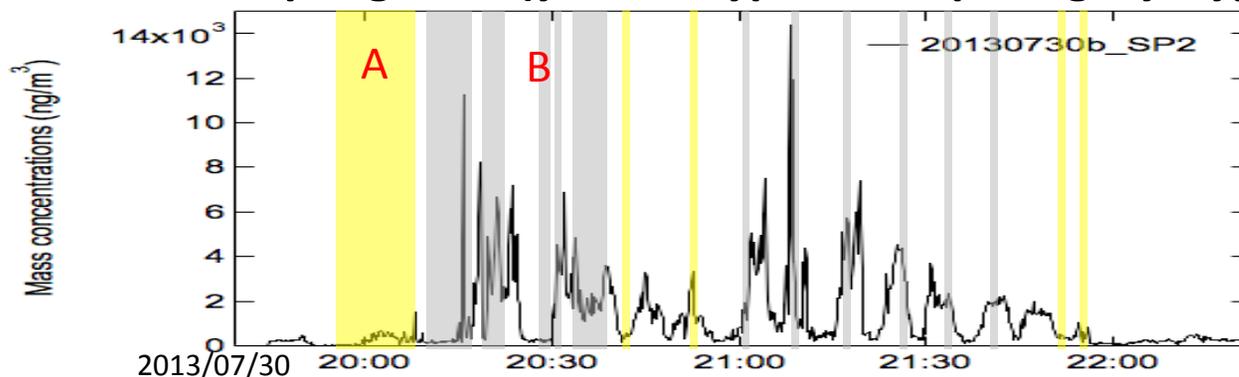


Tar balls (spherical brown carbon) dominate the sample. See yellow in SP2 data, below.



Liquid organic matter with sulfate inclusions. See grey in SP2 data, below.

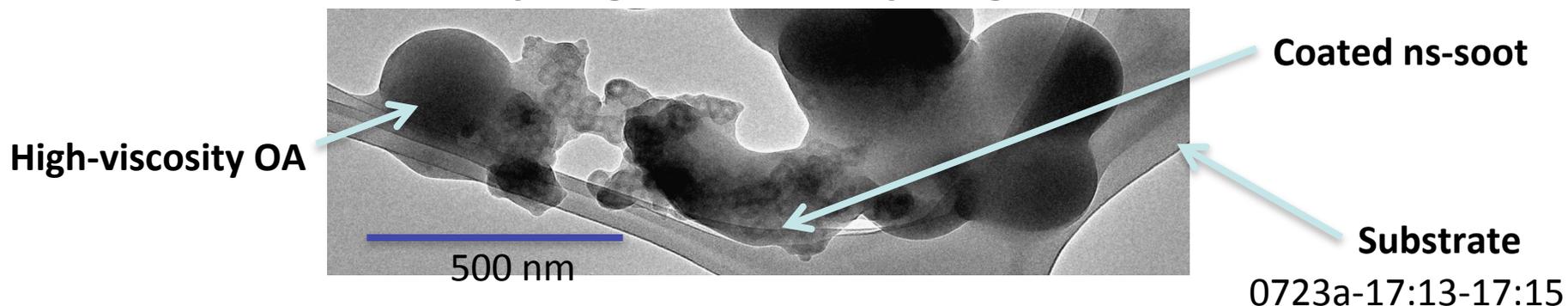
**SP2 data with TEM sampling time (yellow: type A samples, grey; type B samples)**



Outside plumes (yellow) tar balls and other solid or high-viscosity organic aerosol particles dominate.  
Within plumes (grey) liquid or low-viscosity organic aerosol particles dominate.

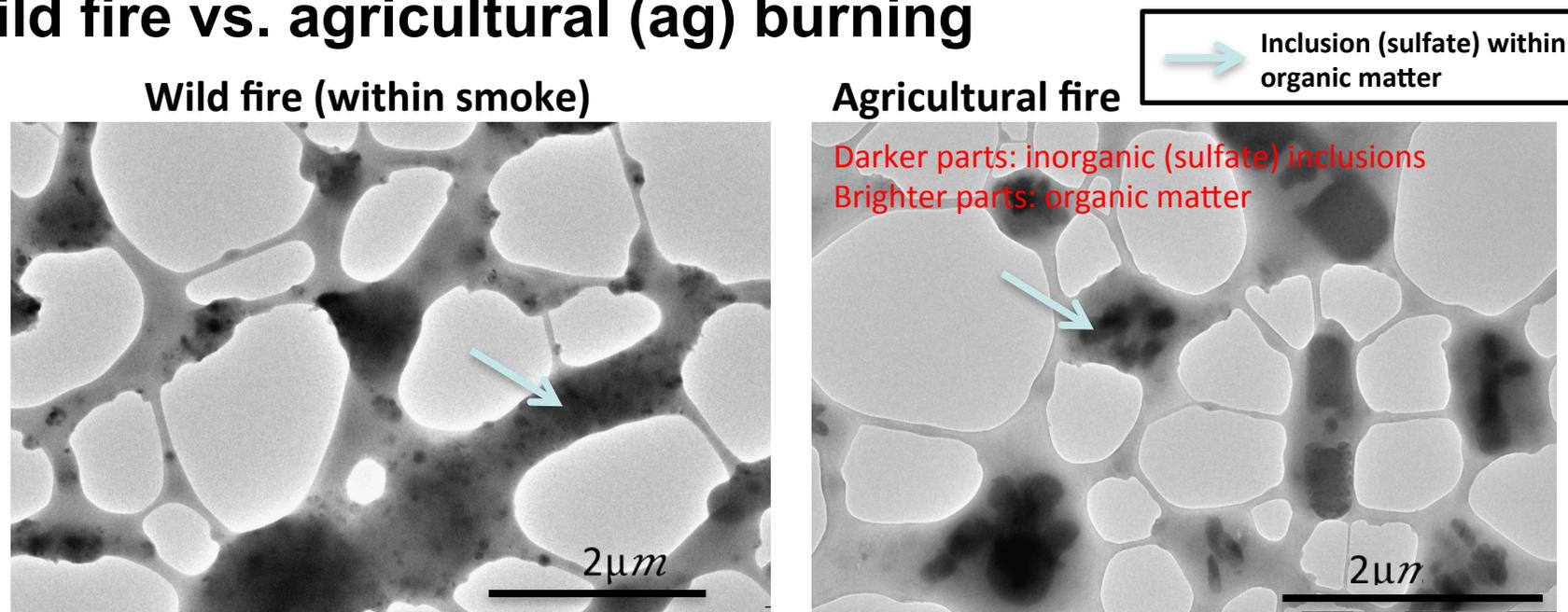
Transmission electron microscopy– Peter R. Buseck (ASU) and Kouji Adachi (MRI)

## 2. Ns-soot coated by high-viscosity organic matter in wild fire



Organic coatings on ns-soot depend on viscosity, i.e., low-viscosity organic matter embeds ns-soot whereas high-viscosity organic coats it

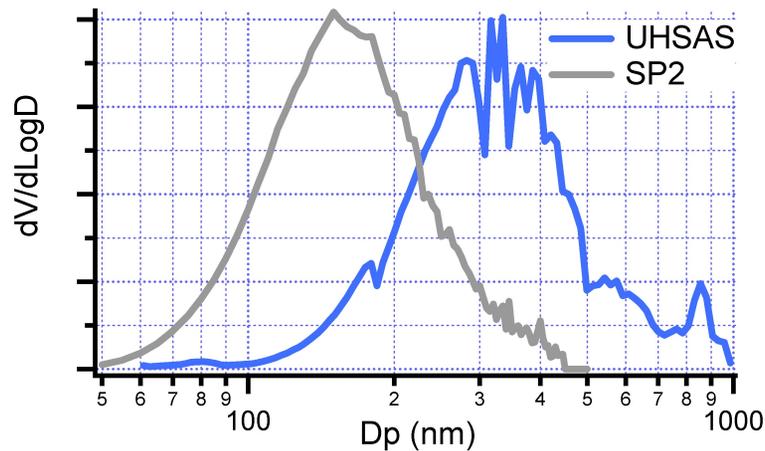
## 3. Wild fire vs. agricultural (ag) burning



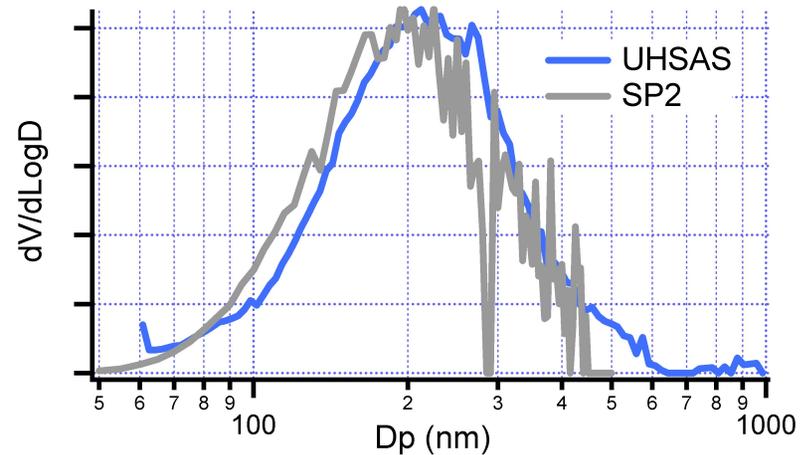
Ag smoke: larger sulfate inclusions; wildfire particles: smaller and scattered inclusions within organic matter. Ag-smoke aerosols were mostly liquid and contained no tar balls

# Size Distributions

## Wildland Fire



## Prescribed Ag. Burn



## Representative Data

UHSAS: Jason Tomlinson

SP2: Art Sedlacek

Both Cases rBC ~ 3%, Rest is Organic

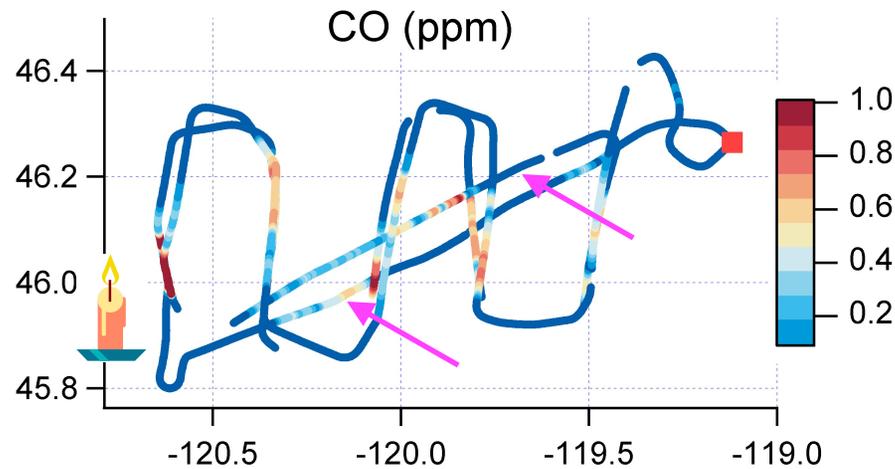
Do size distributions contain information on coating?

Wildland has smaller rBC, larger Total particles

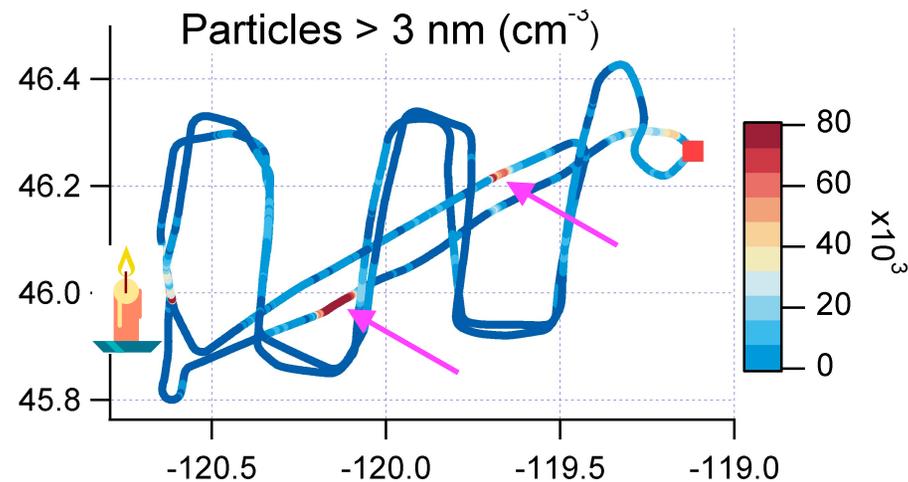
Why are BC and Total similar in Ag. Burns.

# Goldilocks Theory of NPF & Growth

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**Plume is spread out**



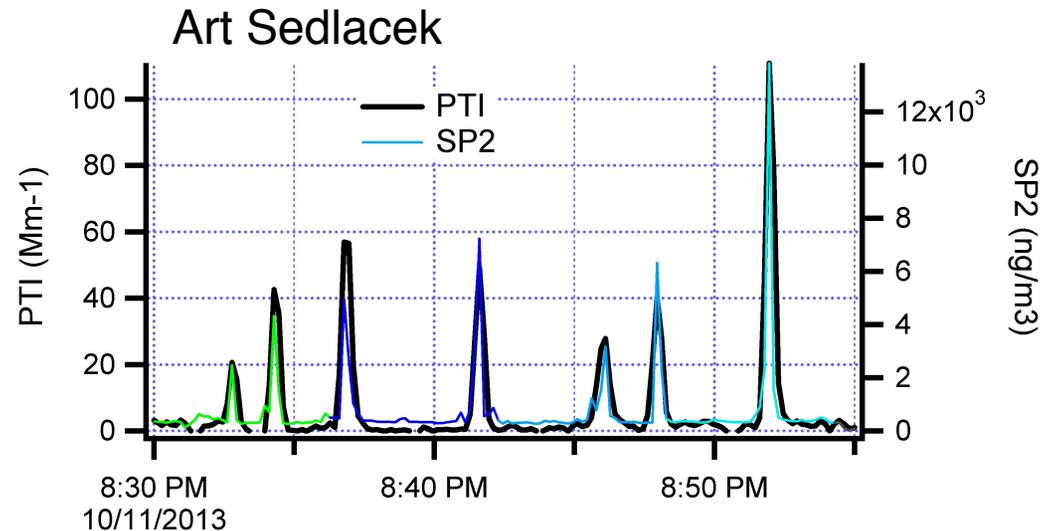
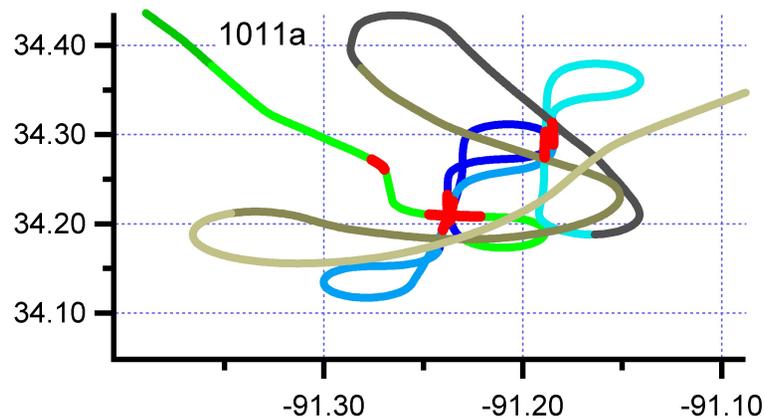
**Small regions  
with lots of particles**

**Coincident with Plume  
& Adjacent to Plume**

# Mass Absorption Coefficient (MAC)

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## 3 Ag. burns



$$\text{MAC} = 8.5 \pm 1.6 \text{ m}^2/\text{g}$$

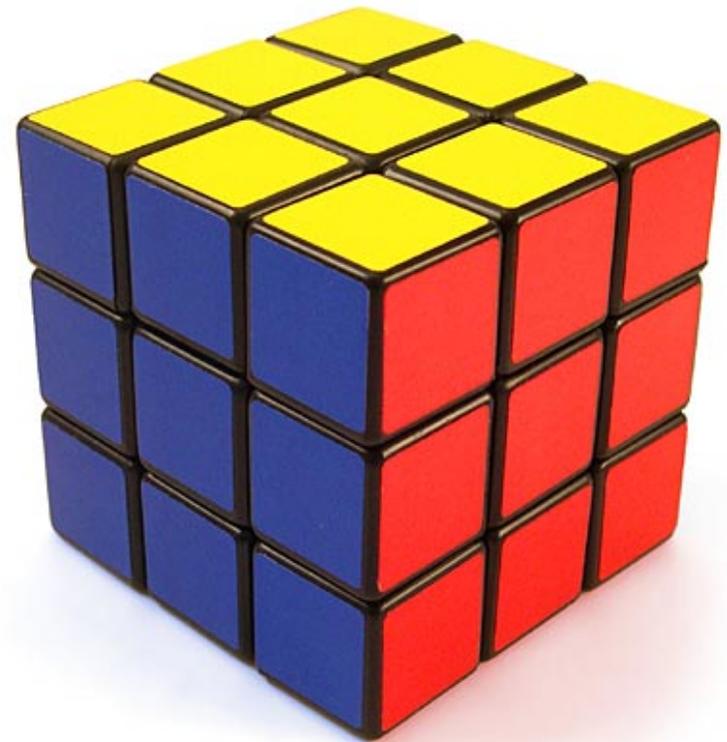
**Most scatter due to varying instrument time response  
(for almost all instruments)**

**Good thing that Beat Schmid agreed to Effort Problem  
before GoAmazon!!!**

# SP-AMS

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Whose Mystery is Exceeded Only by its Power



Tim Onash, John Shilling, Ed Fortner, Doug Worsnop