

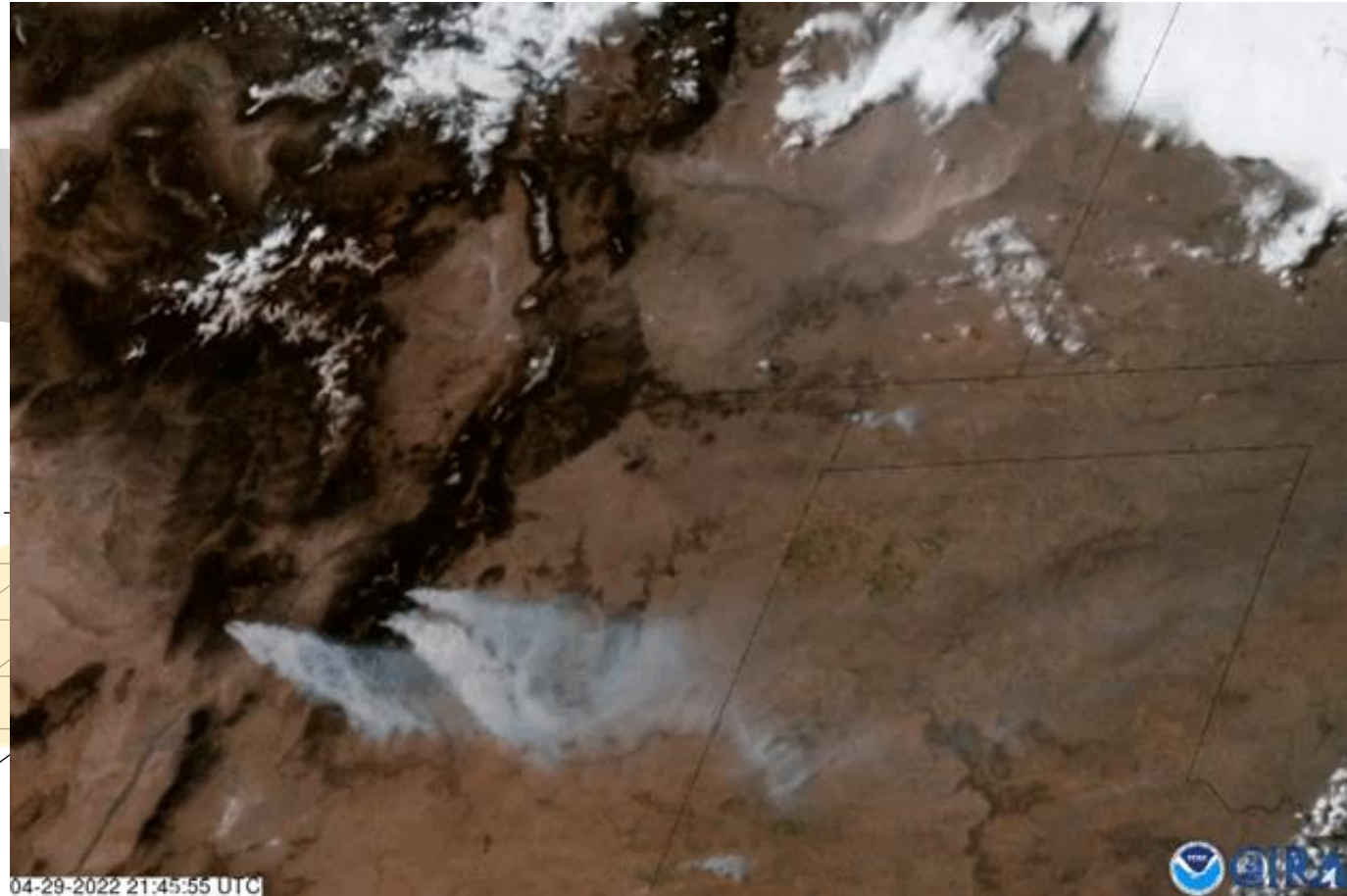
Combining low-cost sensors and satellite data to understand smoke and dust exposure in rural regions

Jeff Pierce, Olivia Sablan, Jennifer McGinnis, and many others!

CSU, Atmospheric Science



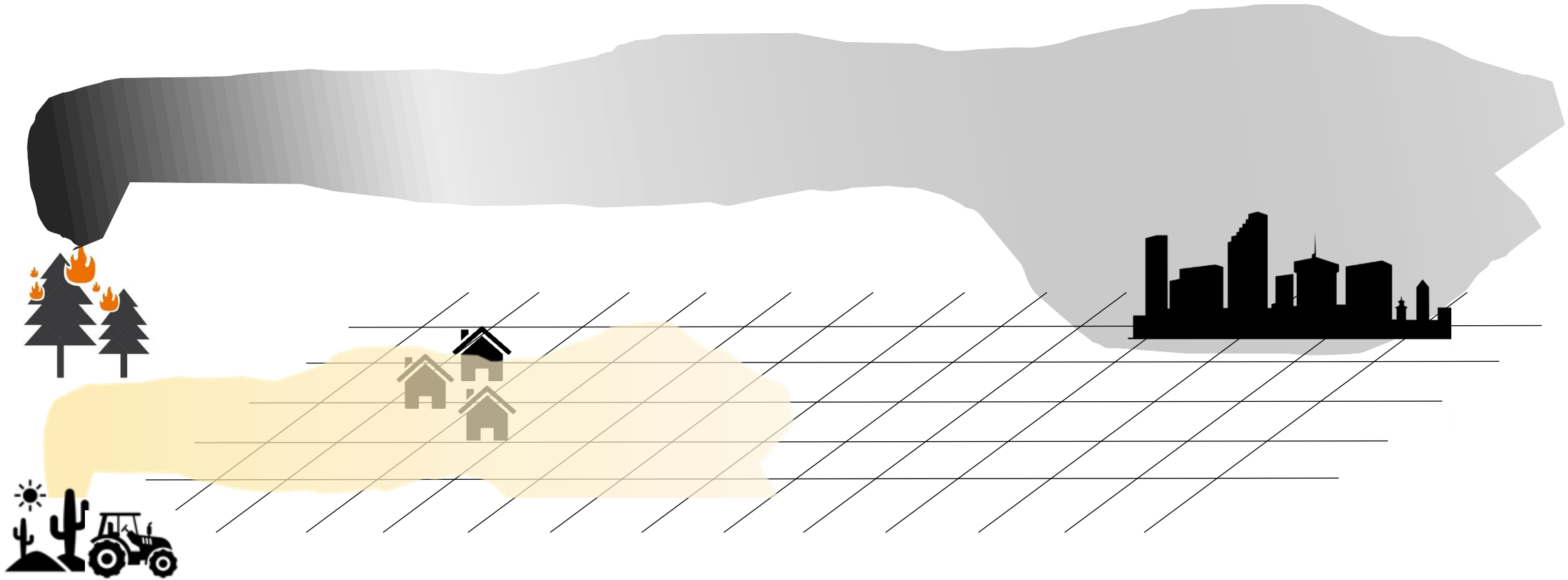
Smoke and dust events are transient, often with steep spatial concentration gradients.



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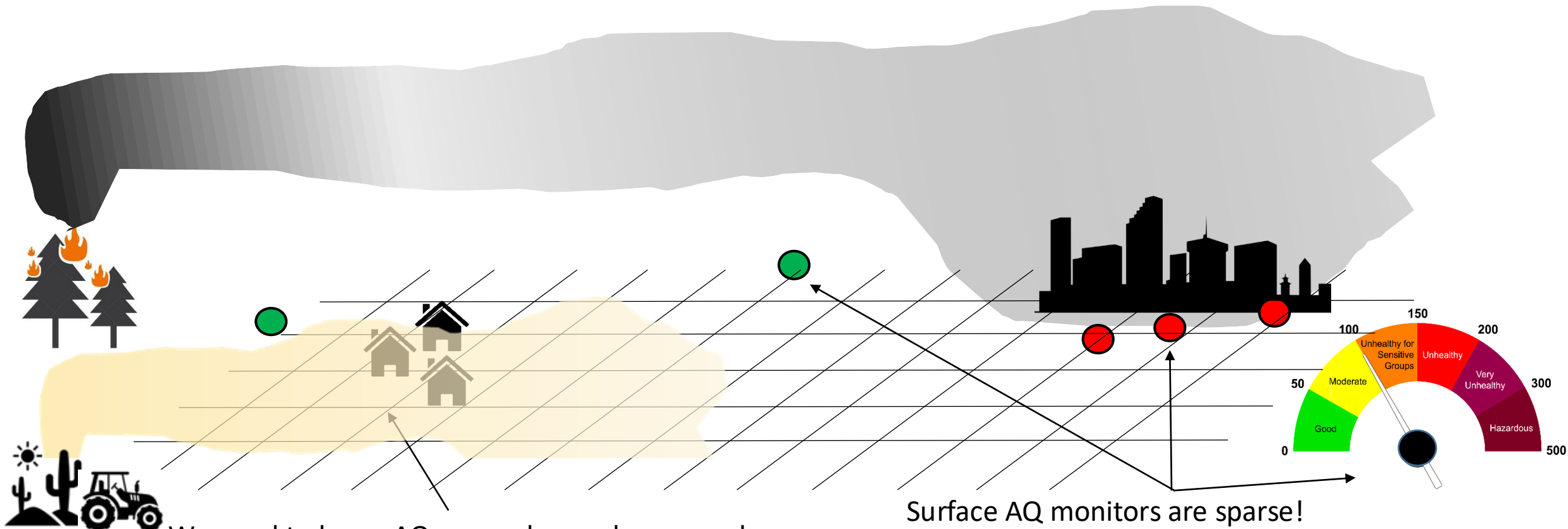
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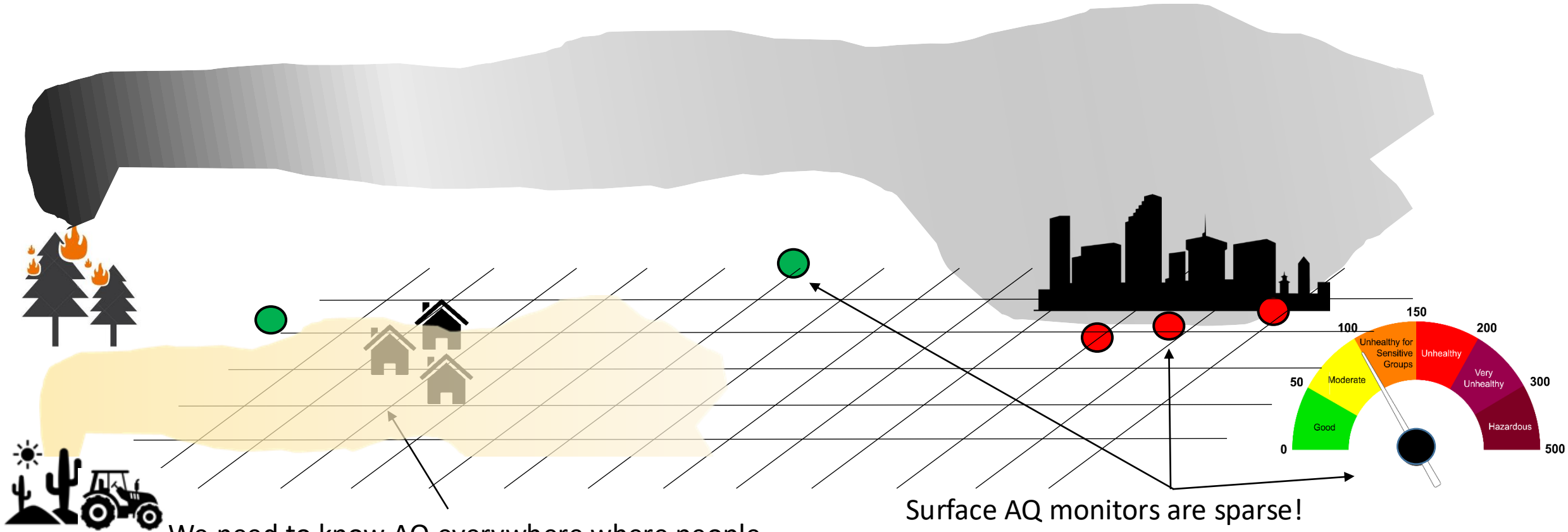


We need to know AQ everywhere where people live, work and play - not just near the monitors!

We want to use the information from both satellites and surface monitors.



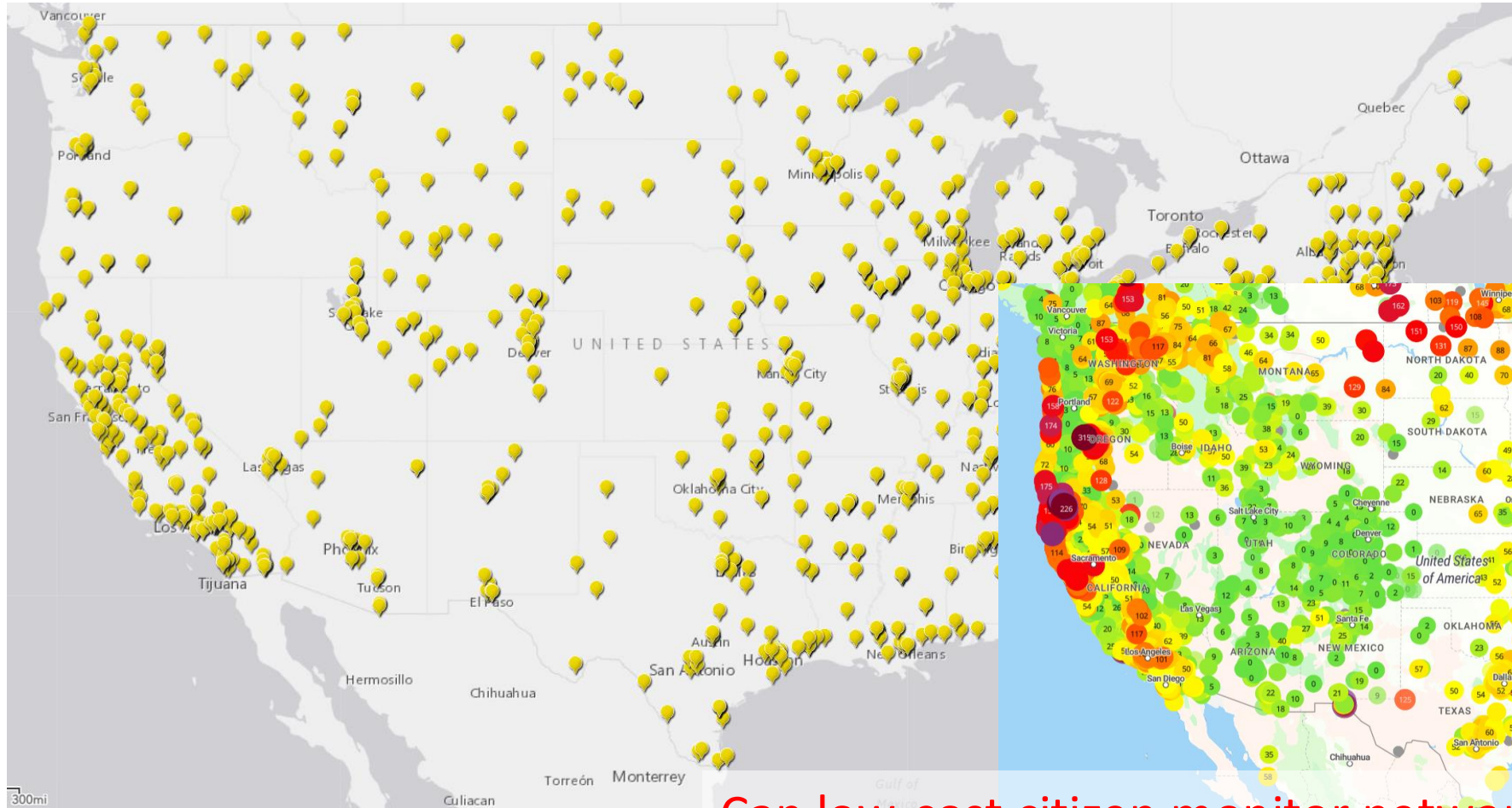
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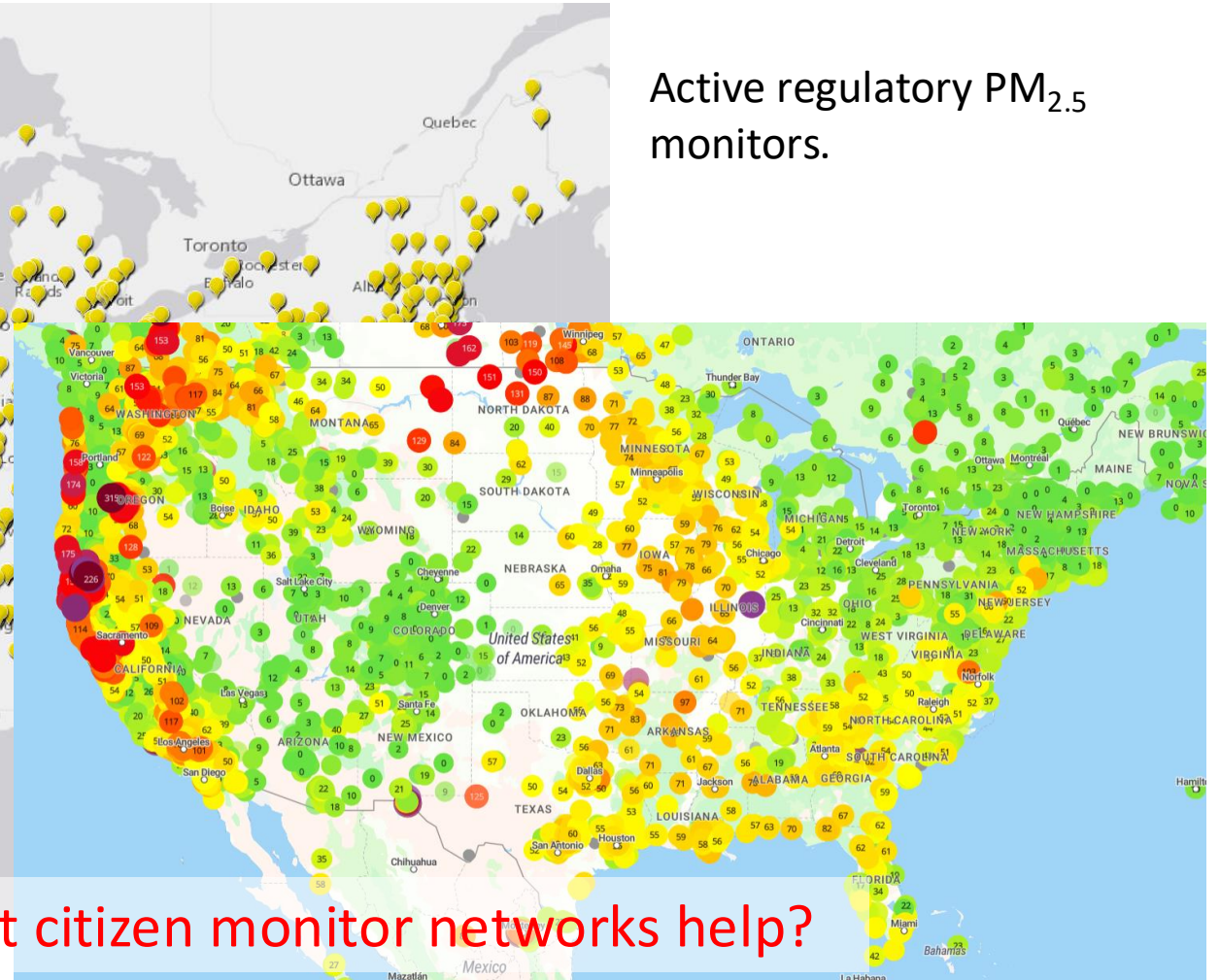
We need to know AQ everywhere where people live, work and play - not just near the monitors!

Surface AQ monitors are sparse!

Satellites are best for determining contributions of PM from smoke or dust when there are nearby monitors, but there are large areas without regulatory monitors.

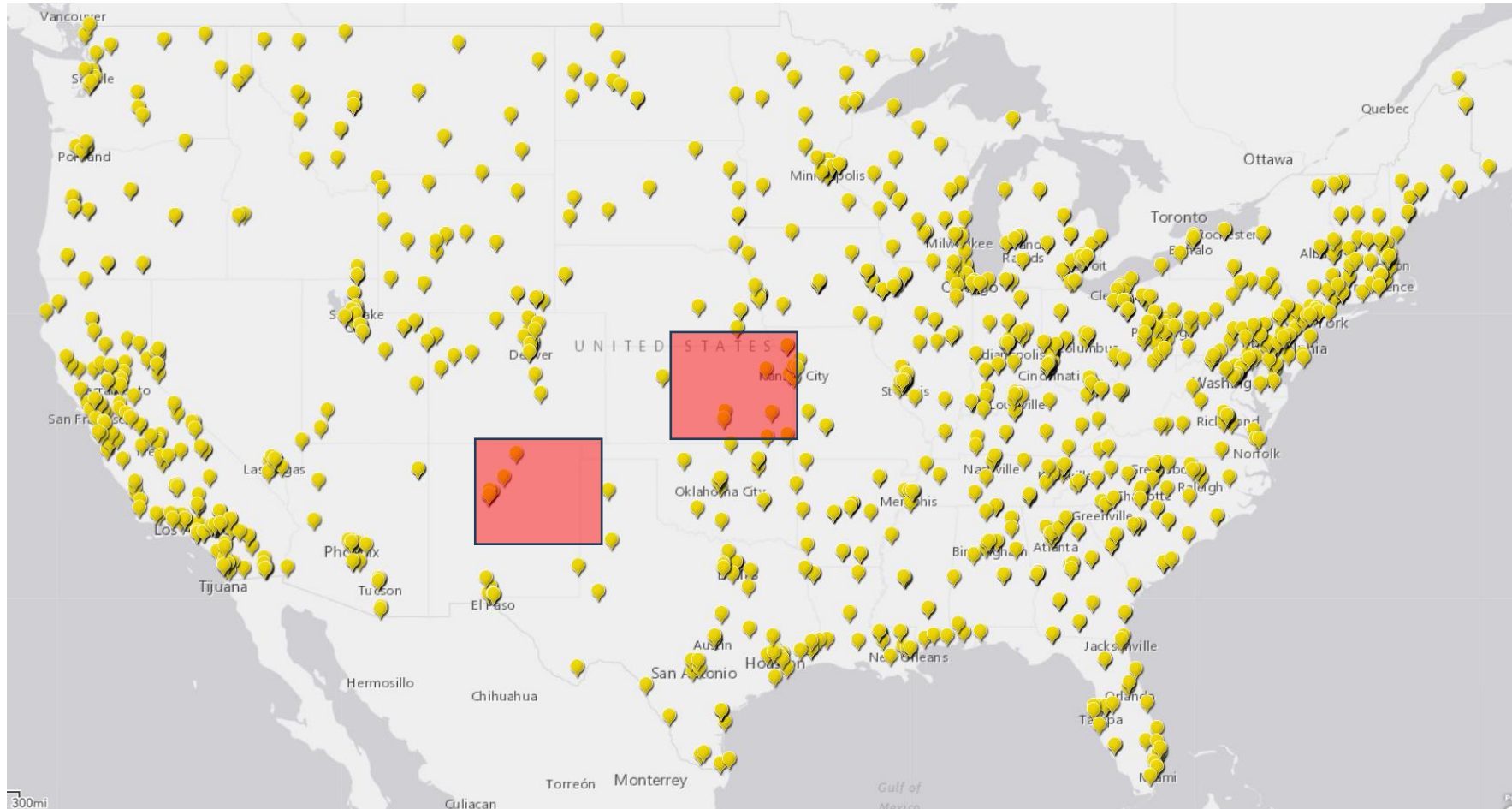


Active regulatory PM_{2.5} monitors.



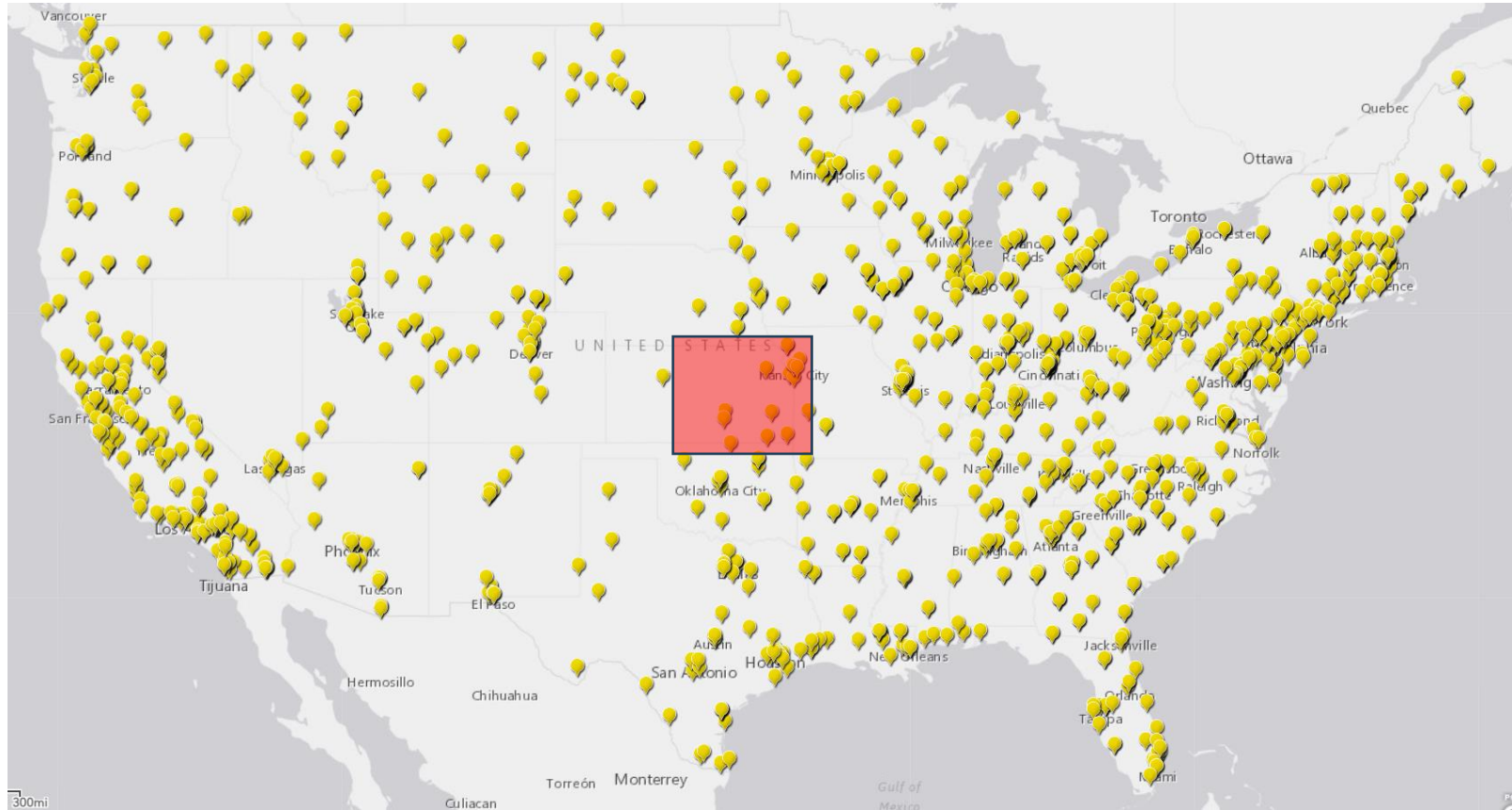
Can low-cost citizen monitor networks help?

2 HAQAST smoke study regions with gaps in regulatory monitors



Active regulatory PM_{2.5} monitors.

Kansas: Spring prescribed fires in the Flint Hills



Annual springtime burning to:

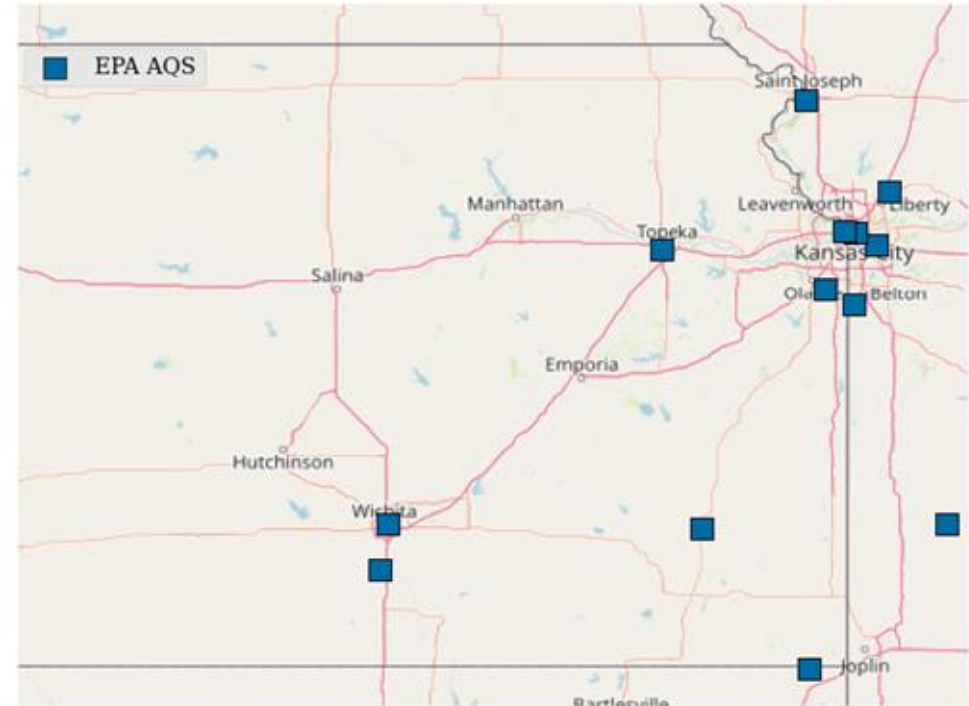
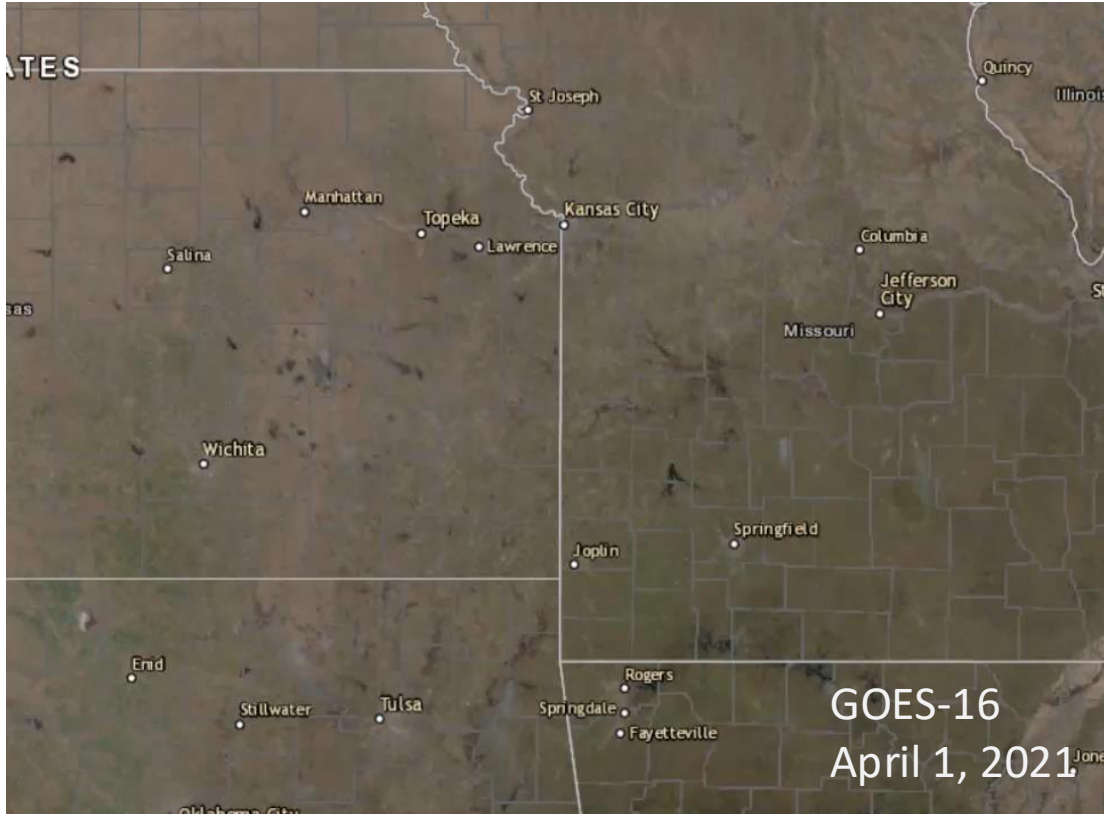
- Decrease risk of wildfires
- Maintain the tallgrass ecosystem
 - Control invasive species
 - Decreasing woody encroachment
- Improve nutrition for livestock



Partners: Kansas Department of Health and Environment, community partners

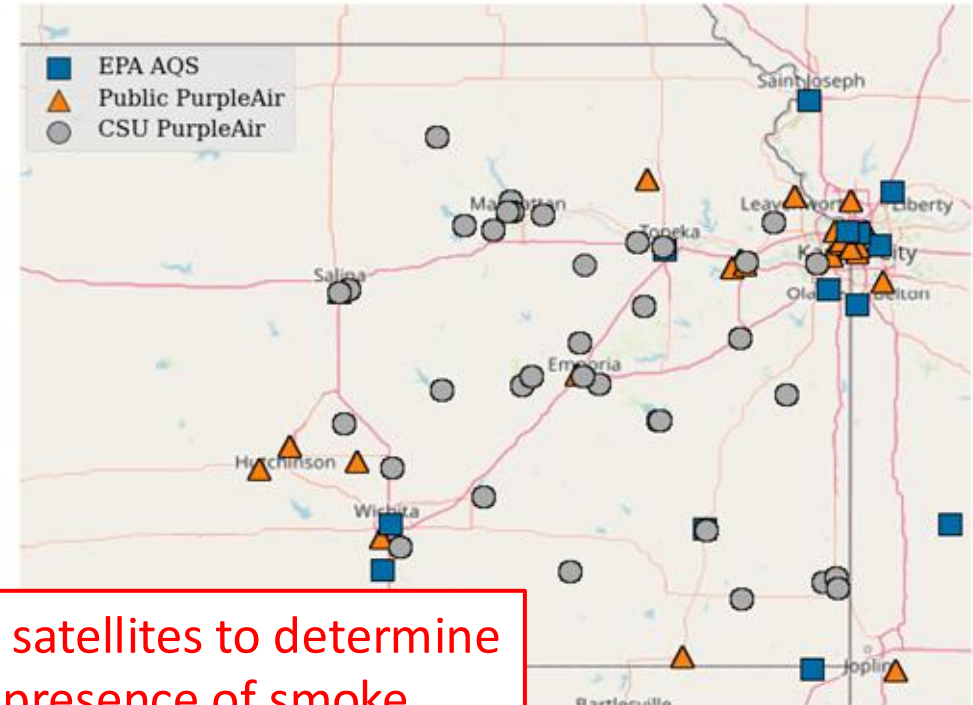
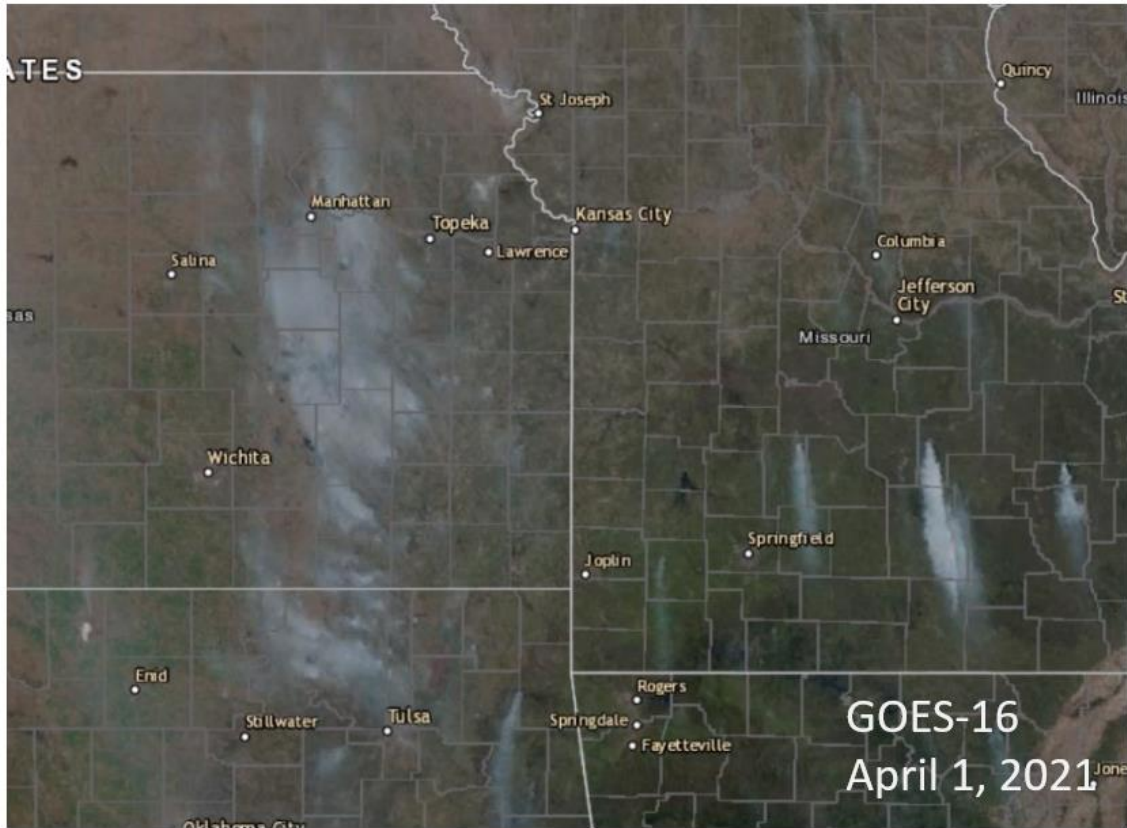
Sheryl Magzamen Amber Soja 8

Prescribed fires in the Flint Hills often occur away from regulatory monitors.



Partners: Kansas Department of Health and Environment, community members

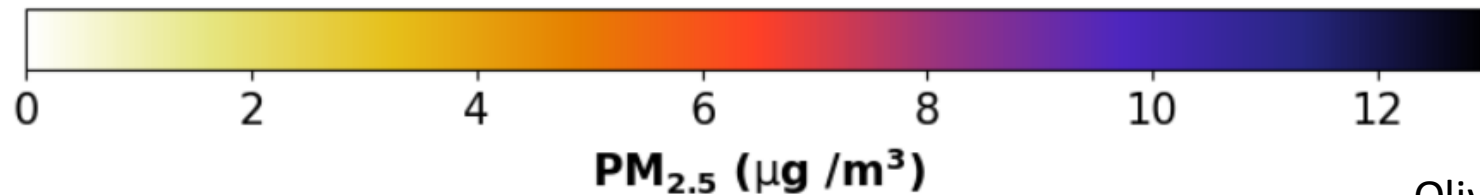
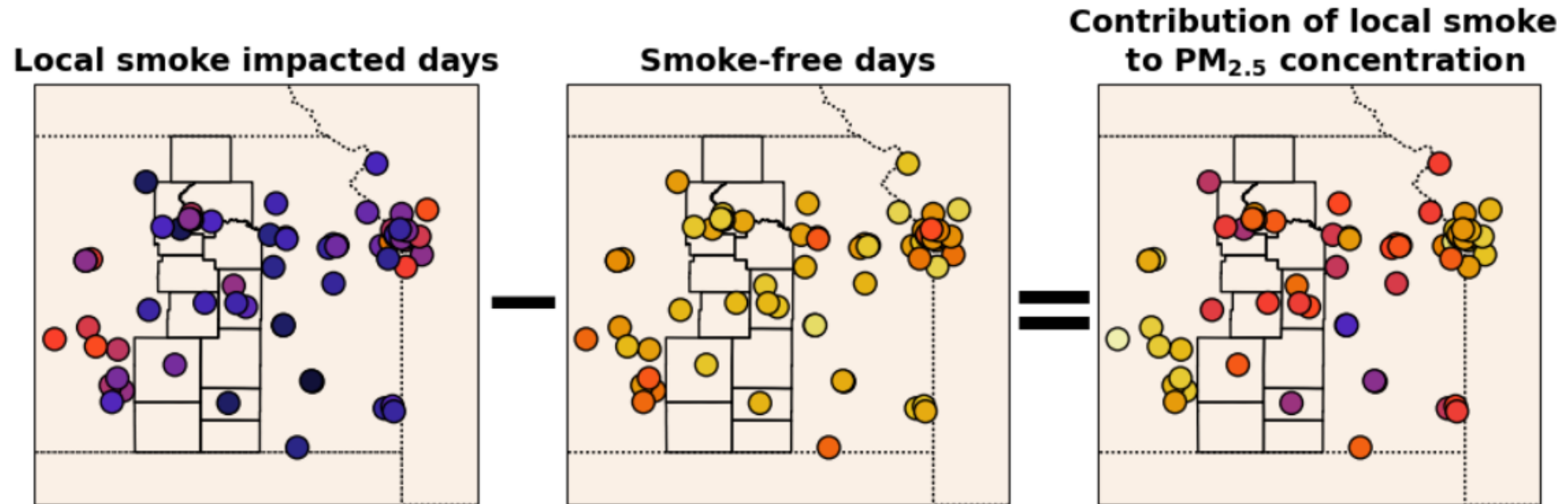
Incorporating low-cost monitors can help fill the gaps in regulatory monitors.



Use satellites to determine the presence of smoke from local fires

Partners: Kansas Department of Health and Environment, community members

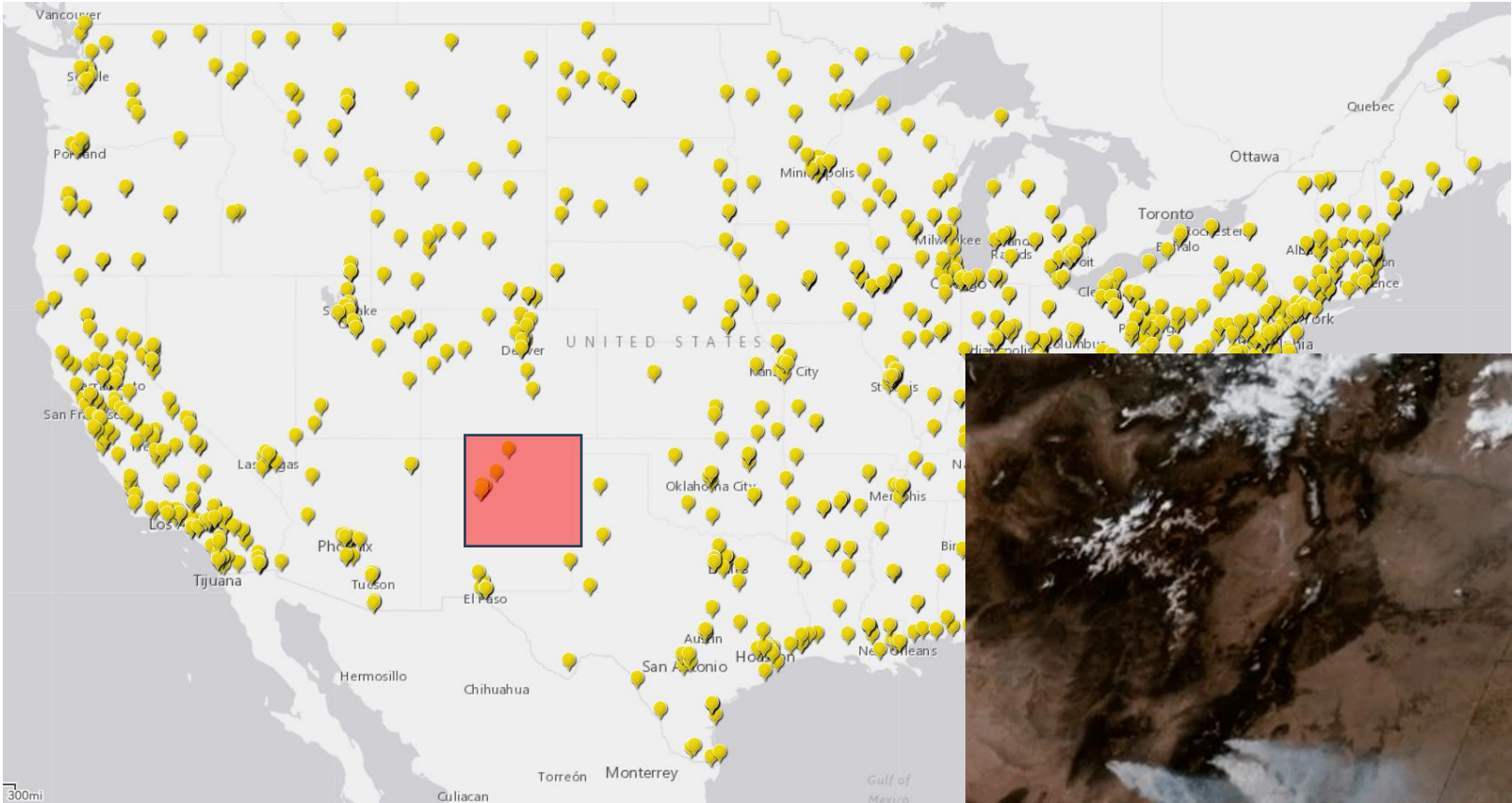
On days with local burning, the $PM_{2.5}$ concentrations more than double.



Olivia Sablan

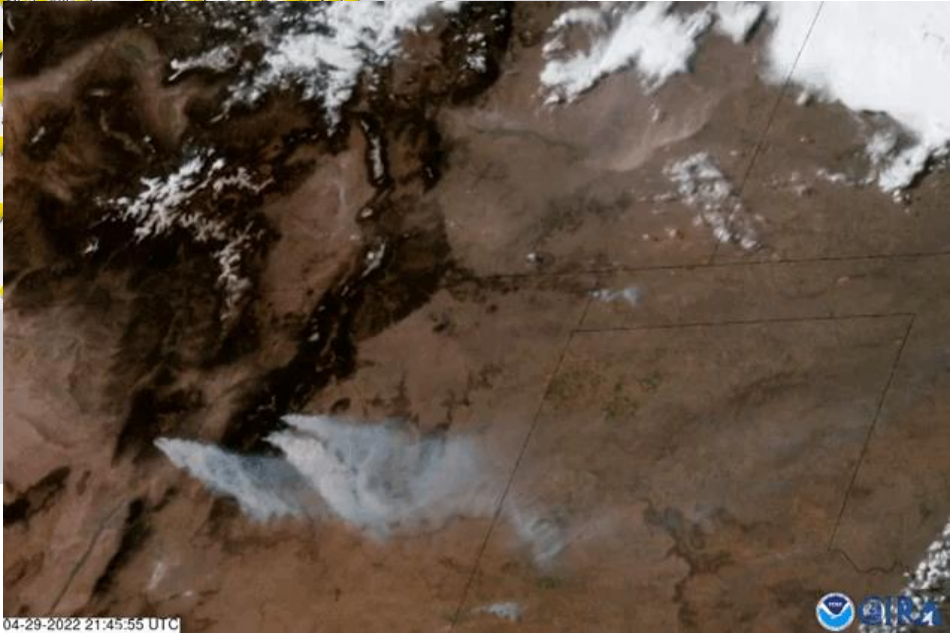


New Mexico: Bad wildfire season in 2022



Two largest wildfires in state history:

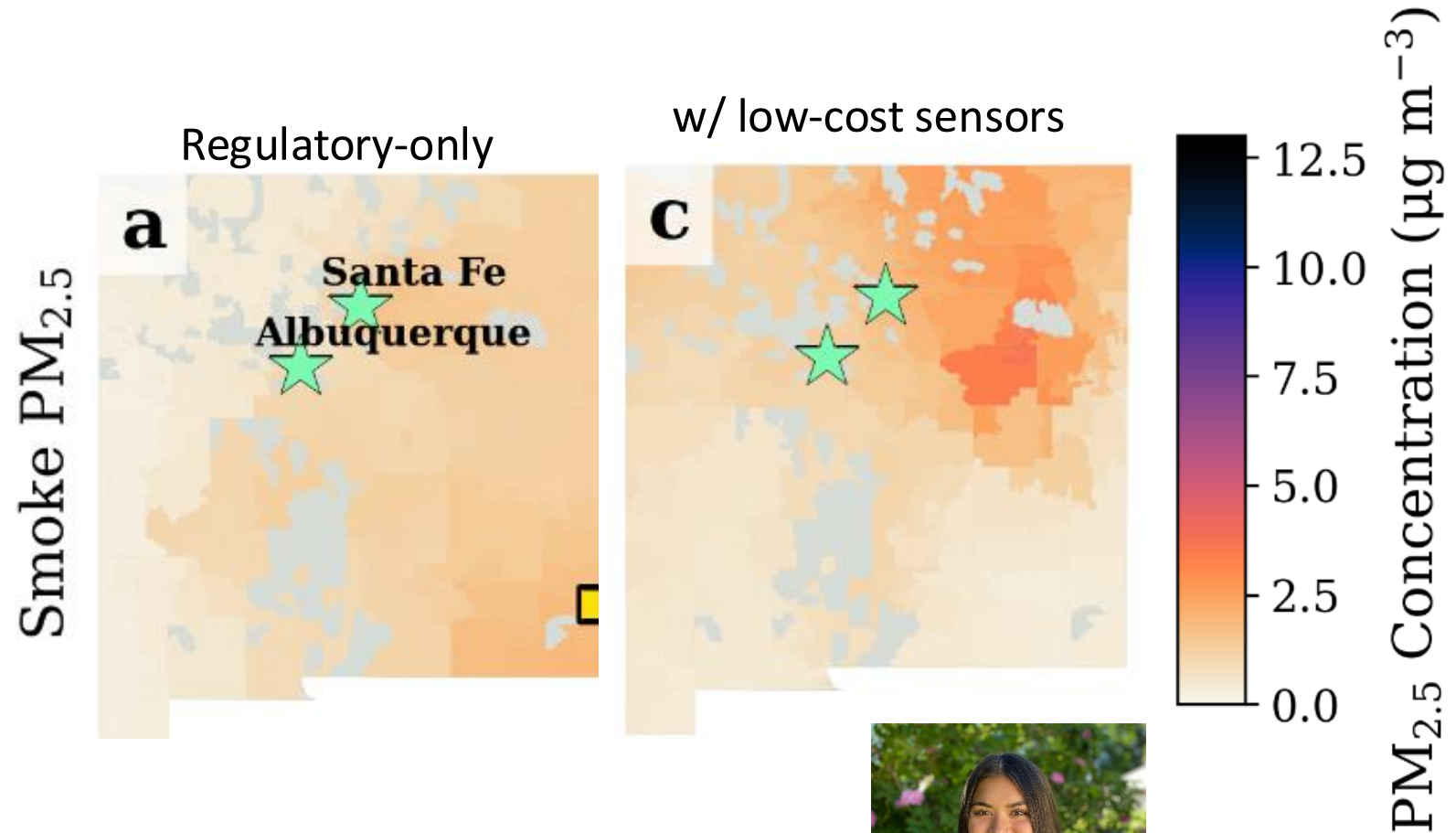
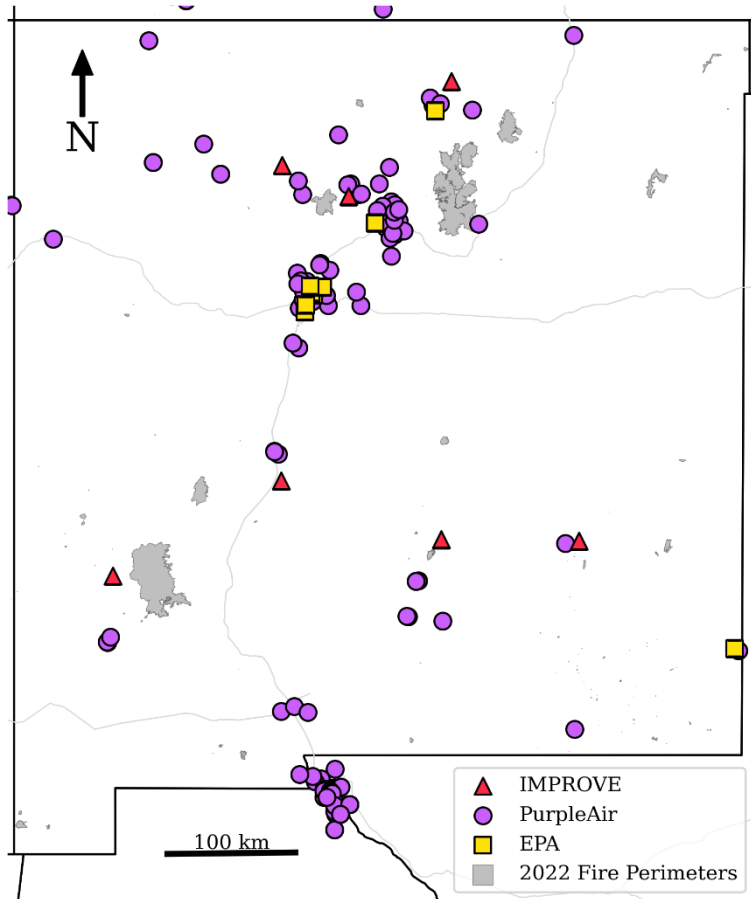
- Calf Canyon/Hermits Peak Fire
- Black Fire



Chris Uejo



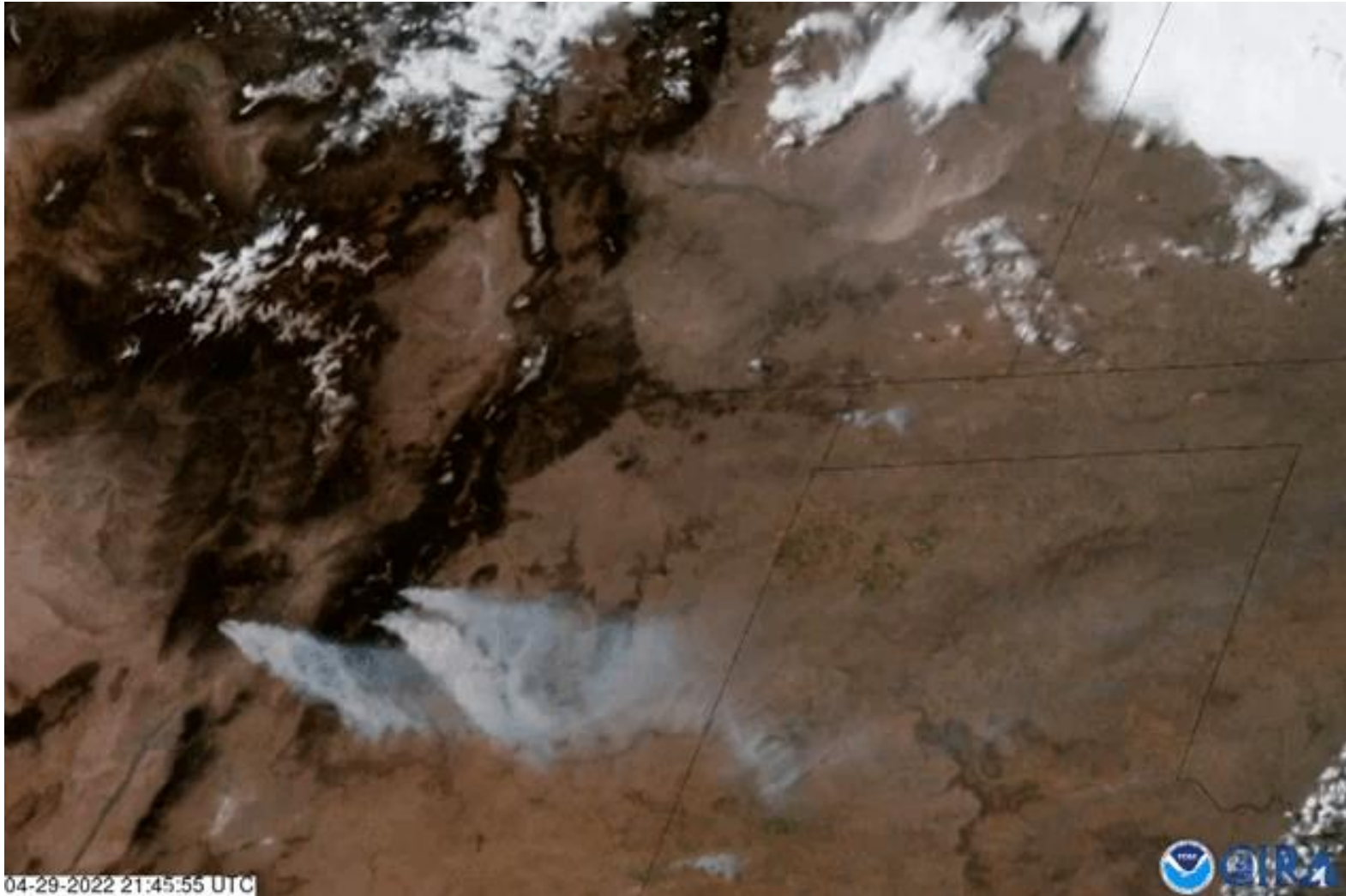
Addition of low-cost sensors greatly refines smoke product.



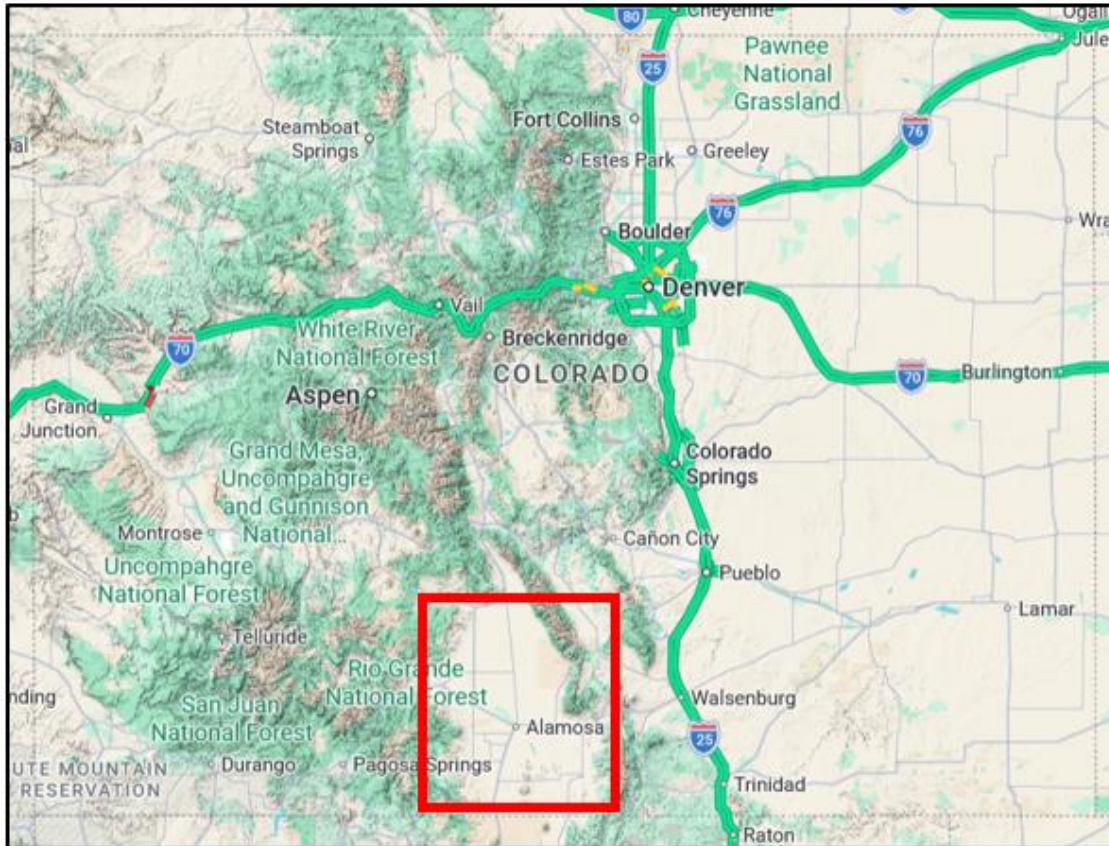
Olivia Sablan



What about satellites and low-cost monitors for quantifying dust events?

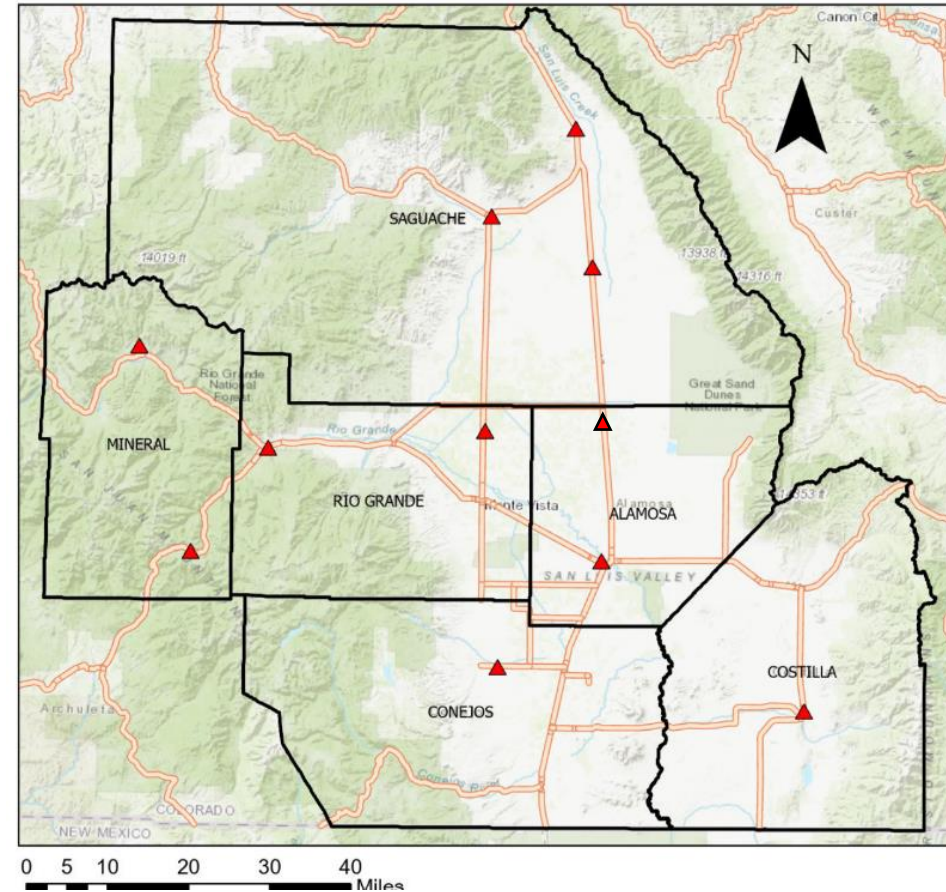
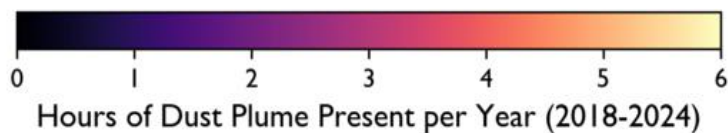
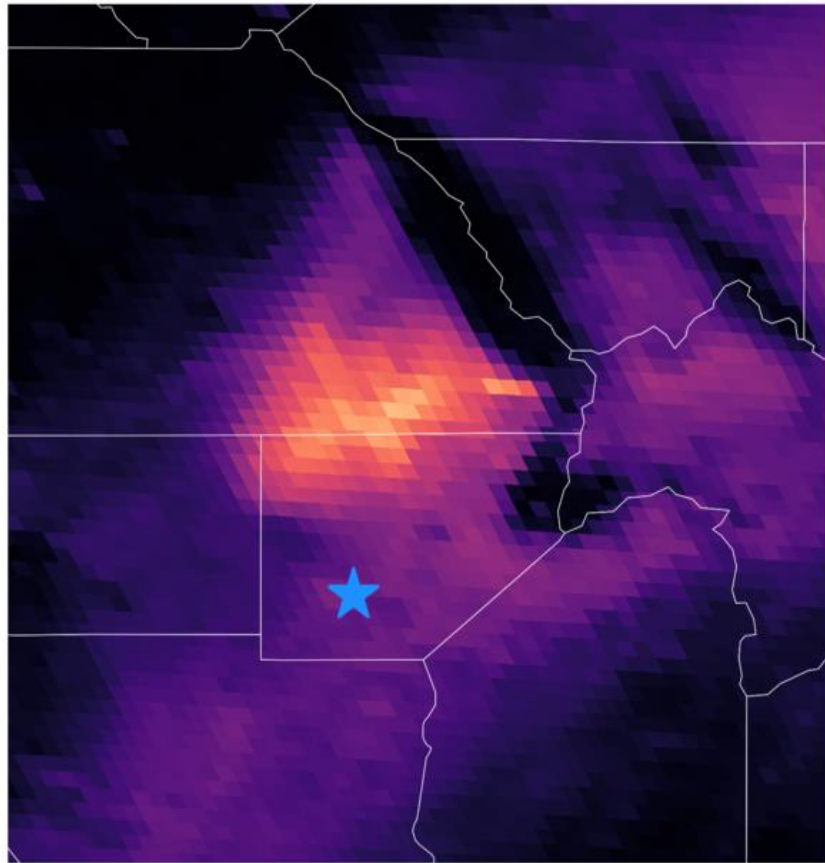


The San Luis Valley is prone to dust events, but has a single monitor that can miss events.



Single monitoring location

Satellite climatology of dust events can help sight low-cost QuantAQ sensor locations for dust measurements.



- Legend**
- ▲ QuantAQ PM Sensor
 - Colorado County Boundaries
 - Colorado Major Roads



Jennifer McGinnis

Thanks!

