

Future Trends in Air Quality Monitoring and Modeling

Cleaning the Air That We Breathe...

Current Monitoring Technology

- Real-time, Continuous (1-hour or less)
 - Ozone, NO_x, SO₂, CO, PM, BC, Ultrafine
- 24-hour plus laboratory analysis
 - Lead, Air Toxics, Metals, PM Components
- Regulatory monitoring will continue to be based on these established methods with incremental improvements over time

Current Monitoring Technology



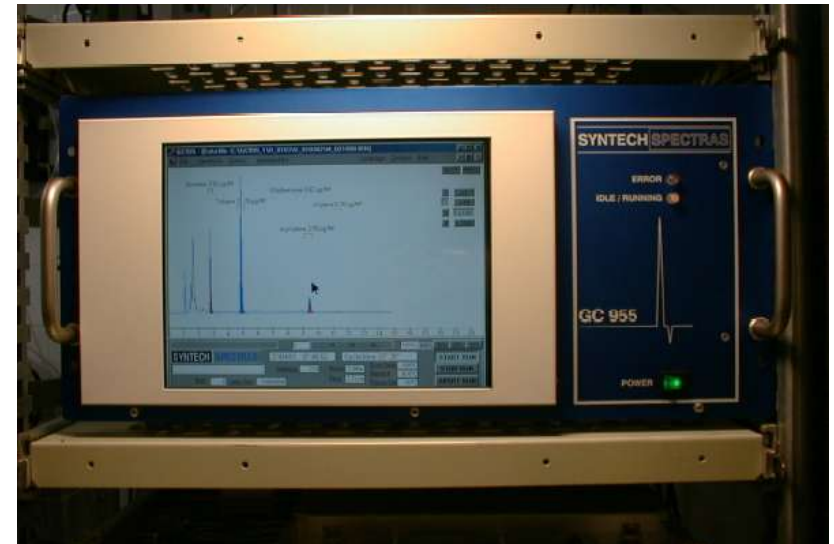
Emerging Monitoring Technology

- Real-time, Continuous (1-hour or less)
 - Lead, Air Toxics, Metals, PM Components
 - Emissions Monitoring
- Better Spatial Coverage
 - Mobile Monitoring Platforms
 - Distributed Low-Cost Sensing
 - Remote Sensing
 - Satellite

Continuous Air Toxics, Lead



- Also adapted to emissions monitoring at stack



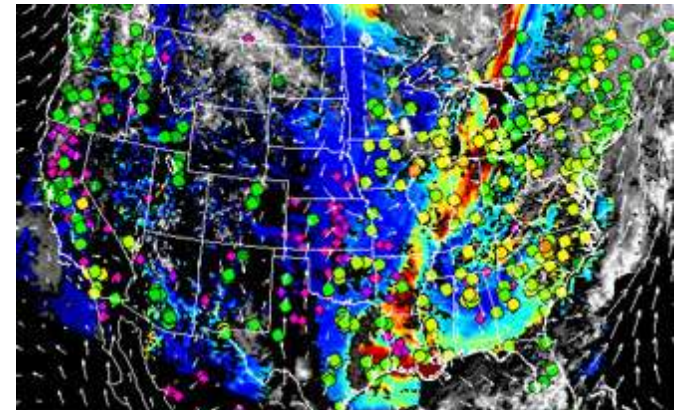
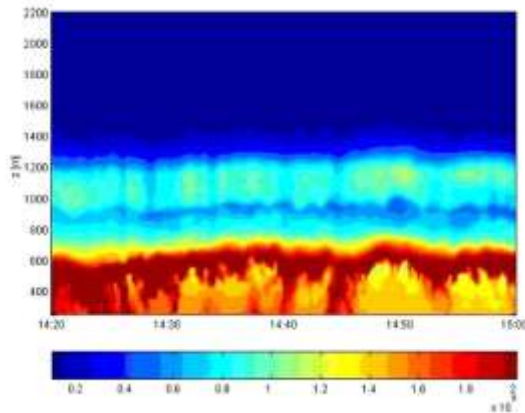
Mobile Monitoring Platforms



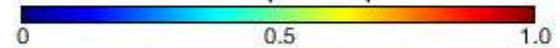
Distributed, Low-Cost Sensors



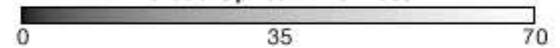
Remote Sensing / Satellite



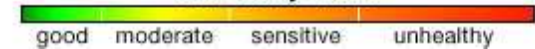
Aerosol Optical Depth



Cloud Optical Thickness



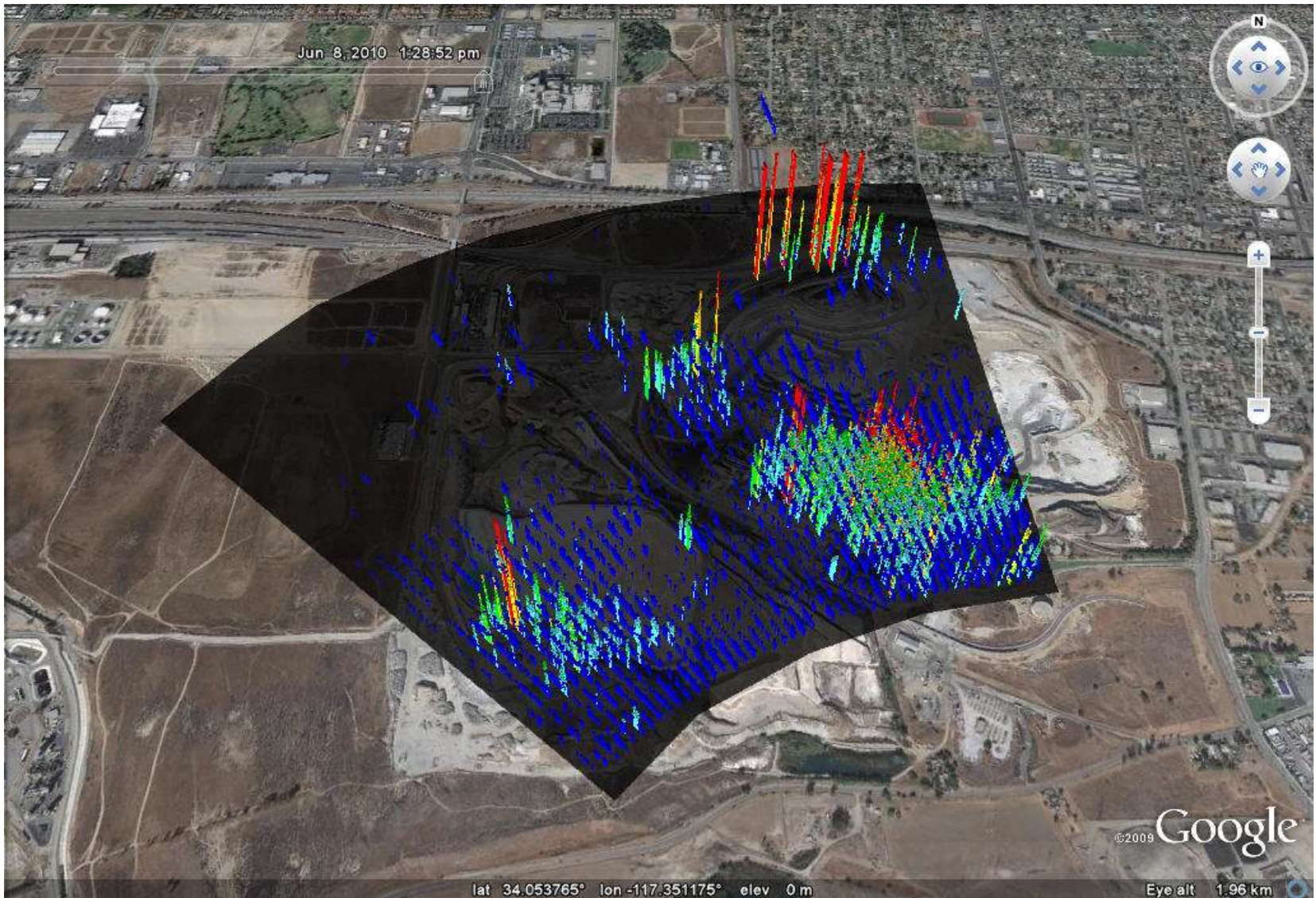
Air Quality Index



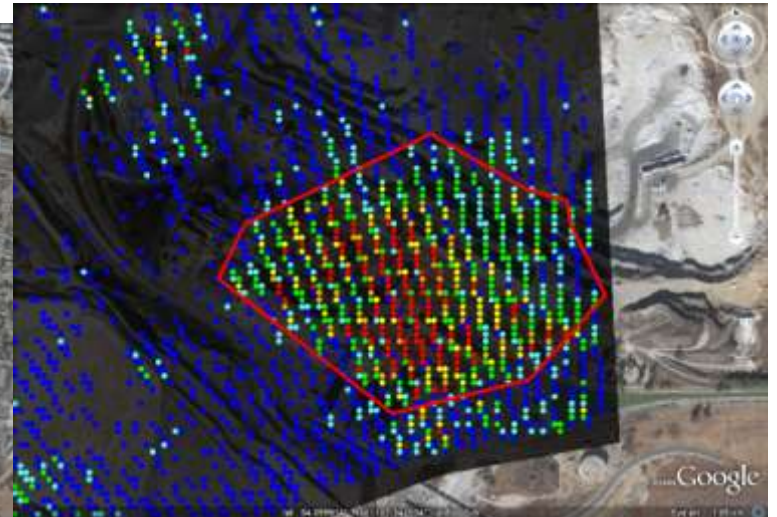
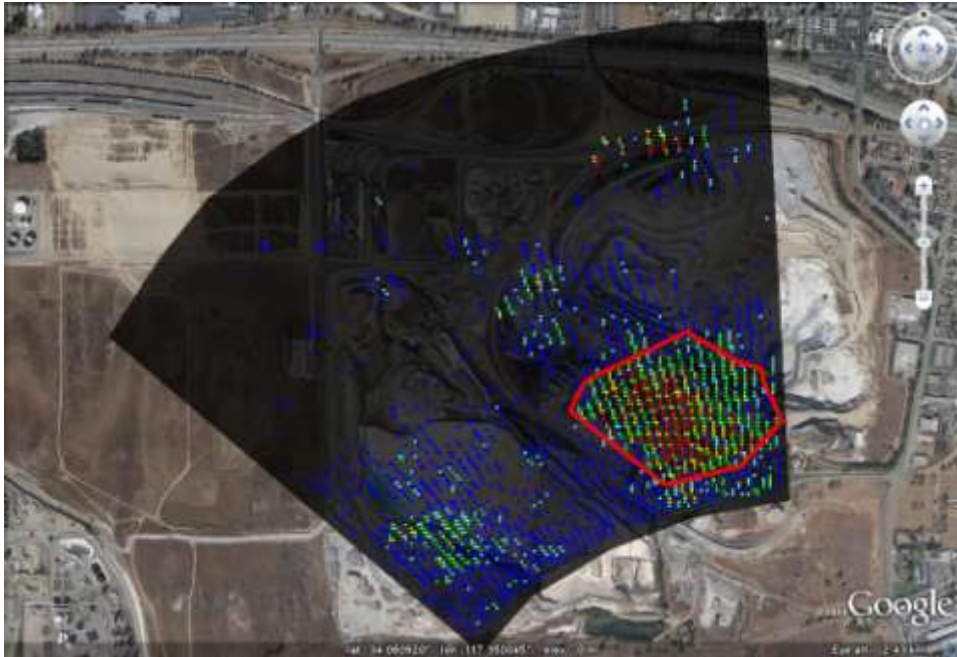


LIDAR Fugitive Dust Detection Project – Aerospace Corp.

100608 54 degrees Scan (11:43am to 1:29pm)



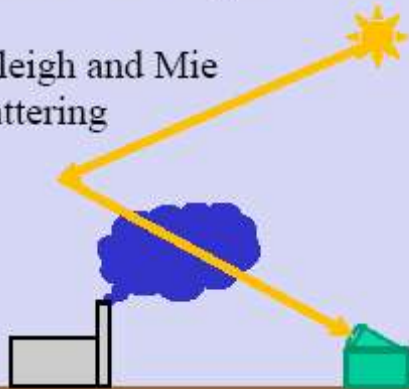
100608 54 degrees Scan (11:43am to 1:29pm)



DOAS deployment strategies

Scattered Light DOAS

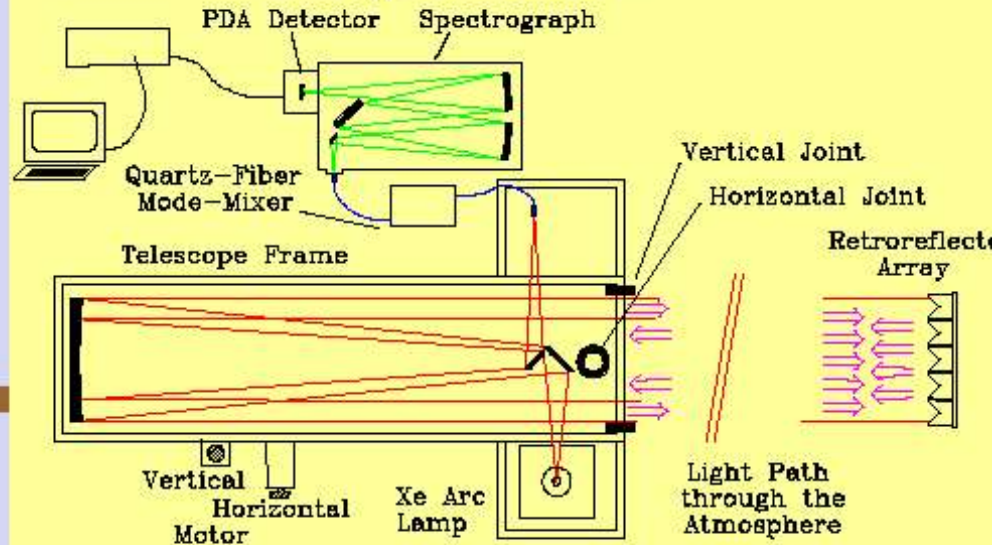
Raleigh and Mie scattering



Slant Column Density

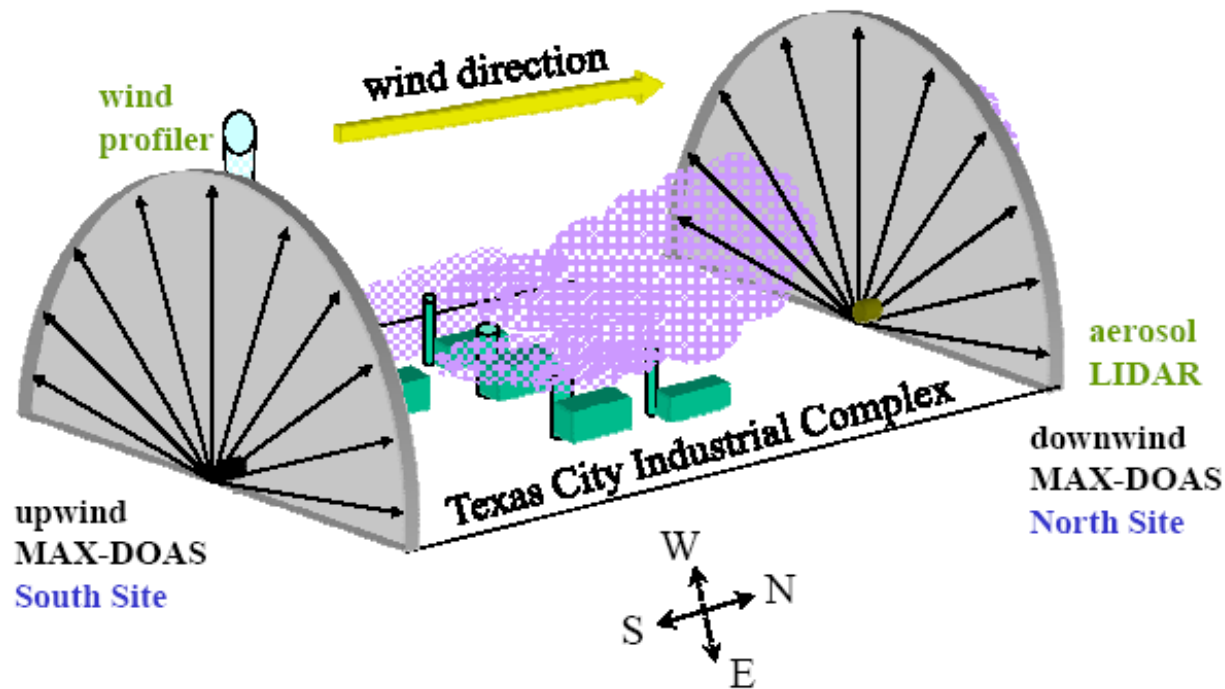
$$SCD = \frac{D'}{\sigma(\lambda)} = \int_{\text{abs. path}} \text{Conc.}(s) ds$$

Longpath-DOAS



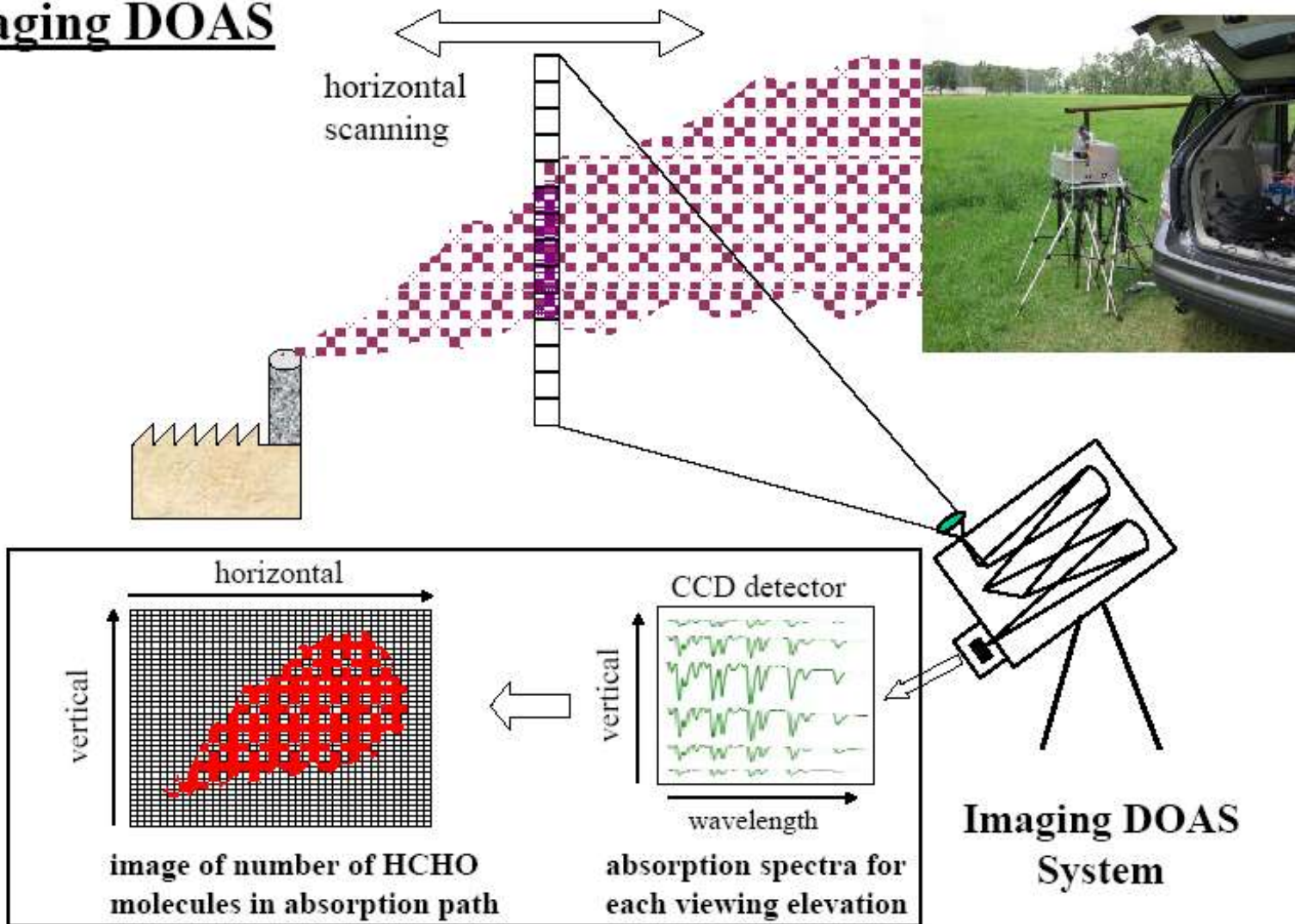
Flux Determination Approach in Texas City, 2009

- Two MAX-DOAS instruments scan in two planes parallel to each other and approximately normal to the wind direction.
- Determine the flux of HCHO from the entire facility by subtracting HCHO Fluxes measured at two sites. Also works for SO₂, and NO₂

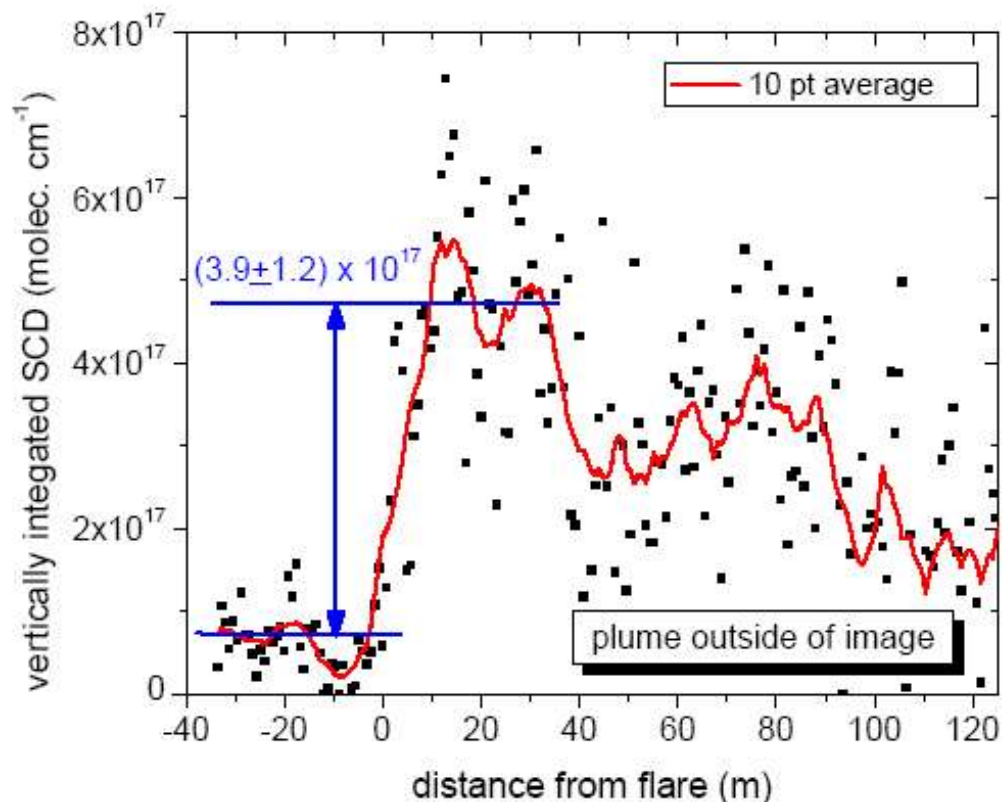
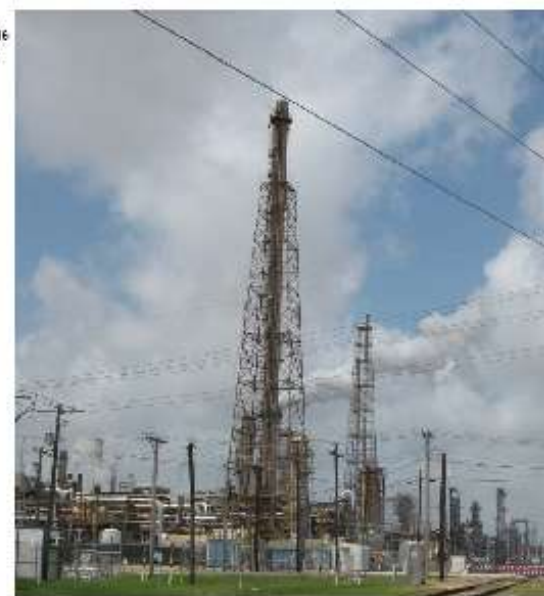
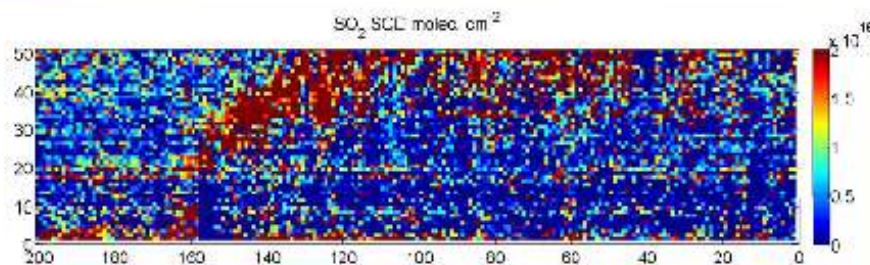


Approach for Point Source Flux Measurement

Imaging DOAS



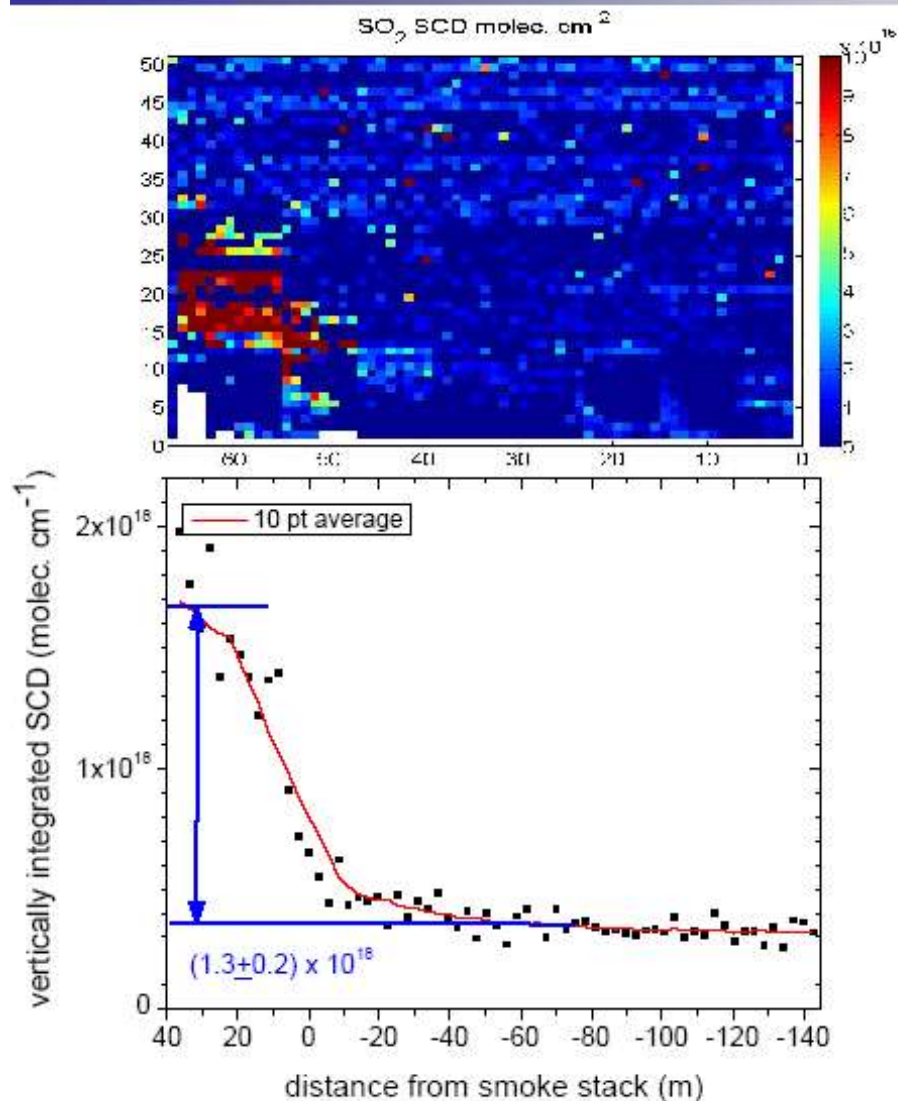
SO₂ Flux from Flare in Texas City



SO₂ flux
from burning flare
in Texas City

2.1 ± 0.6 kg/h

SO₂ Flux from Ship Stack



SO₂ flux
from docked ship
in Ship Channel
5/28/09

9.3 ± 1.5 kg/h