

MATES V ENHANCED MONITORING: POTENTIAL PROJECTS

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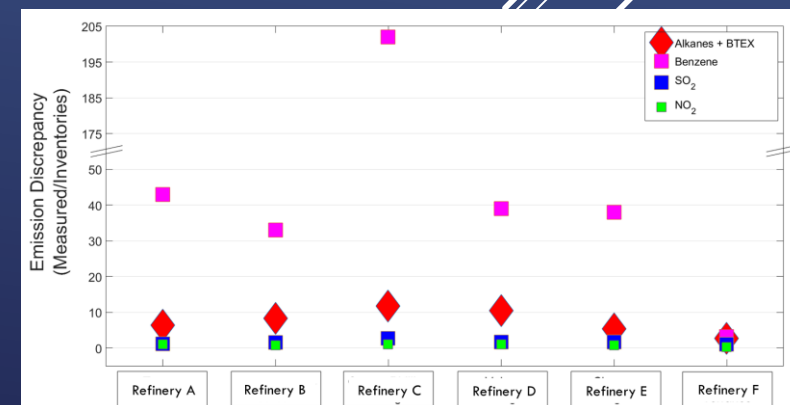
Cleaning the Air That We Breathe...



MOTIVATION



- ▶ Measurements conducted in September 2015 by multiple vendors suggest that fugitive VOC emissions from SCAB refineries may be underestimated (2015 Fluxsense report)
- ▶ Incorporate enhanced monitoring of communities adjacent to refineries into MATES V framework
 - ▶ Mobile monitoring to measure local-scale gradients
 - ▶ Fenceline monitoring at SCAB refineries to identify potential leaks and better characterize emissions
 - ▶ Work with communities on air quality
- ▶ Lessons learned would assist with future monitoring efforts

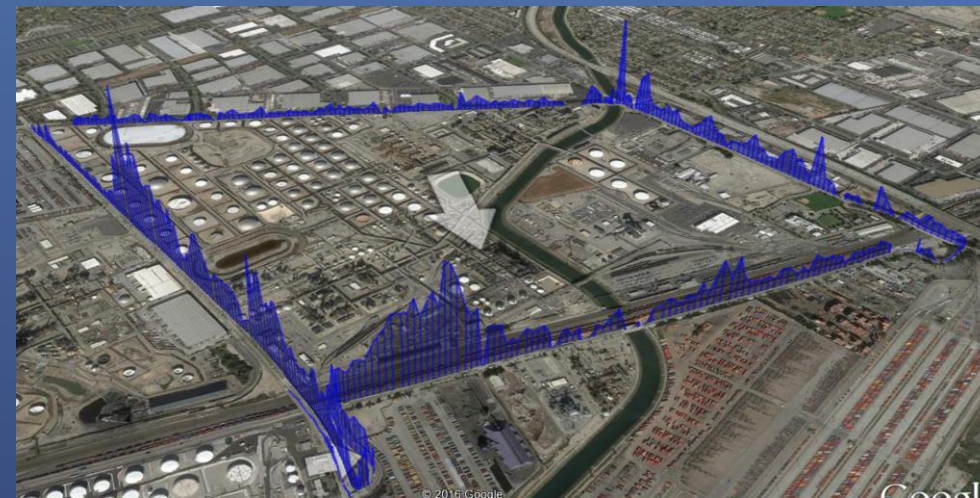


MOBILE COMMUNITY SURVEYS (FLUXSENSE)

- ▶ Mobile laboratory equipped with optical remote sensing and in-situ optical instruments:
 - ▶ Concentration mapping
 - ▶ BTEX by **UV-DOAS White cell**
 - ▶ VOC's – **MeFTIR cell**
 - ▶ Emission flux measurements
 - ▶ VOC's by **Solar Occultation Flux (SOF)**
 - ▶ HCHO, NO₂, SO₂ by **DOAS**
 - ▶ BTEX, CH₄, NH₃ by combining **SOF and UV-DOAS**



Example of plume detection at a refinery



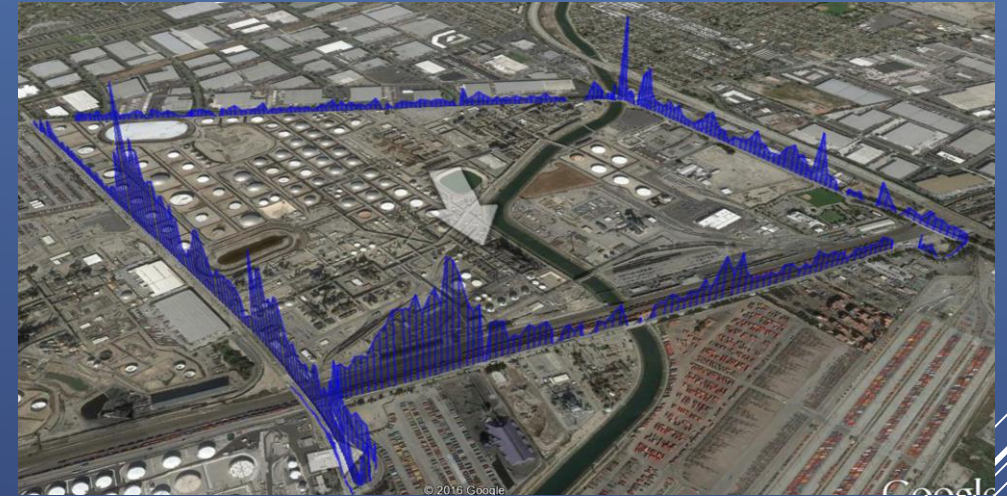
Example of benzene concentration mapping



MOBILE COMMUNITY SURVEYS (FLUXSENSE)

- ▶ Proposed use within MATES V
 - ▶ Guide placement of other monitors
 - ▶ Characterize refinery emissions and identify leaks
 - ▶ Conduct periodic community surveys
 - ▶ Identify hot-spots
 - ▶ Provide insights on small-scale gradients

Example of plume detection at a refinery

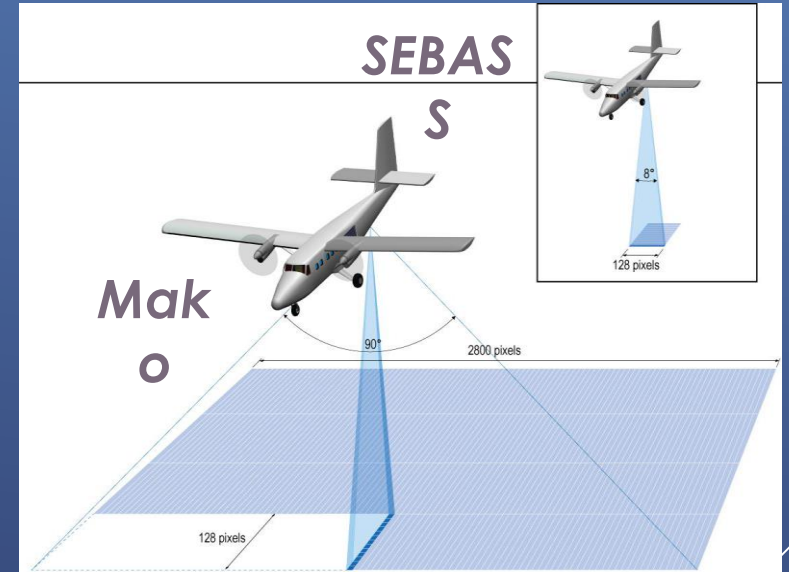


Example of benzene concentration mapping



AIRBORNE OPTICAL REMOTE SENSING (AEROSPACE)

- ▶ Aerospace Corporation's **Hyperspectral Thermal-Infrared Imaging**
 - ▶ Developed over the past 20+ years
 - ▶ Airborne "Mako" and "SEBASS" hyperspectral images
 - ▶ Large area coverage
 - ▶ 20 km² / min (at 2-m GSD) from 12,500 ft (3.8 km) AGL
 - ▶ Suitable for regional-scale surveying
 - ▶ Multiple compounds detected simultaneously



Ammonia

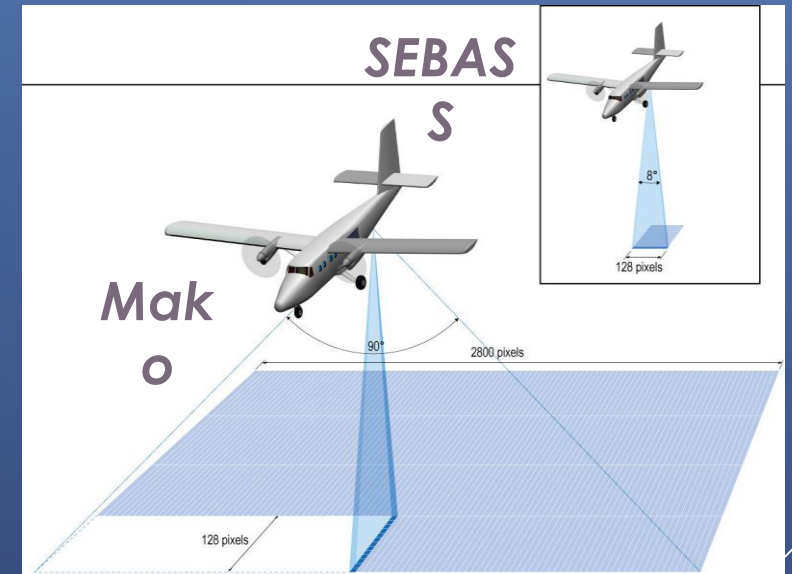
Sulfur Dioxide

Ethene

Methane

AIRBORNE OPTICAL REMOTE SENSING (AEROSPACE)

- ▶ Proposed use within MATES V
 - ▶ Periodic aerial surveys of the SCAB to:
 - ▶ Identify potential emission sources
 - ▶ Aid selection of locations for enhanced monitoring
 - ▶ Analysis of historical measurements over the SCAB



*Gas plumes detection
at an oil refinery*

Ammonia

Sulfur Dioxide

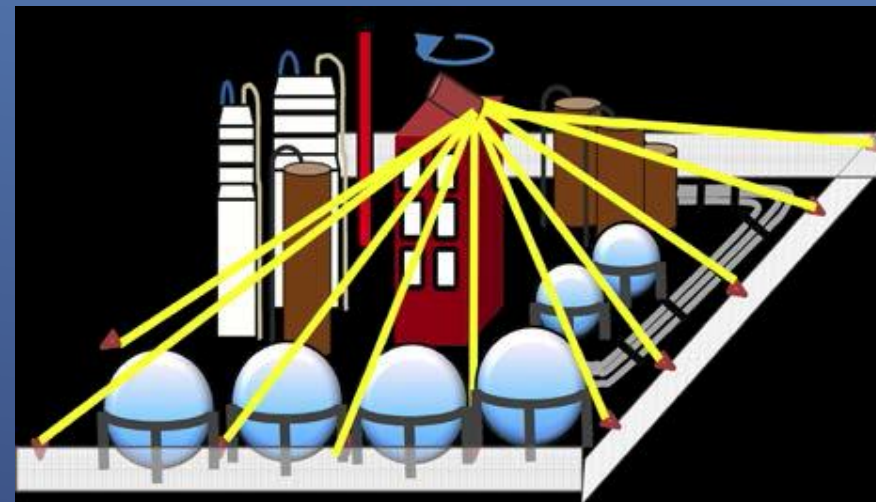
Ethene

Methane

OPTICAL TENT (UCLA)

Conceptual illustration of an optical tent

- ▶ Develop / deploy an optical tent at one SCAB refinery
 - ▶ Use of elevated Long Path DOAS and UV LED light source
 - ▶ Pollutants detected: BTEX and other aromatic hydrocarbons, HCHO, and SO₂
 - ▶ Continuous (24/7) operation
 - ▶ Real-time feedback for facility operator(s)
 - ▶ Community alarms for accidental releases
- ▶ Successfully deployed in Houston, TX, during 2015 BEE-TEX study
 - ▶ BTEX measurements over residential area near a refinery
- ▶ *Requires approval from / collaboration with a refinery*



BEE-TEX 2015 measurement setup



COMMUNITY DEPLOYMENT OF “LOW-COST” SENSORS

▶ Work with community members to deploy “low-cost” sensors

- ▶ EPA STAR grant: 500+ sensors for PM_{2.5}/10, O₃, NO_x, T, RH
- ▶ Community scale grant: prototype sensors for VOCs, PM, and winds
 - ▶ Apply dispersion models to identify sources
- ▶ Incorporate data from other monitoring network(s)

▶ Qsense cloud

- ▶ “Cloud Calibration” methods to address “low-cost” sensor limitations
- ▶ Navigate geospatial and temporal data on dedicated website
- ▶ Centralize data from multiple air monitoring devices



UPCOMING PROJECT: TORRANCE COMMUNITY MONITORING

- ▶ Collaborative project between:
 - ▶ Sonoma Technology – monitoring
 - ▶ City of Torrance – alert and notification
- ▶ Monitoring components:
 - ▶ Open-path fenceline network
 - ▶ Real-time monitoring of HCN, HF, H₂S, benzene, SO₂, and other air toxic pollutants
 - ▶ Community monitoring
 - ▶ Four air monitoring stations for air toxics
 - ▶ Community engagement
 - ▶ Deploy ~50 “low-cost” PM sensors in communities
- ▶ *Project timeline may not coincide with MATES V*

