

Measuring VOC and Benzene Emissions with DIAL

- DIAL: Differential absorption lidar, a form of laser radar
- Uses an IR laser to measure VOC and a UV laser to measure benzene
- Lasers measure the absorption profile across an elevated path to obtain concentration profile
- Wind speed sensors are used to measure the wind profile
- VOC and benzene emission rates are calculated from the product of gas concentrations and the wind velocity component perpendicular to the DIAL measurement plane



NPL Trailer & 10 meter calibration chamber

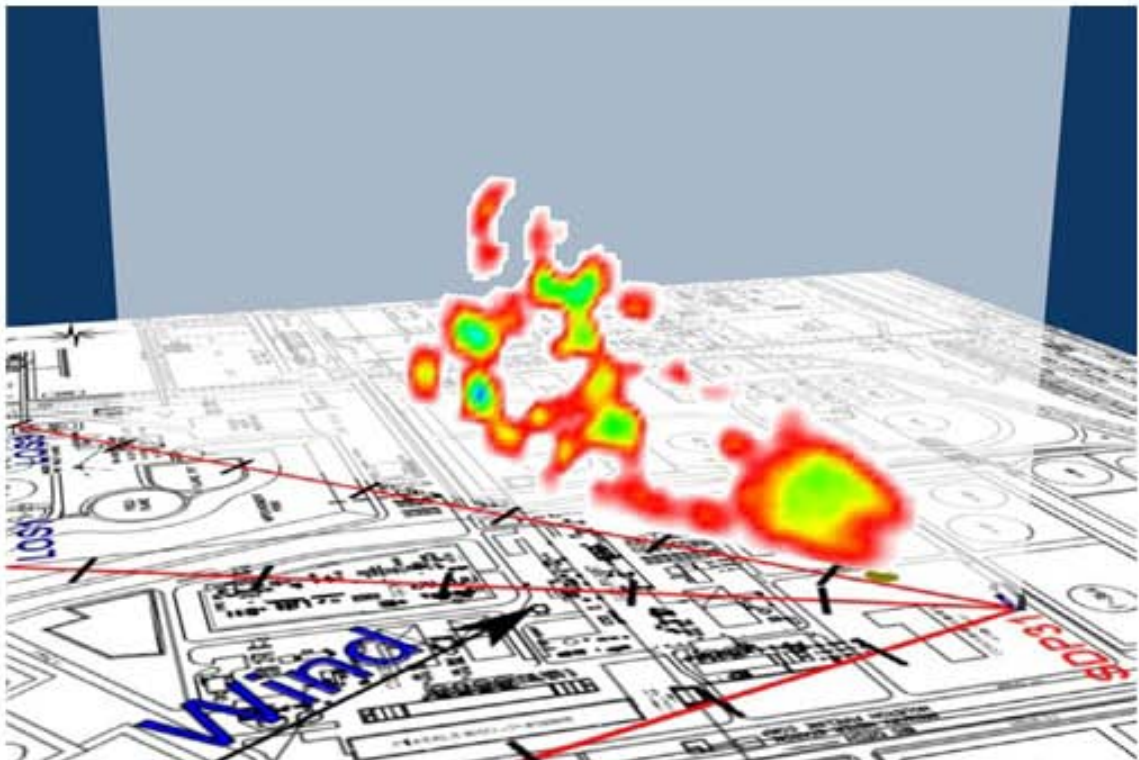
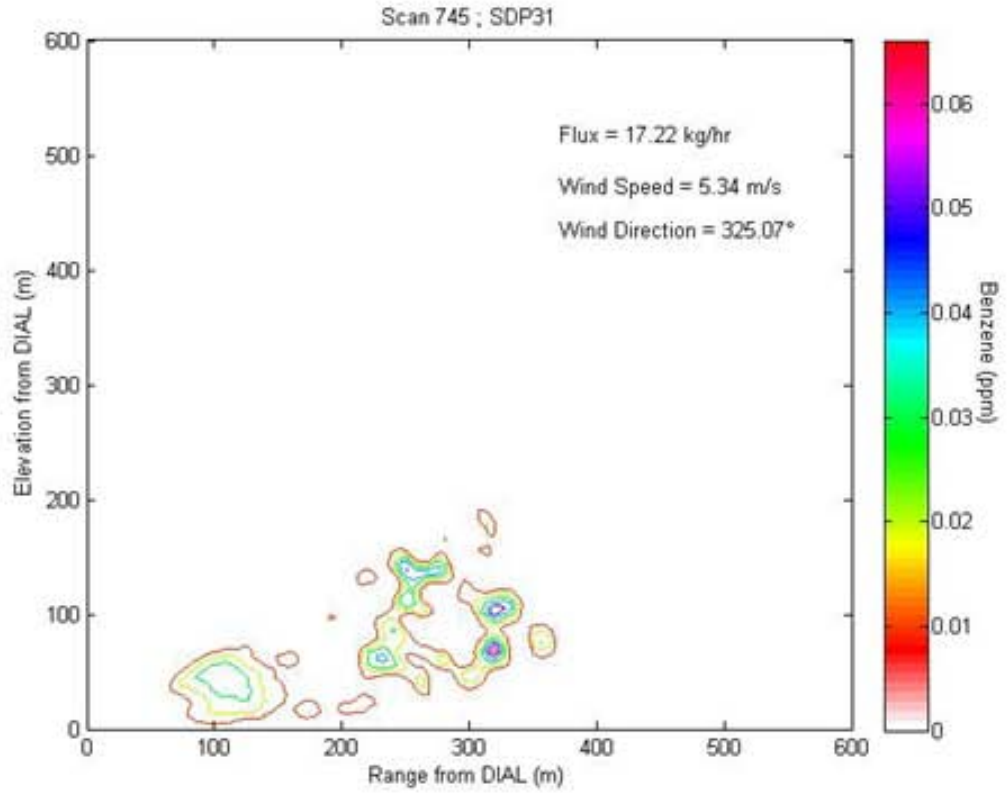
The unit can be set to use either pulsed pairs of IR laser signals to measure absorption from non-aromatic hydrocarbons (VOCs) in the Infra Red spectrum or pulsed UV laser signal pairs to measure the absorption of benzene and other aromatic compounds in the UV portion of the spectrum

The laser signals are pulsed very rapidly as the lasers are gradually swept back and forth through a 90 degree arc to measure the concentration of VOCs or aromatics present in the plane swept out by the arc. Using computers to match and correct for differences in the two signals and applying complex algorithms to the data, the concentration plane measured is then mathematically combined with the wind speed and direction data to produce a 3D representation of the emissions.

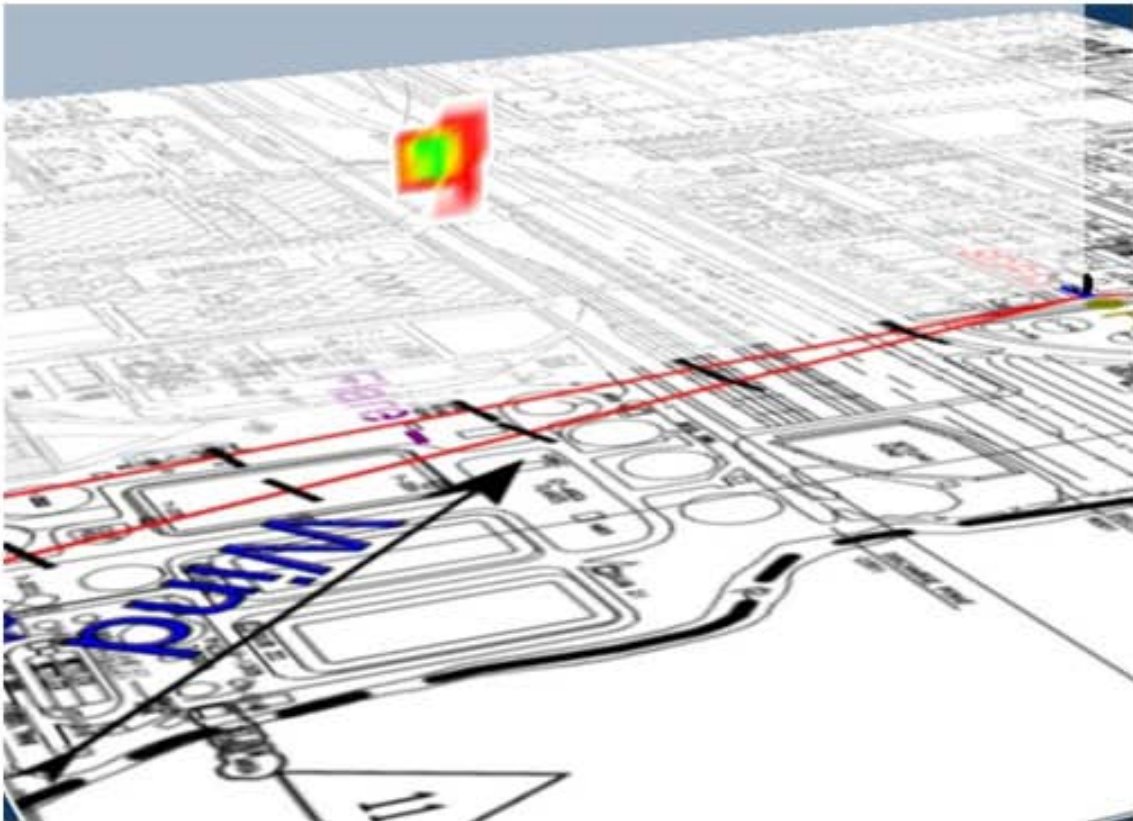
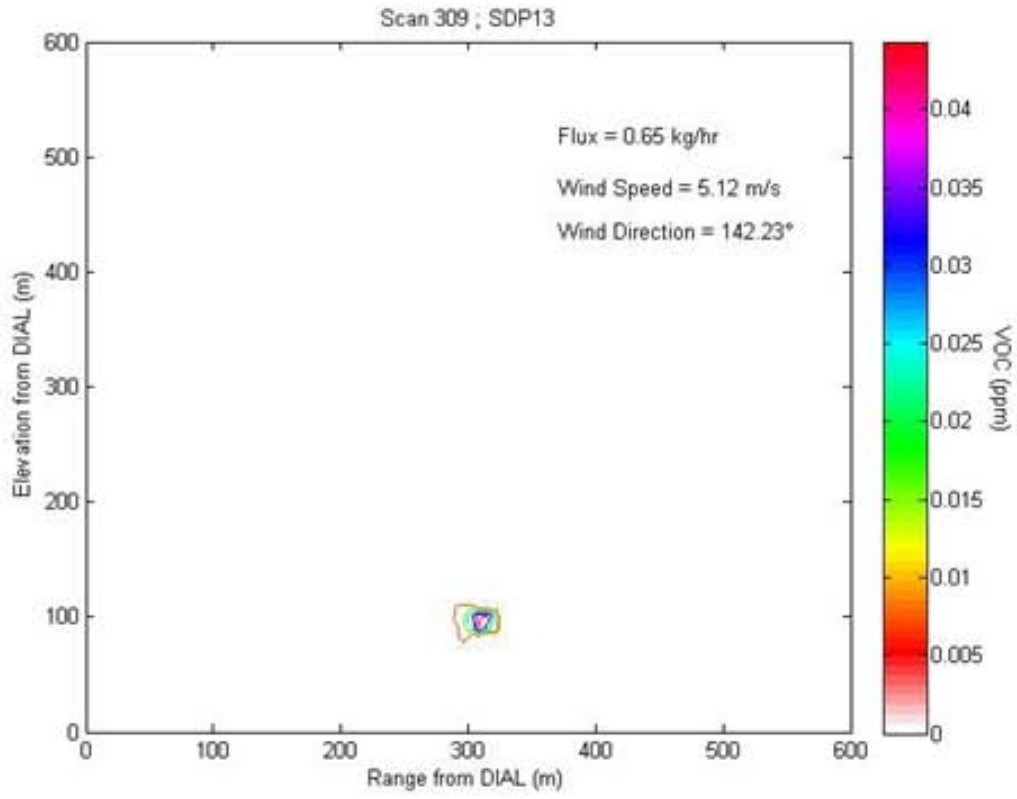
The Other Techniques

- UV – DOAS (used by the EPA) uses UV lasers to determine benzene concentration along a predetermined path
- OP-FTIR – Uses an IR beam to measure VOCs along a fixed path (2m above ground)
- MAAML – GC/MS platform to measure VOCs & benzene at a fixed point about 5m above ground level
- Summa canisters – Used to collect samples at a point for later analysis
- ATD – Fixed point samplers for measuring VOCs, data is used to adjust DIAL algorithm output.

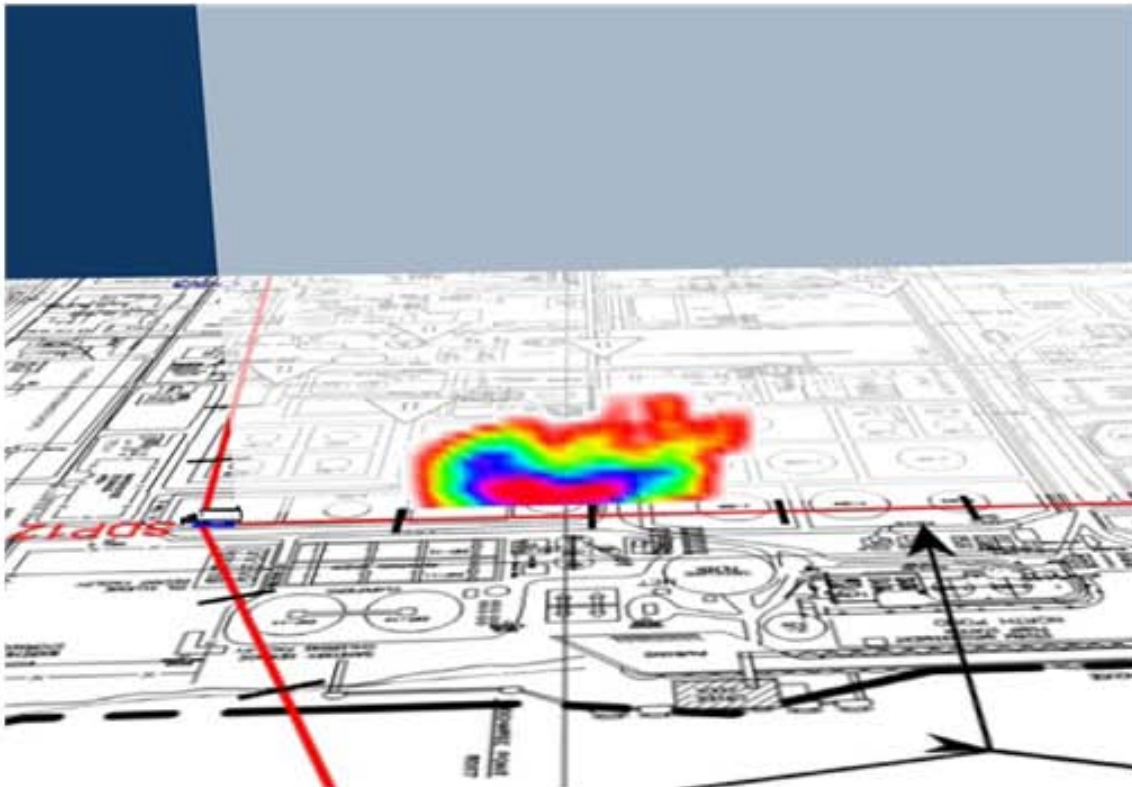
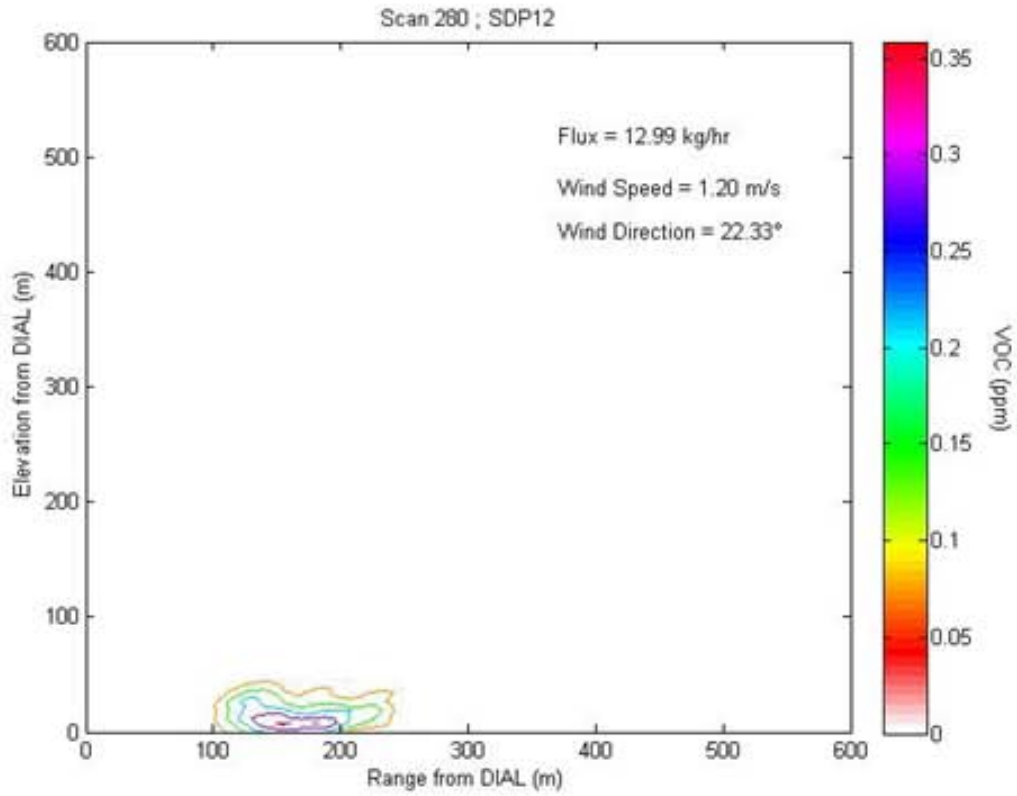
COKER



Flare



Wastewater Treatment



W. Tank Event

