Bringing Environmental Measurements to the Field

VOC and GHG mapping

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Mobile Chemical Analysis

Lab-to-Field Revolution

Samples to Lab

Lab to Samples
Volatile Organic Compounds and GHGs

1. Which compounds are present?
2. At what concentrations?
3. Where are they coming from?
4. How much does each source contribute?
Needle in a Haystack

What is it? Mass Spectrum

Molecular Level Information

How much?
Mobile MS Lab for On-site Air Quality

- GPS, Inlets & meteorological data
- Power Supply
- CIT-MS
- CH₄/CO₂/H₂O
- NOₓ
- O₃
- Server
- PTR-TOF-MS
- Optical Particle Sizer
Mapping Greenhouse Gas Concentrations

Methane July 24, 2018

Carbon dioxide July 24, 2018

Preliminary data for research purpose only. Must be verified if important.
Spatial Mapping of Chemical Fingerprints

Targeted quantitative analysis

Non-targeted qualitative analysis

Taking it to the Street!

Continuous, spatially and temporally resolved measurements of VOC mixtures

$1.50/L

GAS

$1.50/L
Geospatial Map of VOC Sources

- Biomass Component
- Wood Component
- Hydrocarbons Component
- Pulp Mill Component

Southeast Vancouver Island

Elements:
- Sawmill
- Compost
- Landfill
- Pulp Mill
- Car crusher
- Ladysmith
- Traffic
- Nanaimo
- Topsoil farm
- Ferry
- Crofton
Transformative Technology

**In-field Environmental Monitoring, Food Security and Point-of-Care Medical Diagnostics**

Information when and where you need it

- Unprecedented *Spatial* and *Temporal* Resolution
- Opportunities for *Big Data* Analytics
- Risk-based and *Adaptive* Sampling
- *Emergency Response*
Have Mass Spec – Will Travel

GIS for data interpretation/visualization
  - Site Surveys & Plume Tracking

Integrating all chemical sensor data (VOCs, PM, GHG)
  - Source apportionment

Indoor air quality
  - Occupational exposure
  - Human stress molecules

Biogenic VOCs
White, four-wheeled bloodhound; maps made from its memories.
Hose for a nose. Sniff!
Geospatial Data Visualization
Mobile Monitoring Data Types

**Mass Spectrometric** (CIT, PTR-ToF-MS)
  MS/MS, SIM and full scan (meta data)

**Air Quality**
  O$_3$, NO$_x$, CH$_4$, CO$_2$, PM (0.3 – 10 microns)

**Derived data**
  Calibration standards, statistical data

**Positional**
  Latitude, longitude, altitude, direction of travel

**Meteorological**
  Temp, humidity, barometric pressure, wind speed/direction

**Digitized Qualitative Data**
  Time lapse photography/Video, digitized notes
Why Take Instruments out of the Lab

Data Density

Sample Integrity

Geo-Spatial Mapping

Information ‘when and where’ it’s needed

- Site Assessments/Surveys
- Real-time Monitoring
- Adaptive Sampling
- Rapid Response