



Photo credit: Patrick Cullis, NOAA/CIRES

CHEMICAL IONIZATION MASS SPECTROMETERS (CIMS)

BACKGROUND :

Volatile organic compounds (VOCs) are pollutants that are emitted from human and natural sources. VOCs contribute to the formation of hazardous air pollutants, including ozone and PM_{2.5}, and many are considered air toxics that can impact human health. The proton-transfer-reaction mass spectrometer (PTR-ToF-MS) is a key instrument at NOAA CSL that is capable of measuring hundreds of VOCs that degrade air quality. The ammonium-adduct mass spectrometer (NH₄-LToF-MS) is a new tool at CSL that will expand our measurement capabilities to measure previously understudied VOCs, as well as components of PM_{2.5}.

DESCRIPTION :

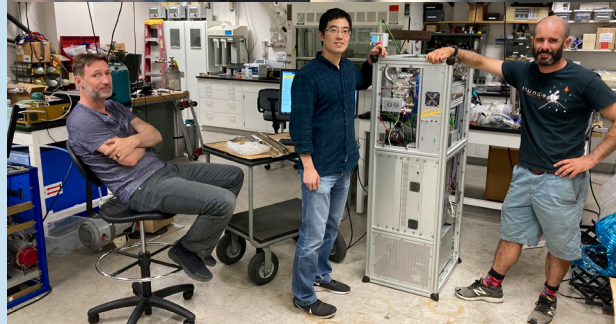
The NOAA PTR-ToF-MS and NH₄-LToF-MS are high-resolution mass spectrometers that detect VOCs by chemical ionization. The instruments are capable of measuring compounds with a wide-spectrum of functionalities including ketones, aldehydes, alcohols, acids, aromatics, and alkenes. The instruments are built into aircraft-certified racks, which enables them to be deployed on range of platforms, including aircraft, mobile laboratories, and ships.

INNOVATIONS :

The PTR-ToF-MS has been instrumental in quantifying key pollutants that degrade air quality in urban areas. Using this instrument and the GC-MS, we have been able to link key VOC emissions to human activities such as painting, cooking, and use of personal care products. We have recently characterized the new NH₄-LToF-MS and will deploy this instrument for the first time on the DC8 aircraft for the CSL-led AEROMMA mission.

INSTRUMENT SPECIFICATIONS :

- Accuracy: 30%
- Limit of detection 10 – 50 ppt
- Time resolution: as fast as 10 Hz
- Sources we have quantified: motor vehicles, consumer products, cooking emissions, biomass burning, agricultural emissions, wood-stove emissions, oil and natural gas emissions



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