

WHAT'S THAT SMELL? IS IT TOXIC?



Chemical Characterization of Odors using Mobile Measurements

WHY NOW?

Community concerns and fear of possible health effects are often centered around the perception of odors from emission sources. However, it is important to know that toxic gases may be odorless at concentrations that may be harmful to human health, and that odorous gases may not be hazardous at the concentrations we can start to smell them. The SETx-UIFL set out to answer the question: can individual components of chemical mixtures be quantified and separated to reveal "odor culprits" in Southeast Texas?

WHO WAS INVOLVED?

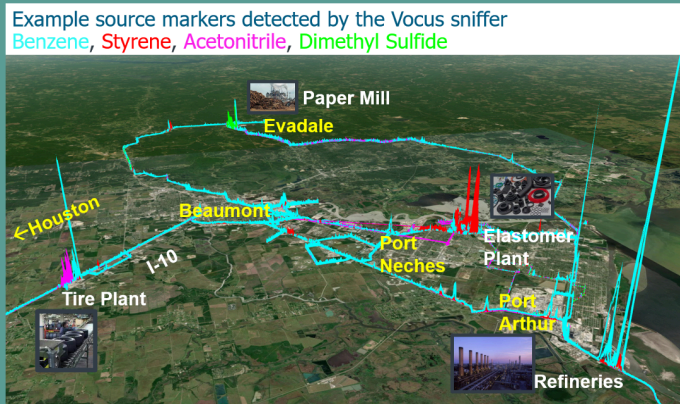
Over the course of the project, many local partners suggested sites in the area where they observed odors. These suggestions informed the measurement driving routes and justified the investigation of odors.

FINDINGS

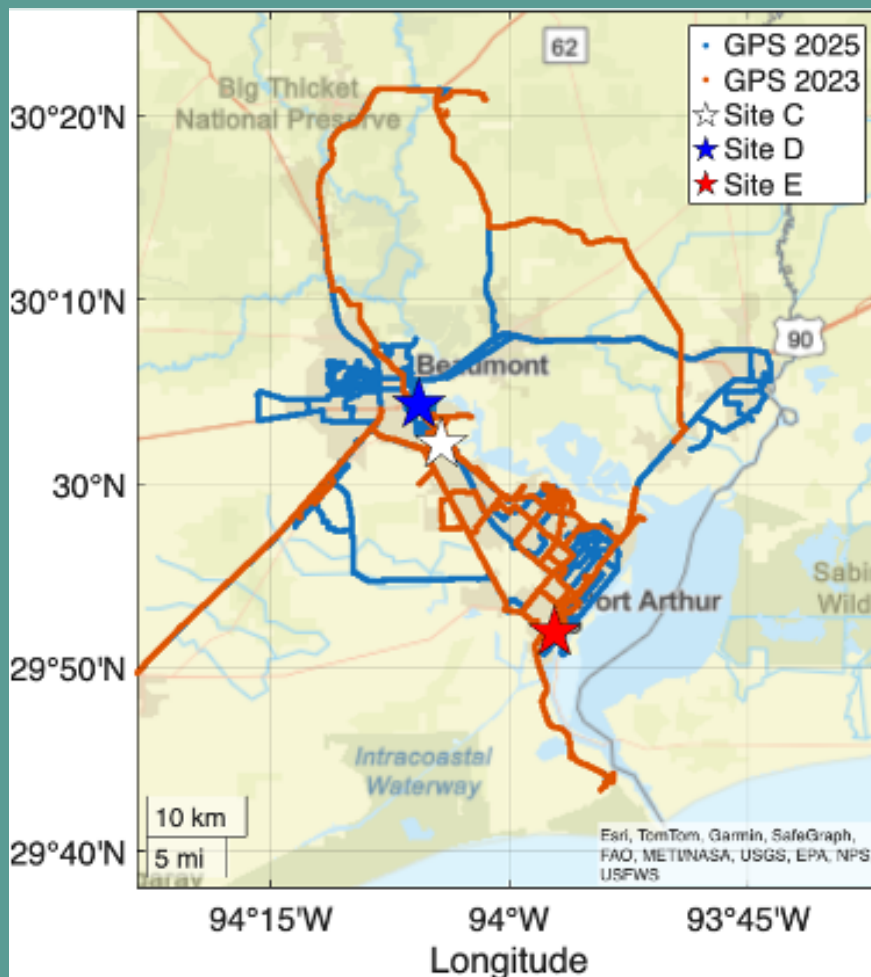
The SETx-UIFL generated high-resolution spatial maps of measured total odor activity. Odors from manufacturing of elastomers were dominated by isopropyl mercaptan, and odors from petroleum refining were dominated by n-butyl mercaptan. Although these sulfur-containing compounds were the most odorous, they were not the most abundant or most toxic. On the other hand, acrolein and 1,3-butadiene, which can cause eye irritation and respiratory issues, were the major components of relative toxicity estimates. Benzene, styrene, acetonitrile, and dimethyl sulfide were among some of the most abundant compounds, but their contributions to odor and toxicity were less pronounced. This analysis points to the need for targeted odor control strategies in chemical manufacturing processes. Mobile measurements can help to identify and address odor nuisances affecting communities.

WHAT WE DID

As the human nose is a sensitive chemical sensor itself, measurements of ultra-low concentrations are needed to identify potentially odorous compounds present in ambient air. During three measurement campaigns in 2023 and 2025, the SETx-UIFL research team utilized a state-of-the-art instrument called the "Vocus Sniffer" mounted on a mobile van to measure complex gas mixtures with hundreds of chemicals while driving planned routes. The researchers repeated the driving routes and were able to detect diverse chemical compounds in the plumes downwind of a range of industrial facilities. The research team also estimated odor activity and relative chemical toxicity and were able to estimate the most likely industrial sources of a variety of compounds.



Example source markers detected by the Vocus Sniffer, highlighting some of the most abundant compounds associated with industrial emissions. The "spikes" and taller traces correspond to higher concentrations of a given source marker.



Intensive Mobile Campaigns Conducted During Spring and Fall 2023, and Spring 2025



Mobile Sniffer Lab pictured during measurements. Photo credit Evelyn Deveraux.

MORE ABOUT SETX-UIFL

The Southeast Texas Urban Integrated Field Lab (SETx-UIFL) is one of four projects funded in 2022 by the U.S. Department of Energy to study how climate, environment, and urban changes affect cities. A team of over 80 researchers from UT, Lamar University, Texas A&M, Prairie View A&M, Oak Ridge National Lab, and Los Alamos National Lab has collected data and conducted modeling across hazards including flooding, hurricanes, heat stress, and air quality. Our Why: Southeast Texas faces numerous hazards, yet smaller communities like this one have often felt forgotten compared to larger cities. The SETx-UIFL was designed to explore the complex dynamics of disaster vulnerability for this economically and culturally vibrant region. We believe Southeast Texas is a bellwether for the entire Gulf Coast, and an exemplar for strategies that protect people and places. We hope this effort supports your path toward lasting resilience.



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