

## **An Airborne Study of Methane Point Source Dispersion and Mixed Layer Scaling**

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A light aircraft, equipped with instruments to measure temperature, humidity, methane and horizontal wind, flying in the lower portion of the mixed layer under a variety of micrometeorological conditions, is used to investigate the dispersion of natural gas in the atmospheric boundary layer. Natural gas leaking from a high pressure (~500 PSI) transmission line is initially denser than the surrounding air, inhibiting vertical mixing, however flight safety requires that most aerial patrol operations be conducted at a minimum altitude of 150 meters. Existing dispersion parameterizations are used to find the “sweet spot” where the aircraft should fly to intercept the escaping plume at the minimum safe altitude.

Four days of testing were conducted near Dallas, Texas, where the aircraft patrolled 32 miles of pipeline, which included eight intentional gas releases. By combining data from multiple passes, seven of the eight releases were identified. This technique requires accurate horizontal wind measurements to estimate the back trajectory and identify the source location, as well as knowledge of the mixed layer structure, which is determined by flying profiles from near the surface to above the top of the mixed layer. The ability of ethane measurements to distinguish natural gas leaks from natural and anthropogenic sources is investigated by conducting four flights complete with methane, ethane and horizontal wind. Ethane is found to be an excellent discriminator.



**Figure 1.** Performing a low pass over a gas release in the desert near Barstow, California.