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methane release LLNL

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Disclaimer

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LLNL Instrument Capable of Detecting Methane Releases

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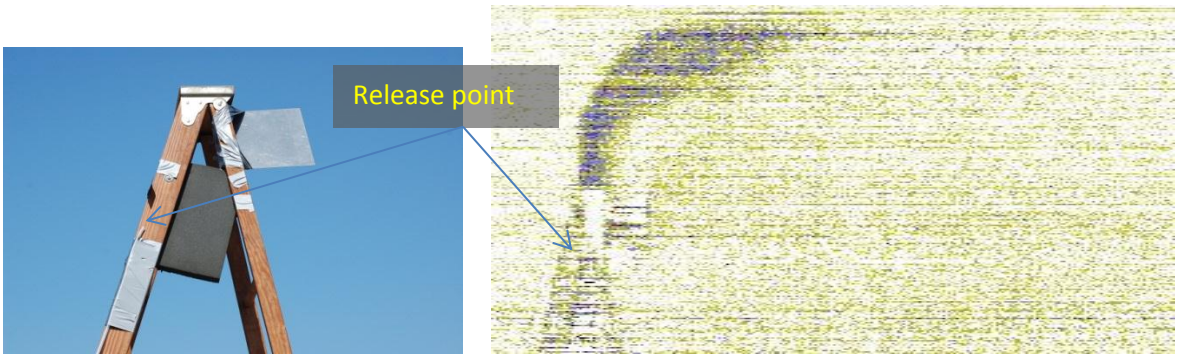

Methane releases in substantial quantities can occur during shale formation fracking. Table 1 in Reference 1 gives a broad range of 12,000 to 680,000 m^3/day (300 to 17,000 ft^3/min) of methane release during the "flow-back" period of establishing a well. The ability to detect and possibly quantify these releases and leaks in the natural gas production system is valuable for economic and environmental reasons.

Under DOE NNSA funding, LLNL has developed a series of long wave, hyperspectral sensors which have been used successfully for many years in gas and solids detection work. The technology allows a spectrum to be measured for each pixel in an imaged scene, with the spectrum covering the ~7.5 to 13.5 micron range in 258 wave bands. These sensors have been developed for both ground-based and airborne platforms. This work shows that these mature sensors can be flown to detect methane releases associated with natural gas production.

Experiments and Results

A small-scale release of methane was performed at LLNL. The above images show the release tube attached to a ladder, and the same scene imaged with the sensor, where the data has been processed to show methane as a dark plume. The methane was released at rates from 0 to 30 ft^3/min, and the sensor was 100 feet from the release point. The image sequence below shows a series of scene images taken approximately 3 seconds apart, which clearly show the methane plume wafting. The ability to see plumes wafting through the scene enhances the ability of the instrument to detect methane. These conditions are favorable to methane detection since there is a cold sky background. Since the concentrations detected were at least a factor of 10 below those expected from fracking, the instrument is expected to be able to detect those releases under the less favorable conditions of looking down from an airplane.

1. Robert W. Howarth, Renee Santoro, Anthony Ingraffea, “Methane and the greenhouse-gas footprint of natural gas from shale formations”, Climatic Change 2011, Volume 106, Number 4, Pages 679-690.

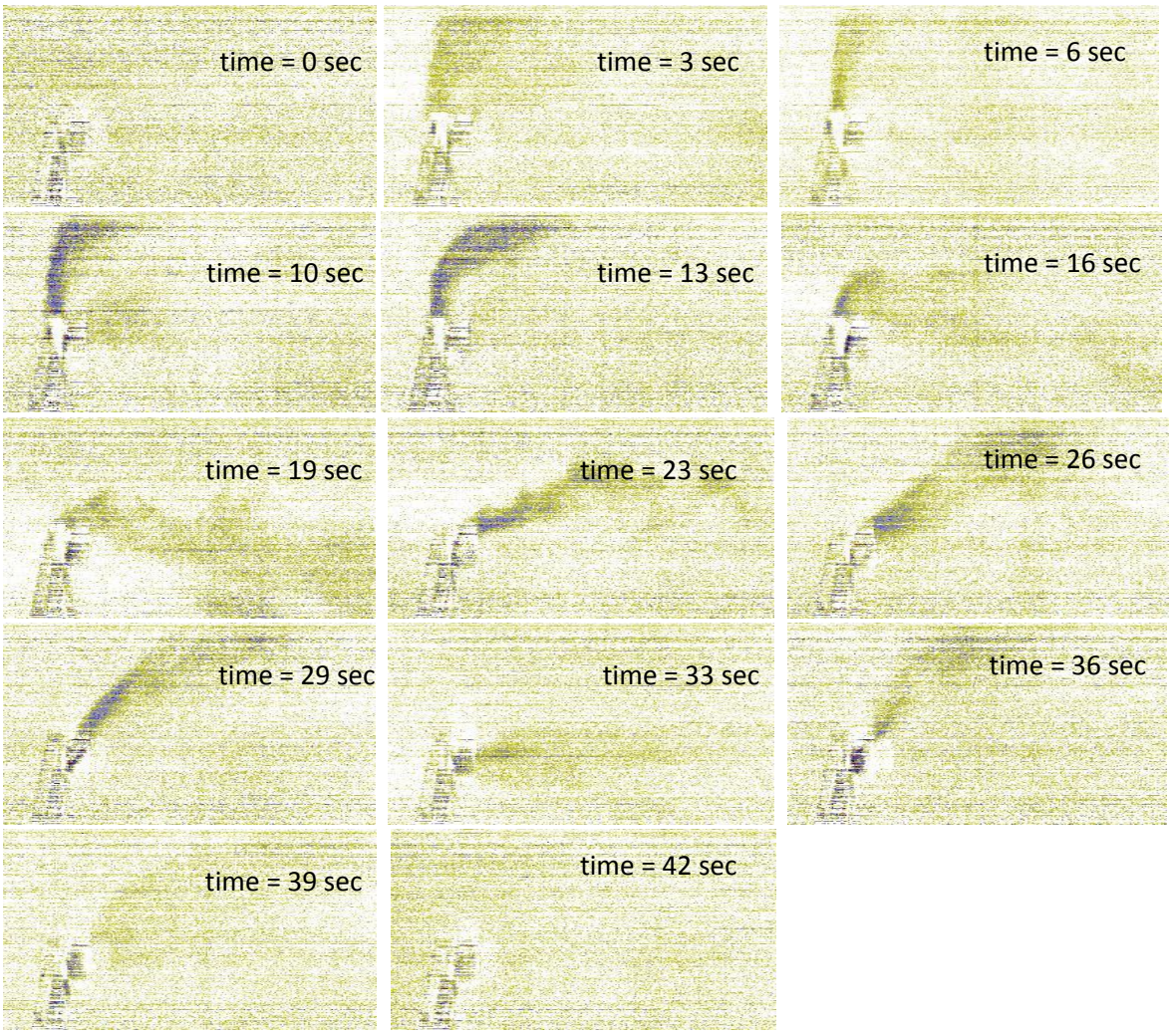

Figure 2. Plume image results using matched filter with methane. Time of images proceed from left to right and down in ~3 second increments. The flow rate started at ~30 ft3/min, then tapered to zero over about 40 seconds.