

## **Supporting Information**

### **Determining times to detection for large methane release events using continuously operating methane sensing systems at simulated oil and gas production sites**

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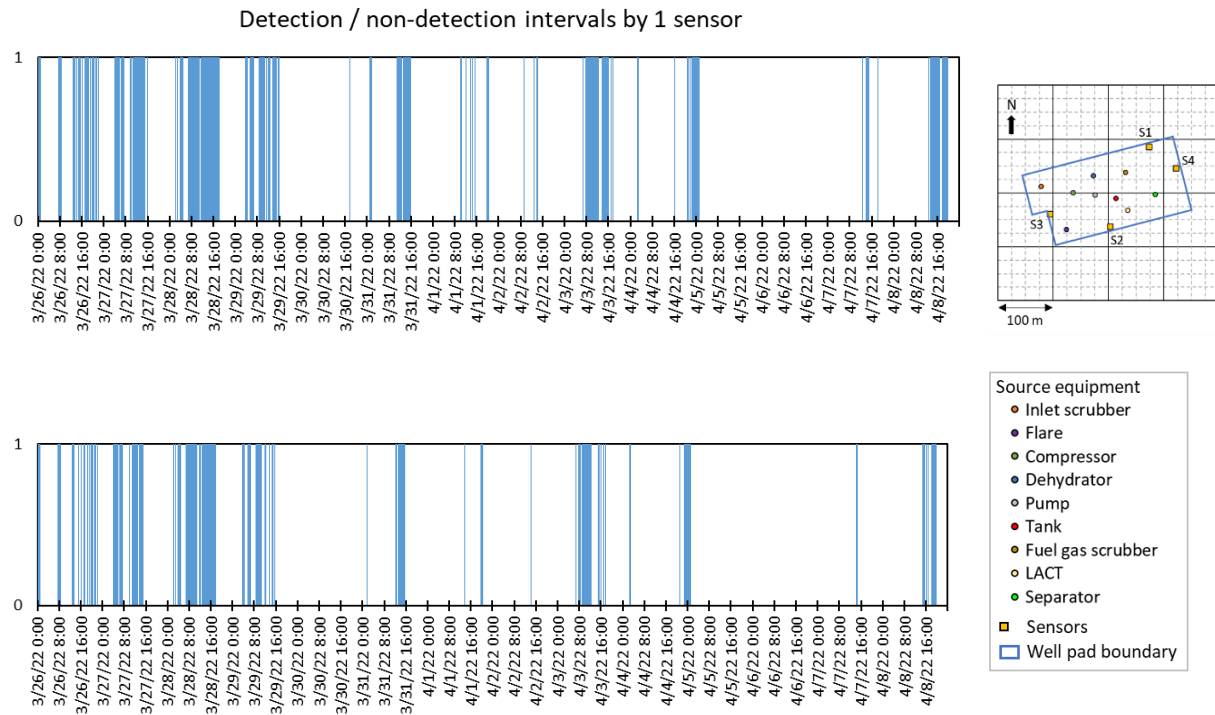
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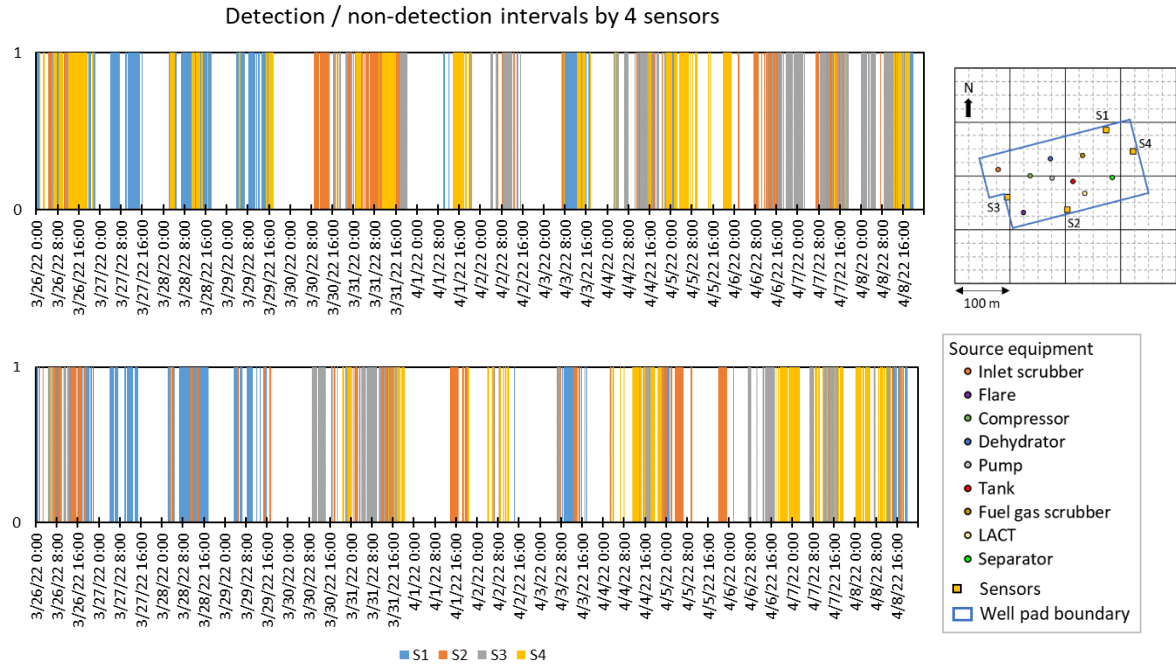
## S1. Detection time periods for events detected based on exceeding a threshold concentration and meeting a persistence criterion

A sensitivity analysis was performed in which the definition for an event detection was changed from a 10 ppm enhancement in methane concentration for one minute to a 10 ppm enhancement in methane concentration over one minute and a time integrated methane enhancement over the preceding 15 minutes >75 ppm-min, including the minute with the enhancement >10 ppm. The second detection criterion is equivalent to an average enhancement of 5 ppm over a 15-minute period. Multiple definitions of persistence could have been used. The purpose of the sensitivity analysis was to examine the effect on time to detection of using both a concentration threshold and a persistence threshold in the definition of an event.

Figures S1 and S2 compare the periods of time during the two week simulation period when a 100 kg/hr emission rate from the tank location is detected using the two different definitions of event detection. Figure S1 shows the detection periods when only one sensor (S1) is used, and Figure S2 shows the detection periods when four sensors are used. Similar detection period mappings were made for each source.



**Figure S1.** Detection time periods for the tank with one sensor (S1) deployed; Upper time series: event defined using only a concentration threshold; Lower time series: event defined using a concentration and persistence threshold



**Figure S2.** Detection time periods for the tank with four sensors (S1, S2, S3, S4) deployed; Upper time series: event defined using only a concentration threshold; Lower time series: event defined using a concentration and persistence threshold

**S2. Times to detection for events detected based on exceeding a threshold concentration and meeting a persistence criterion**

Table S1 reports average times to detection for each source when event detection is defined using both a concentration threshold and a persistence threshold.

**Table S1.** Average time to detection for a large emission event at a tank battery site using concentration and persistence thresholds to define an emission event

Source	Time (hours) until detection for different numbers of sensors on the model site			
	1 Sensor	2 Sensors	3 Sensors	4 Sensors
Compressor	64	24	20	20
Dehydrator	9.1	5.5	4.3	3.7
Flare	40	19	14	11
Fuel gas scrubber	6.9	3.6	2.7	1.8
Inlet scrubber	14	8.2	6.2	6.2
LACT	10	3.5	3.3	2.5
Separator	11	3.7	3.6	2.2
Tank	11	4.1	3.2	2.3
Pump	12	4.8	3.4	2.8
Average over all sources	20	8.5	6.8	5.8

Minimum	6.9	3.5	2.7	1.8
Maximum	64	24	20	20