

Supplementary Materials: Simulated Methane Emission Detection Capabilities of Continuous Monitoring Networks in an Oil and Gas Production Region

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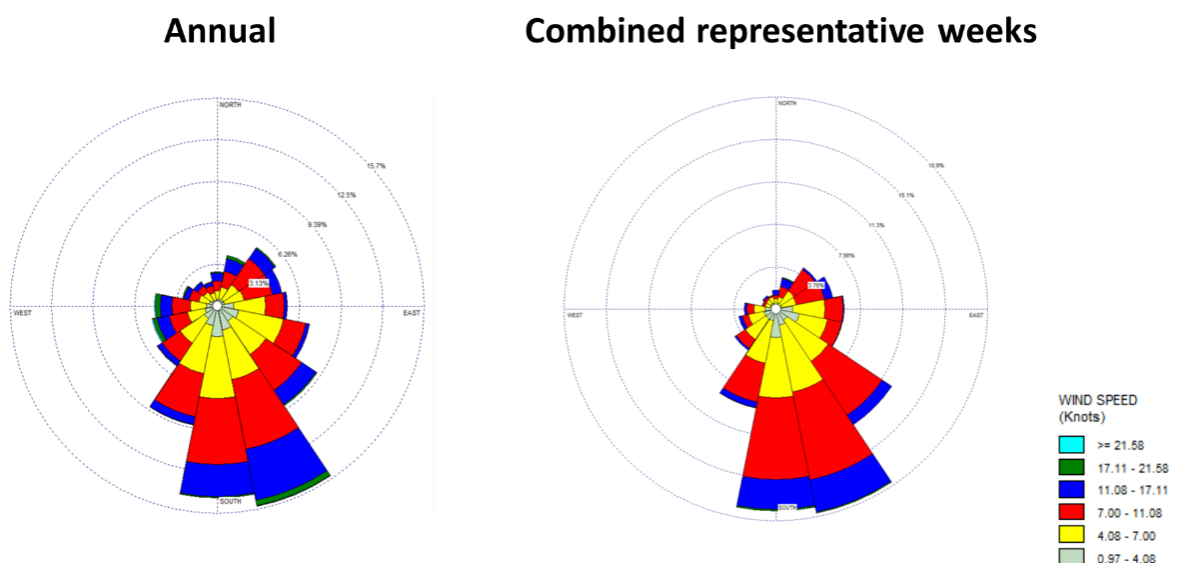
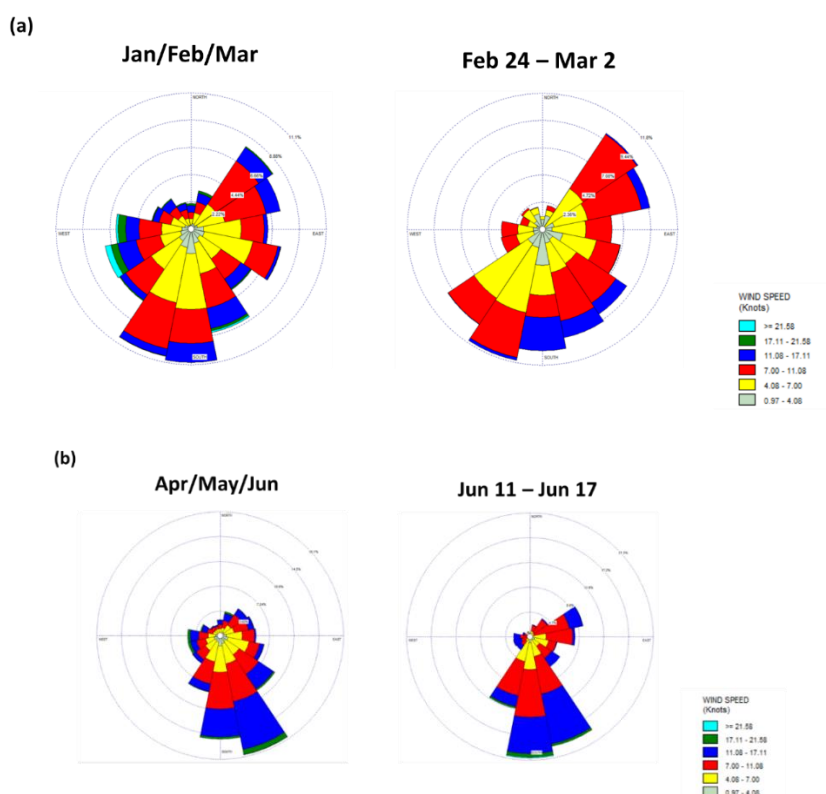


Figure S1. Wind rose diagrams, showing wind speed frequency data, by wind direction for the four representative weeks and for observational annual average data.



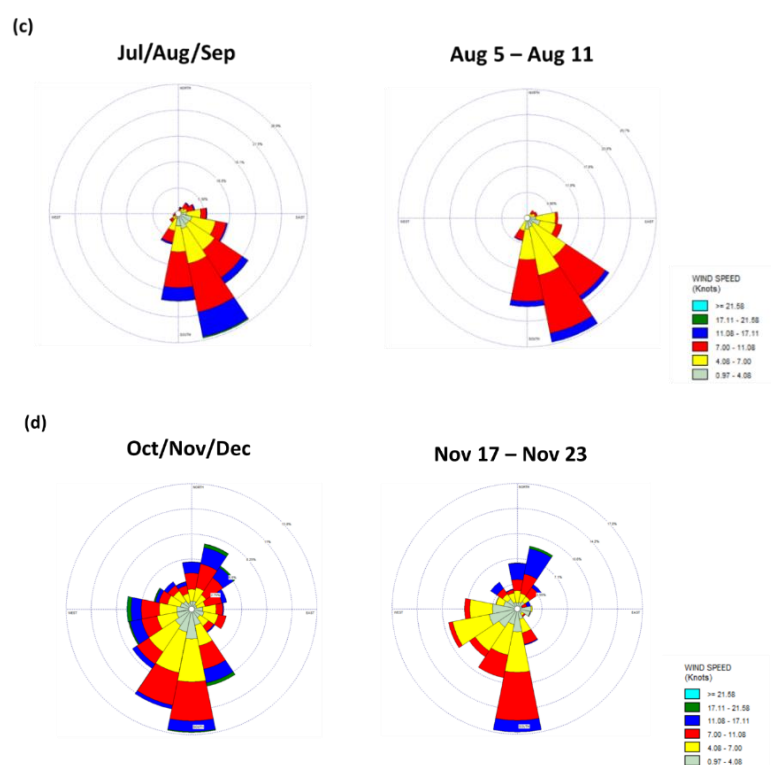
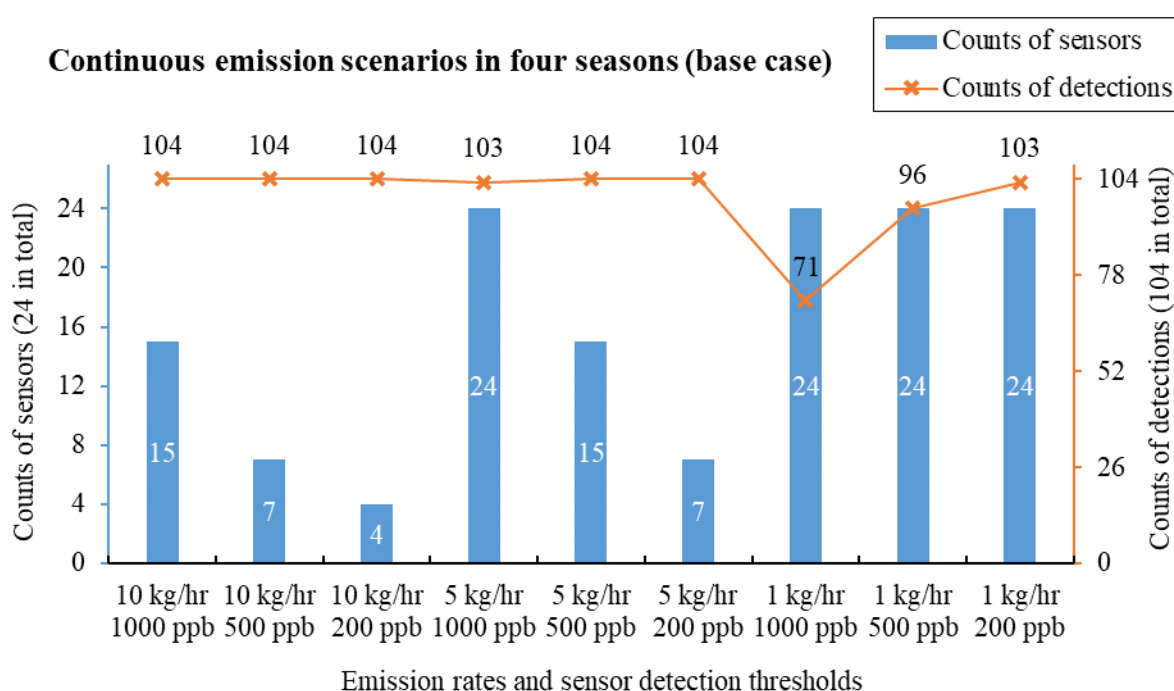


Figure S2. Wind roses for each quarter (left) and representative week (right) for quarters 1 (a), 2 (b), 3 (c), and 4(d).

2. Alternative representation of results

Results in Tables 1–4 in the main text are also represented by bar and line graphs in Figures S3–S6. These figures are used to aid in understanding of the comparison of results under different simulation scenarios. Readers should refer to Tables 1–4 in the main text for more detailed information.



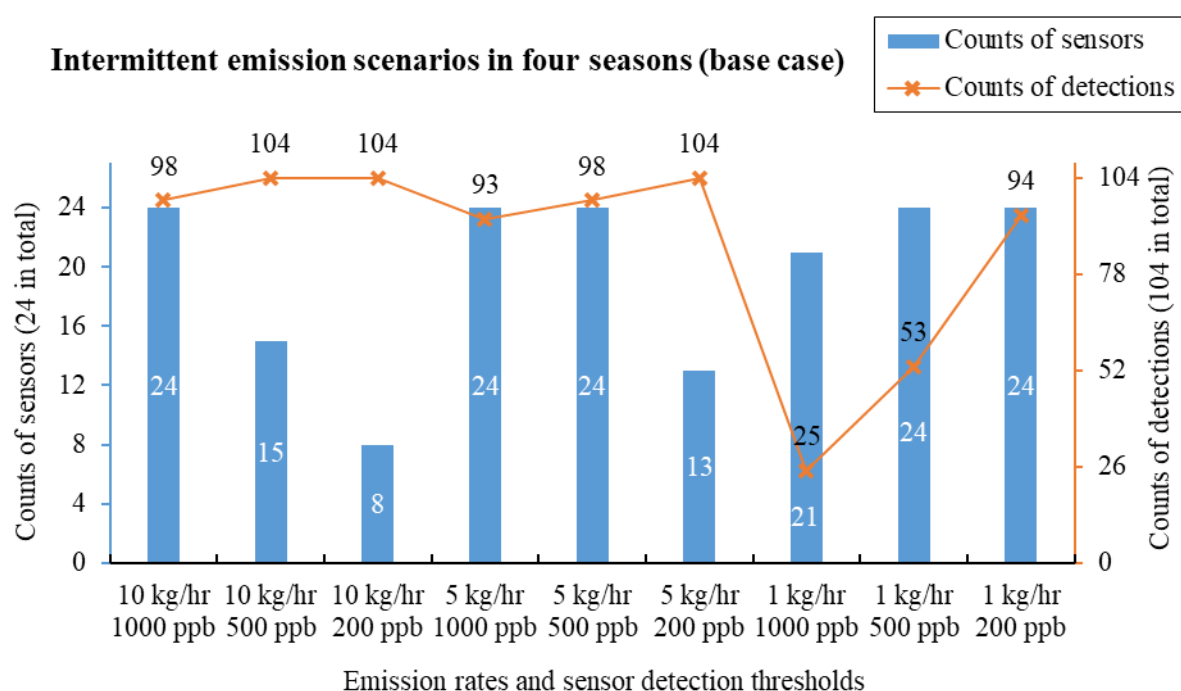
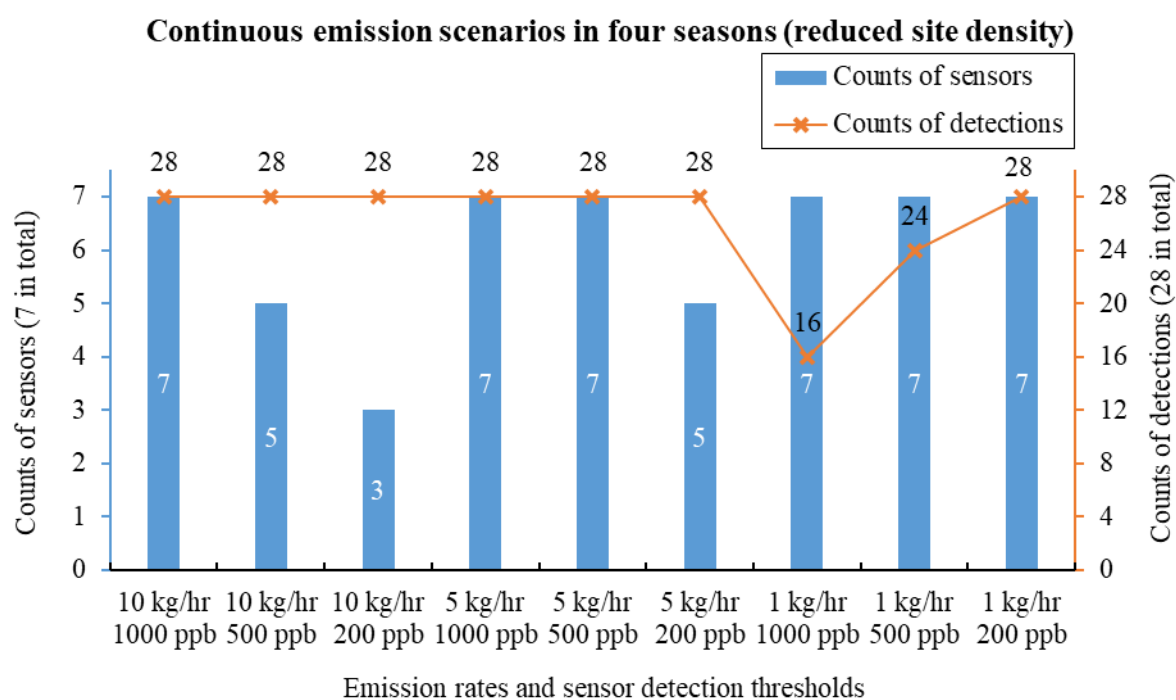


Figure S3. Alternative representation of the results in Table1.



Intermittent emission scenarios in four seasons (reduced site density)

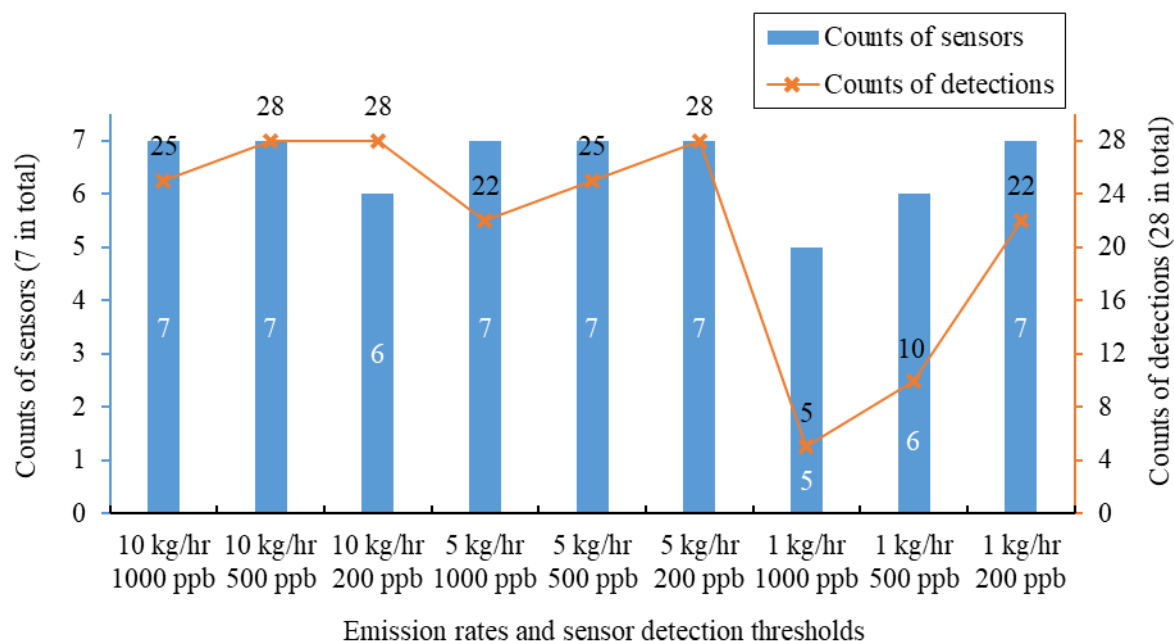
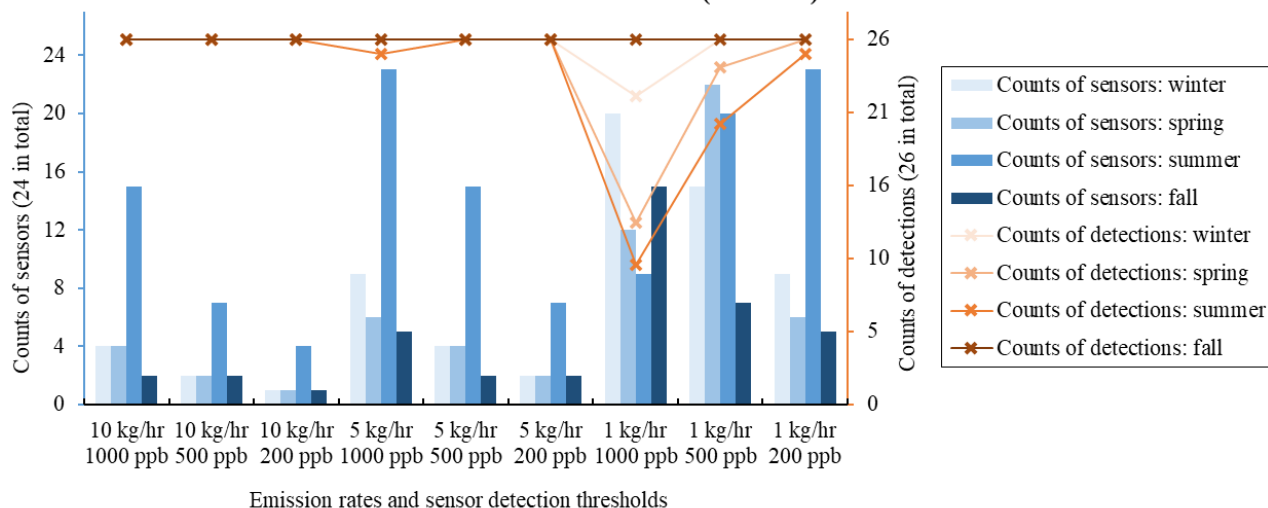


Figure S4. Alternative representation of the results in Table 2.

Continuous emission scenarios in individual weeks (base case)



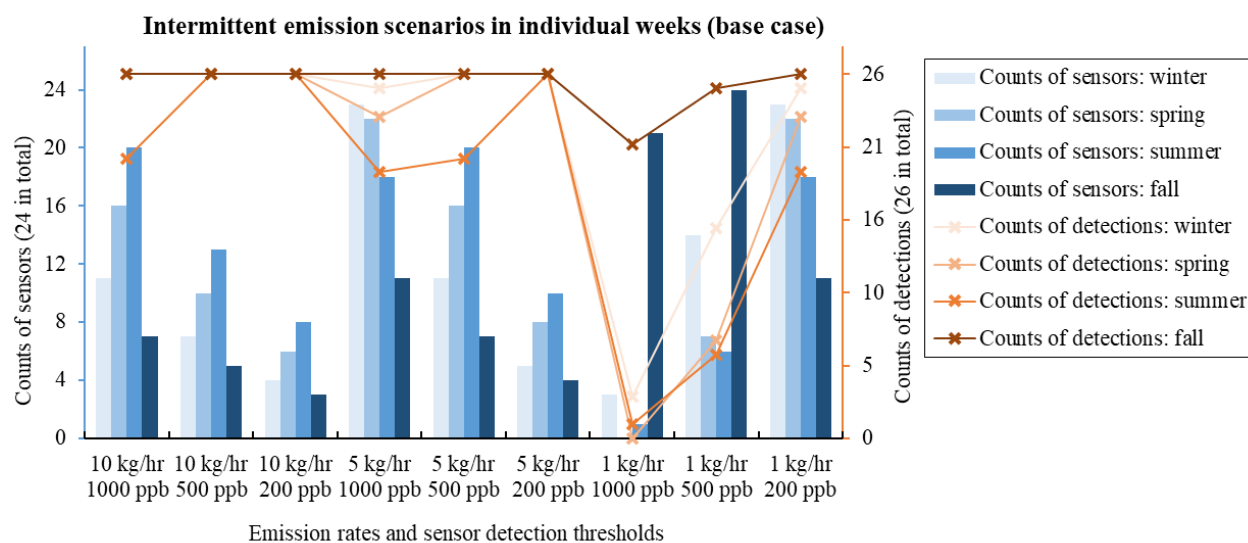
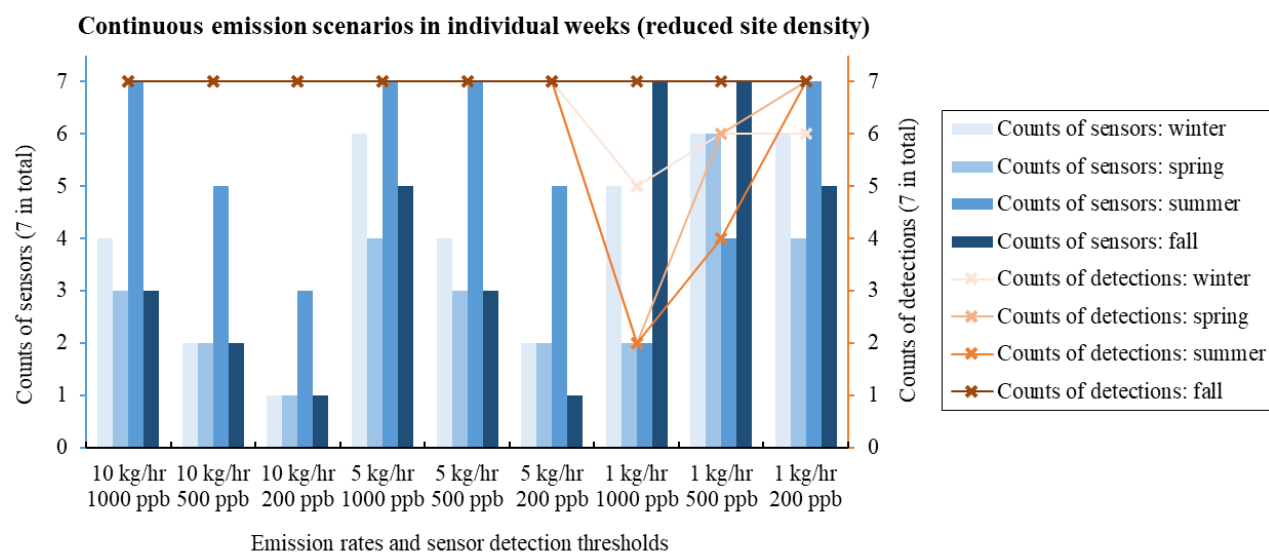


Figure S5. Alternative representation of the results in Table 3.



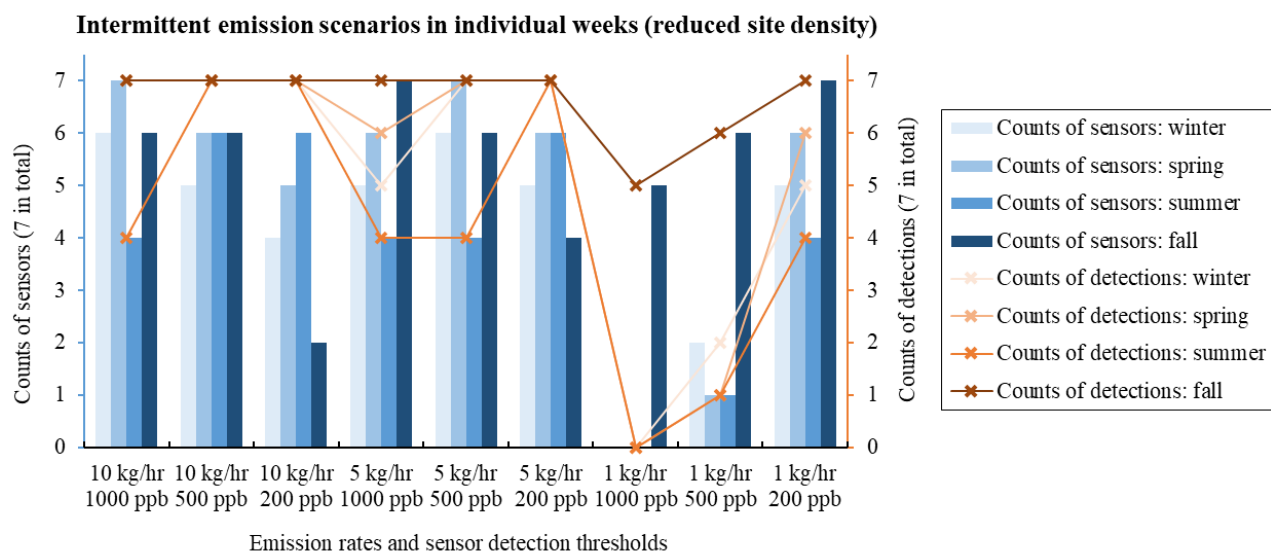


Figure S6. Alternative representation of the results in Table 4.

3. Sensitivity analyses

Table S1. Sensors required to detect continuous emissions from each of the 26 emissions sites, in each of the four weeks of meteorology evaluated in this work (104 total detections), using multiple dispersion models.

Sensor precision (ppb)	Minimum number of the 24 available sensors required to detect continuous emissions from 26 sources in each of four week-long periods (104 detections) using <i>Calpuff dispersion model with NAM meteorology</i>	Minimum number of the 24 available sensors required to detect continuous emissions from 26 sources in each of four week-long periods (104 detections) using <i>HYSPLIT dispersion model with NAM meteorology</i>
<i>Emission rate of 10 kg/hr</i>		
1000	15	7
500	7	5
200	4	4
<i>Emission rate of 5 kg/hr</i>		
1000	24 sensors made 103 detections*	24 sensors made 103 detections*
500	15	7
200	7	5
<i>Emission rate of 1 kg/hr</i>		
1000	24 sensors made 71 detections*	24 sensors made 78 detections*
500	24 sensors made 96 detections*	24 sensors made 96 detections*
200	24 sensors made 103 detections*	24 sensors made 103 detections*

*Out of possible detection of all 26 sources in each of the four week-long meteorological episodes (all sources detected is counted as 104 detections). In this case, the number of sensors represents the number of sensors that have detections, not necessarily the minimum number of sensors to achieve the maximum counts of detected sources.