

Isotopic Signatures of Methane Emissions from Dairy Farms in California's San Joaquin Valley

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Introduction

The Supporting Information includes additional information about the isotopic signatures downwind of dairy farms (Table 4). It includes time series plots of the CH₄ hotspot, Keeling plots, location of the CH₄ measurements, wind direction, and CH₄ flux footprints of the CH₄ hotspots estimated by the Eulerian numerical dispersion model. The data is averaged to 15 sec intervals.

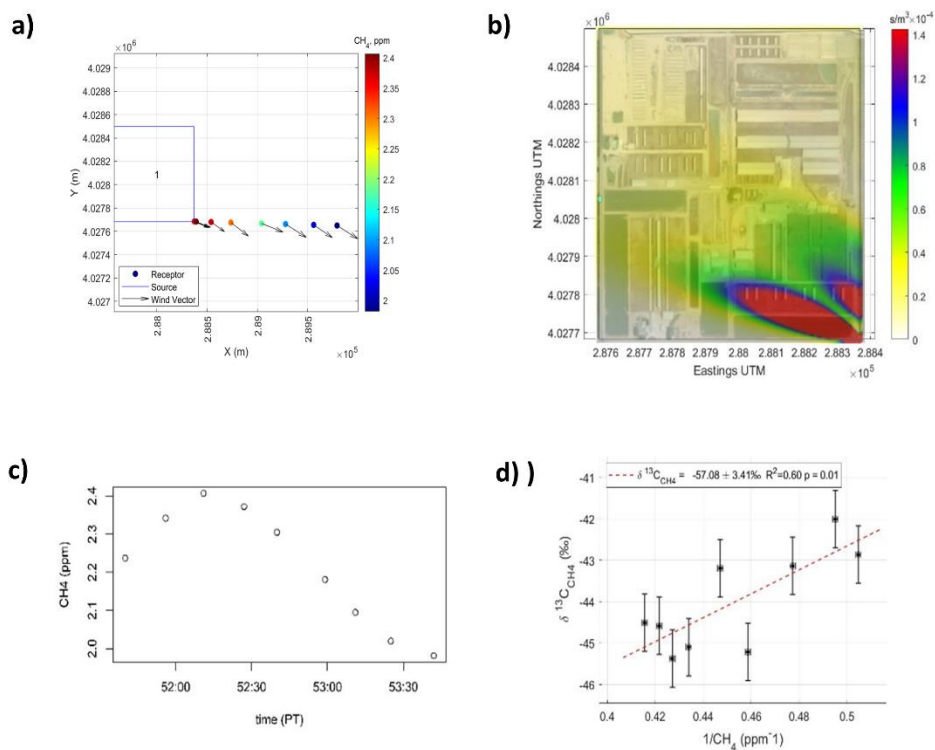


Figure S1. Isotopic signatures downwind of Dairy I on June 25th, 2019 from 15:51:40–15:53:50. a) Mobile platform measurements of 15-sec averaged CH₄ mole fractions (Receptor) downwind of Dairy I (Source). b) Methane flux footprint of Dairy I using the mobile survey shown in (a). The color gradient shows the relative contribution from the upwind areas where CH₄ was emitted. (c) Time series plot using 15-second averages from the mobile survey shown in (a). (d) Keeling plot using 15-second averages from the mobile survey shown in (a).

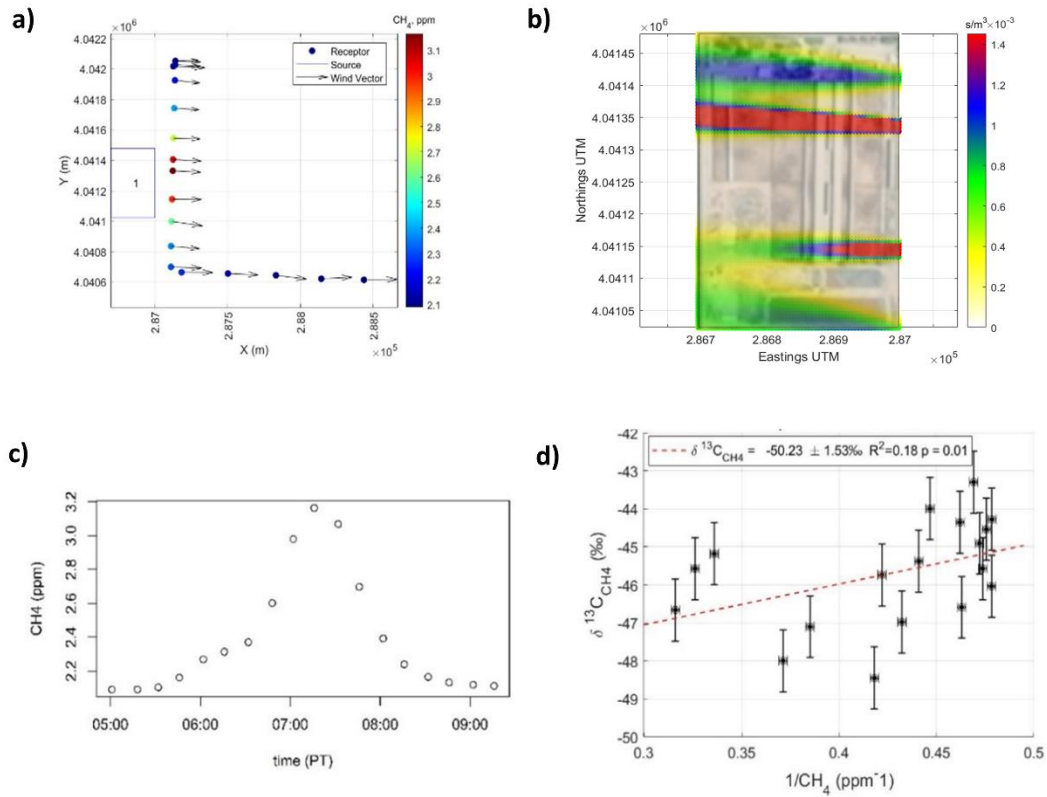


Figure S2. Isotopic signatures downwind of Dairy II on September 21st, 2018 from 18:05:01-18:09:30. a) Mobile platform measurements of 15-sec averaged CH_4 mole fractions (Receptor) downwind of Dairy II (Source). b) Methane flux footprint of Dairy II using the mobile survey shown in (a). The color gradient shows the relative contribution from the upwind areas where CH_4 was emitted. (c) Time series plot using 15-second averages from the mobile survey shown in (a). (d) Keeling plot using 15-second averages from the mobile survey shown in (a).

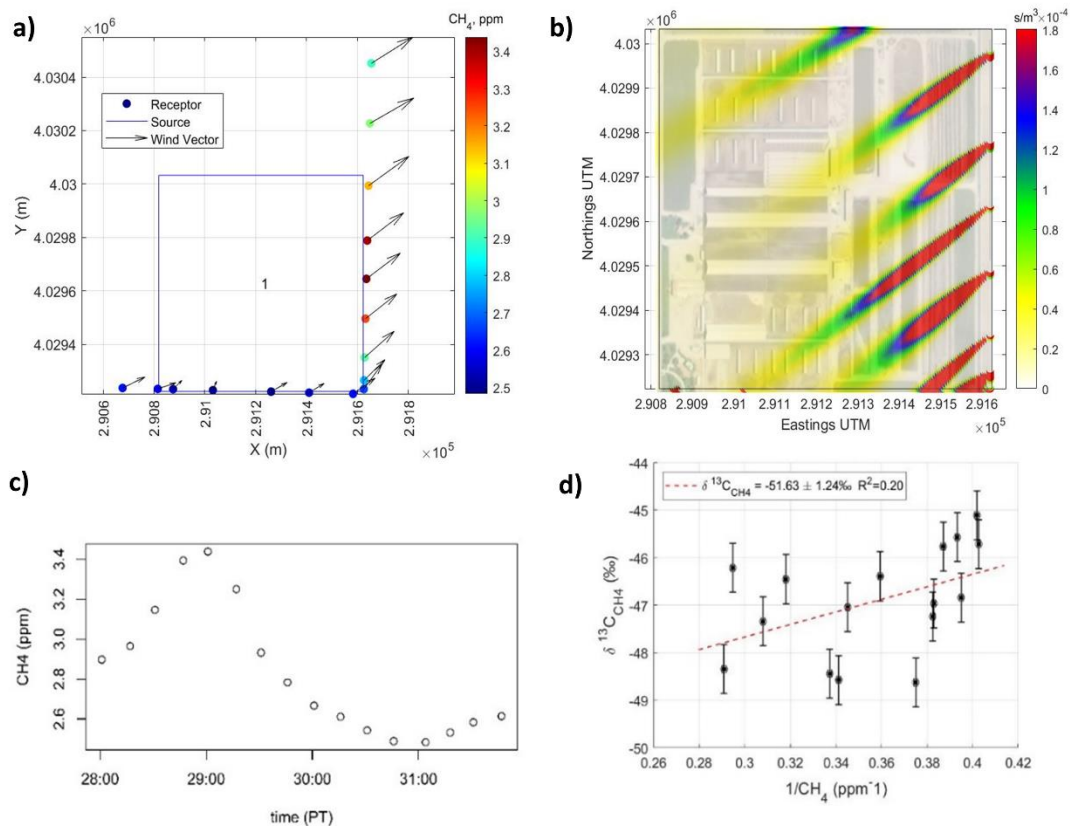


Figure S3. Isotopic signatures downwind of Dairy III on March 24th, 2019 from 13:28:01-13:32:00. a) Mobile platform measurements of 15-sec averaged CH_4 mole fractions (Receptor) downwind of Dairy III (Source). b) Methane flux footprint of Dairy III using the mobile survey shown in (a). The color gradient shows the relative contribution from the upwind areas where CH_4 was emitted. (c) Time series plot using 15-second averages from the mobile survey shown in (a). (d) Keeling plot using 15-second averages from the mobile survey shown in (a).

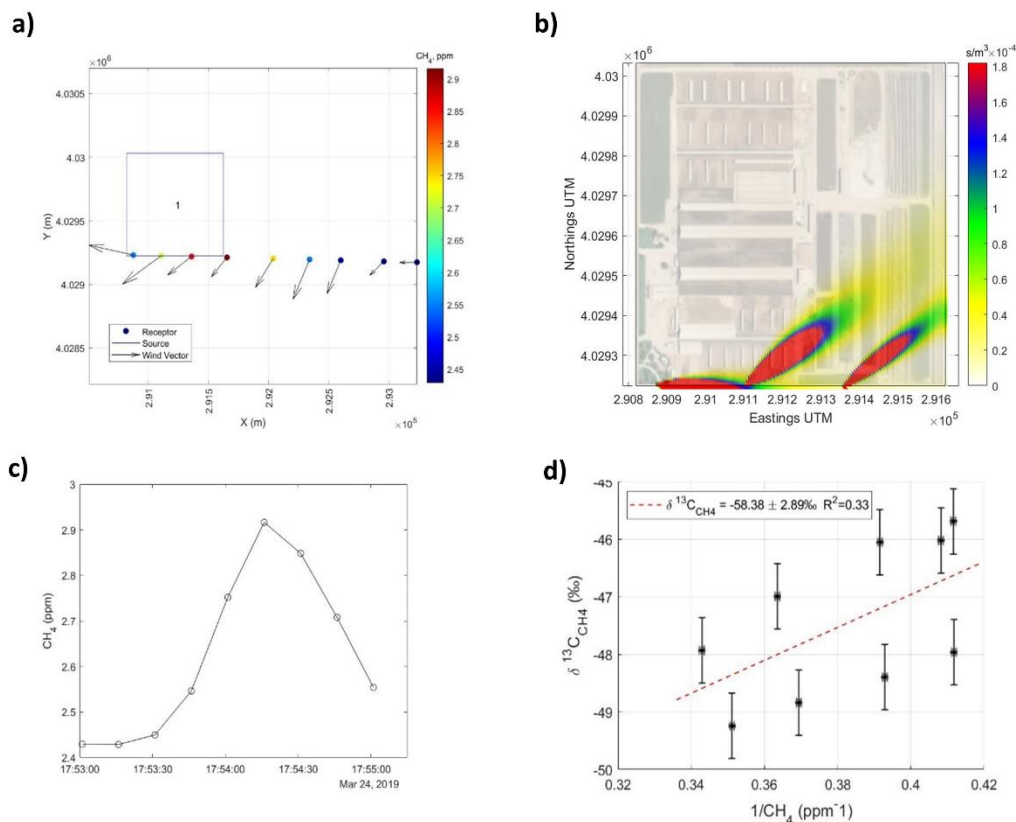


Figure S4. Isotopic signatures downwind of Dairy III on March 24th, 2019 from 17:53:01-17:55:13. a) Mobile platform measurements of 15-sec averaged CH_4 mole fractions (Receptor) downwind of Dairy III (Source). b) Methane flux footprint of Dairy III using the mobile survey shown in (a). The color gradient shows the relative contribution from the upwind areas where CH_4 was emitted. c) Time series plot using 15-second averages from the mobile survey shown in (a). d) Keeling plot using 15-second averages from the mobile survey shown in (a).

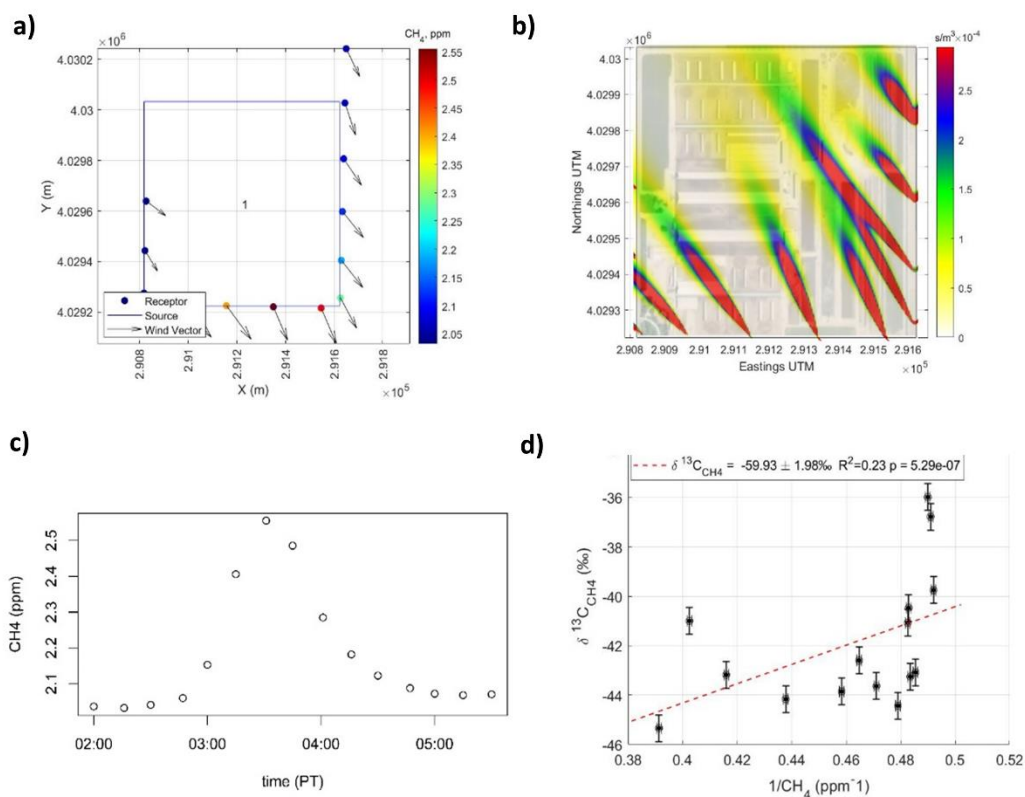


Figure S5. Isotopic signatures downwind of Dairy III on June 25th, 2019 from 14:02:00–14:05:30. a) Mobile platform measurements of 15-sec averaged CH_4 mole fractions (Receptor) downwind of Dairy III (Source). b) Methane flux footprint of Dairy III using the mobile survey shown in (a). The color gradient shows the relative contribution from the upwind areas where CH_4 was emitted. c) Time series plot using 15-second averages from the mobile survey shown in (a). d) Keeling plot using 15-second averages from the mobile survey shown in (a).

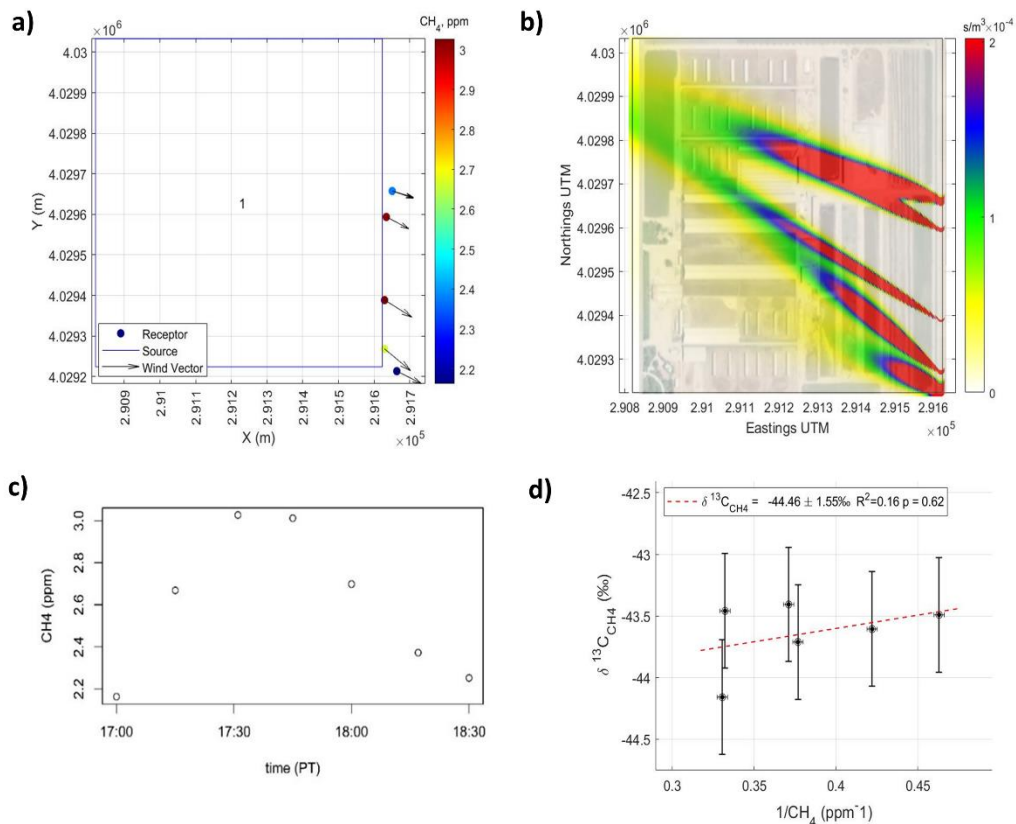


Figure S6. Isotopic signatures downwind of Dairy III on June 25th, 2019 from 15:17:00-15:18:28. a) Mobile platform measurements of 15-sec averaged CH_4 mole fractions (Receptor) downwind of Dairy III (Source). b) Methane flux footprint of Dairy III using the mobile survey shown in (a). The color gradient shows the relative contribution from the upwind areas where CH_4 was emitted. (c) Time series plot using 15-second averages from the mobile survey shown in (a). (d) Keeling plot using 15-second averages from the mobile survey shown in (a).

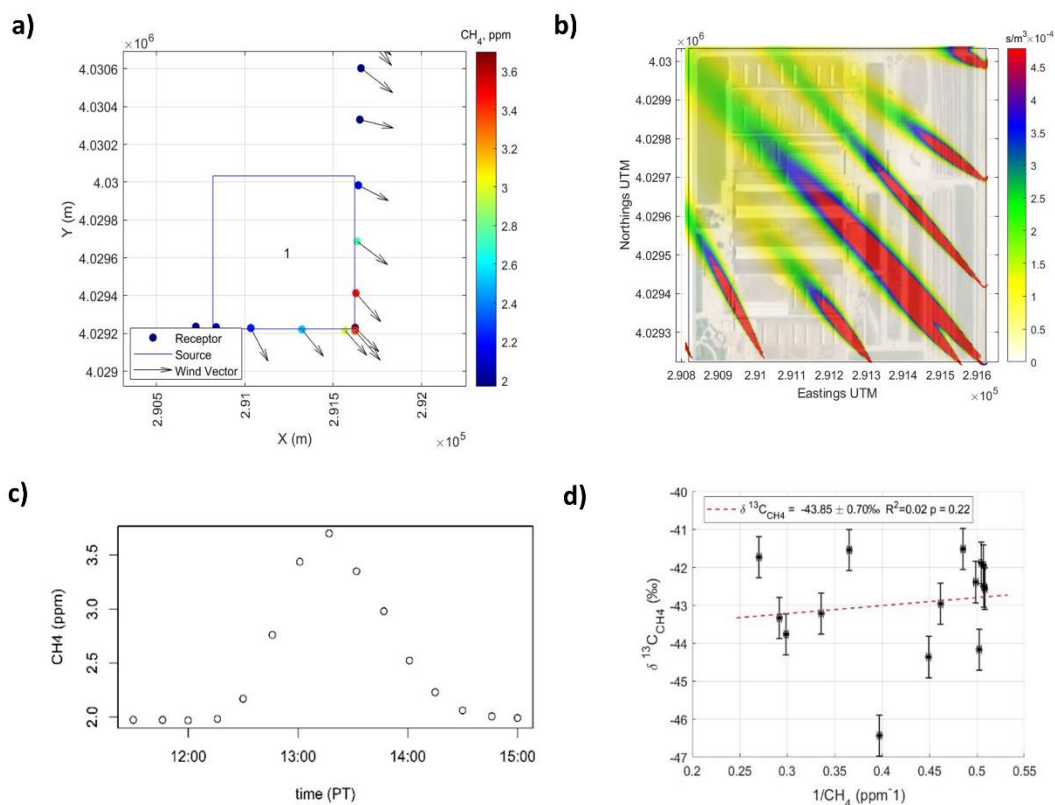


Figure S7. Isotopic signatures downwind of Dairy III on June 25th, 2019 from 17:11:30-17:15:00. a) Mobile platform measurements of 15-sec averaged CH_4 mole fractions (Receptor) downwind of Dairy III (Source). b) Methane flux footprint of Dairy III using the mobile survey shown in (a). The color gradient shows the relative contribution from the upwind areas where CH_4 was emitted. (c) Time series plot using 15-second averages from the mobile survey shown in (a). (d) Keeling plot using 15-second averages from the mobile survey shown in (a).

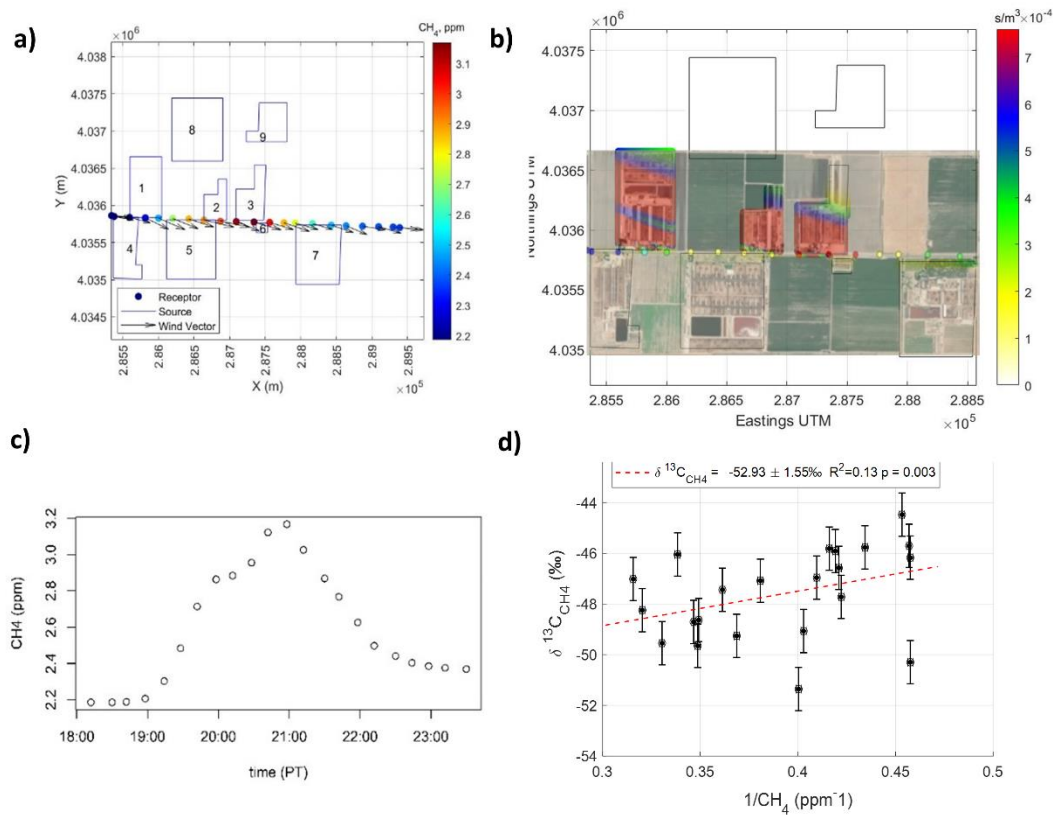


Figure S8. Isotopic signatures downwind of the Dairy Cluster on September 21st, 2018 from 17:18:12-17:23:36. a) Mobile platform measurements of 15-sec averaged CH_4 mole fractions (Receptor) downwind of the Dairy Cluster (Source). b) Methane flux footprints of the Dairy Cluster using the mobile survey shown in (a). The color gradient shows the relative contribution from the upwind areas where CH_4 was emitted. (c) Time series plot using 15-second averages from the mobile survey shown in (a). (d) Keeling plot using 15-second averages from the mobile survey shown in (a).

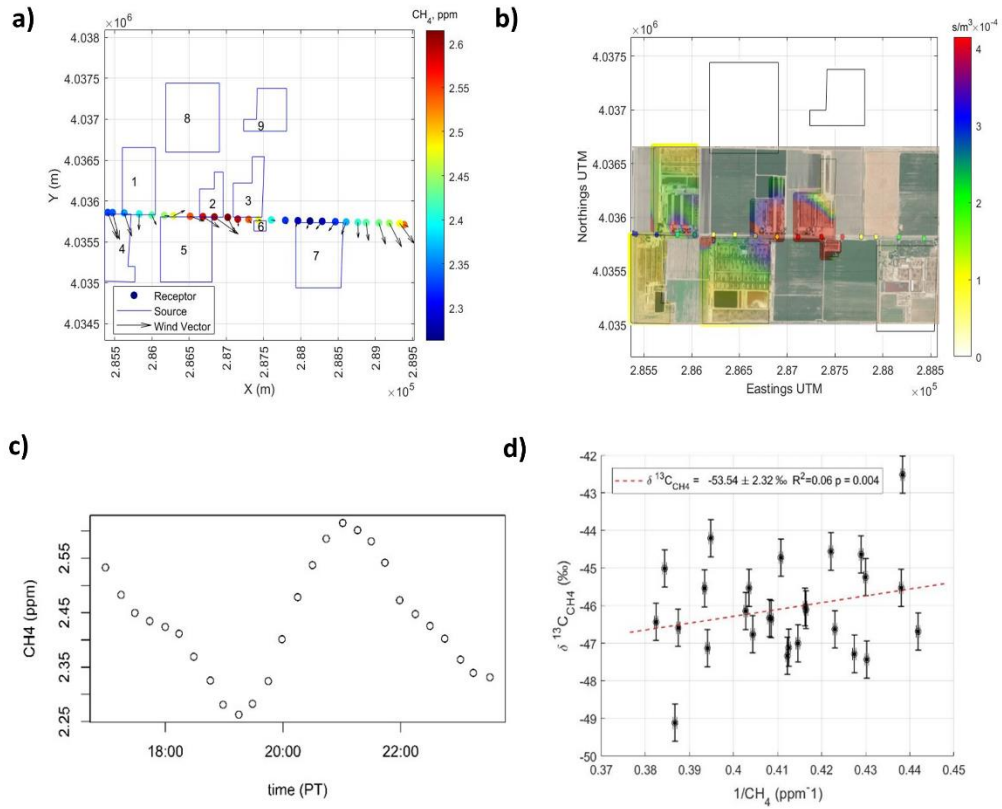


Figure S9. Isotopic signatures downwind of the Dairy Cluster on March 24th, 2019 from 14:16:59-14:23:34. a) Mobile platform measurements of 15-sec averaged CH₄ mole fractions (Receptor) downwind of the Dairy Cluster (Source). b) Methane flux footprints of the Dairy Cluster using the mobile survey shown in (a). The color gradient shows the relative contribution from the upwind areas where CH₄ was emitted. (c) Time series plot using 15-second averages from the mobile survey shown in (a). (d) Keeling plot using 15-second averages from the mobile survey shown in (a).

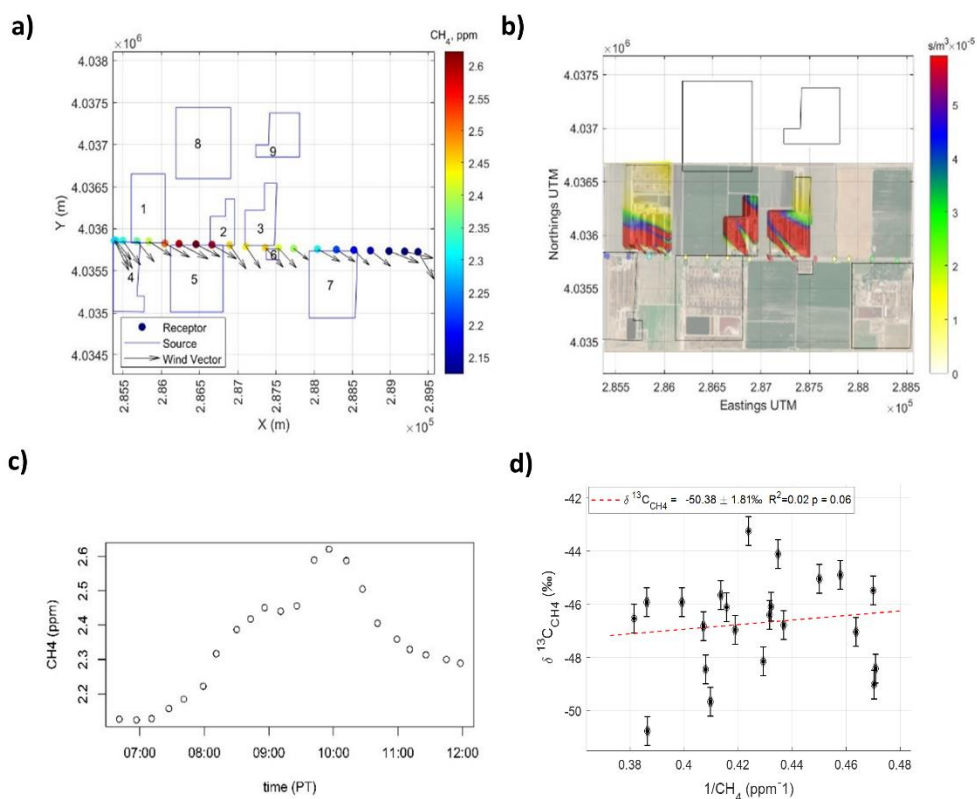


Figure S10. Isotopic signatures downwind of the Dairy Cluster on June 24th, 2019 from 16:06:41-16:12:05. a) Mobile platform measurements of 15-sec averaged CH_4 mole fractions (Receptor) downwind of the Dairy Cluster (Source). b) Methane flux footprints of the Dairy Cluster using the mobile survey shown in (a). The color gradient shows the relative contribution from the upwind areas where CH_4 was emitted. (c) Time series plot using 15-second averages from the mobile survey shown in (a). (d) Keeling plot using 15-second averages from the mobile survey shown in (a).

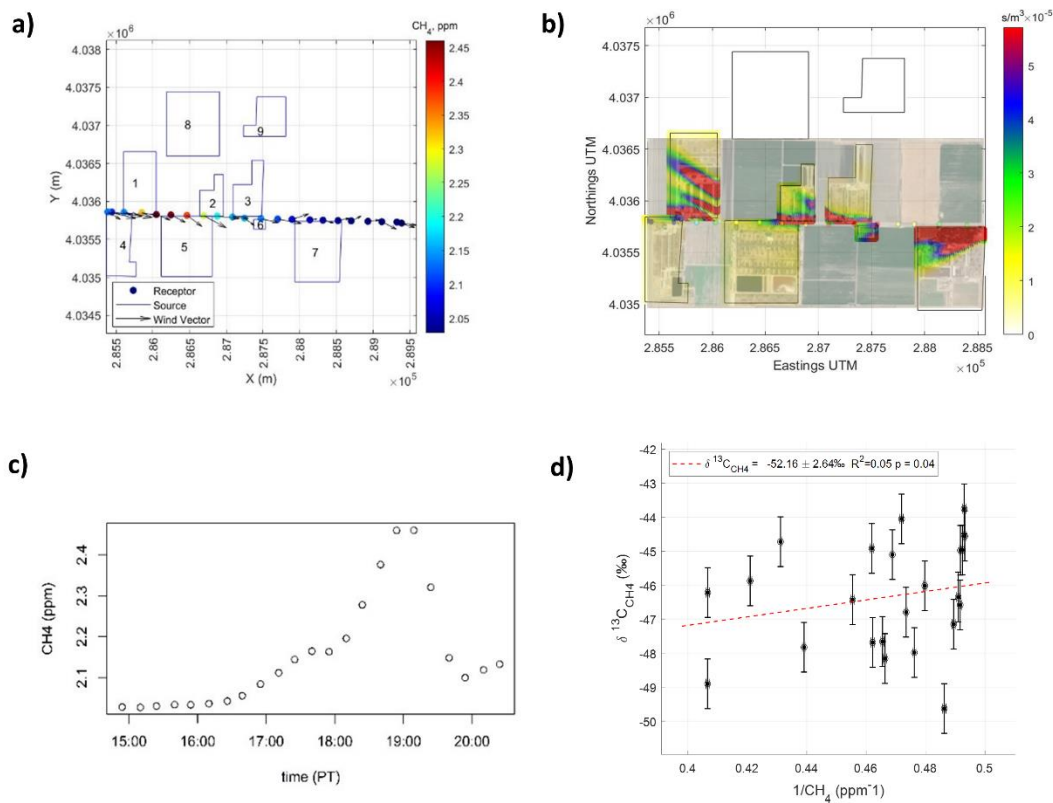


Figure S11. Isotopic signatures downwind of the Dairy Cluster on June 25th, 2019 from 14:14:54-14:20:28. a) Mobile platform measurements of 15-sec averaged CH_4 mole fractions (Receptor) downwind of the Dairy Cluster (Source). b) Methane flux footprints of the Dairy Cluster using the mobile survey shown in (a). The color gradient shows the relative contribution from the upwind areas where CH_4 was emitted. (c) Time series plot using 15-second averages from the mobile survey shown in (a). (d) Keeling plot using 15-second averages from the mobile survey shown in (a).