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Mobile atmospheric measurements and local-scale inverse estimation of the location and rates of brief CH_4 and CO_2 releases from point sources

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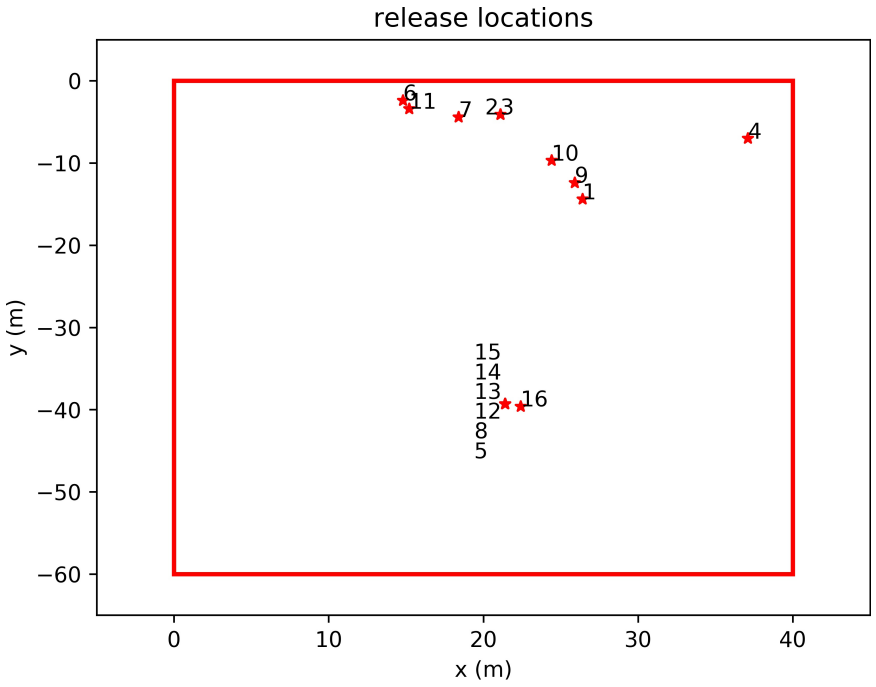
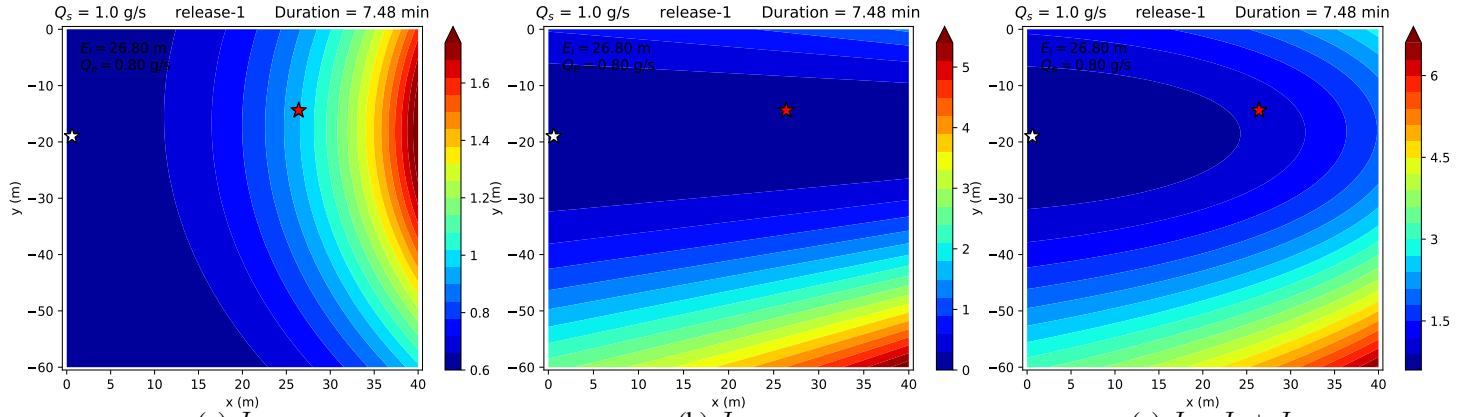
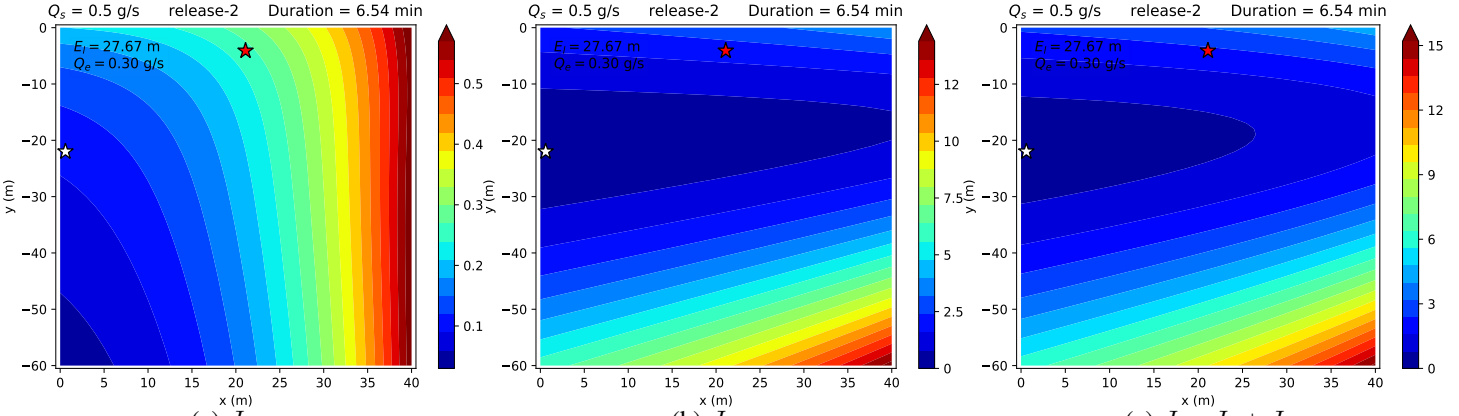


Figure S1. Release locations (red stars) in the ATEX zone. Different releases can have identical locations. Isolated locations (5, 8, 12-16) correspond to the highest release rates.



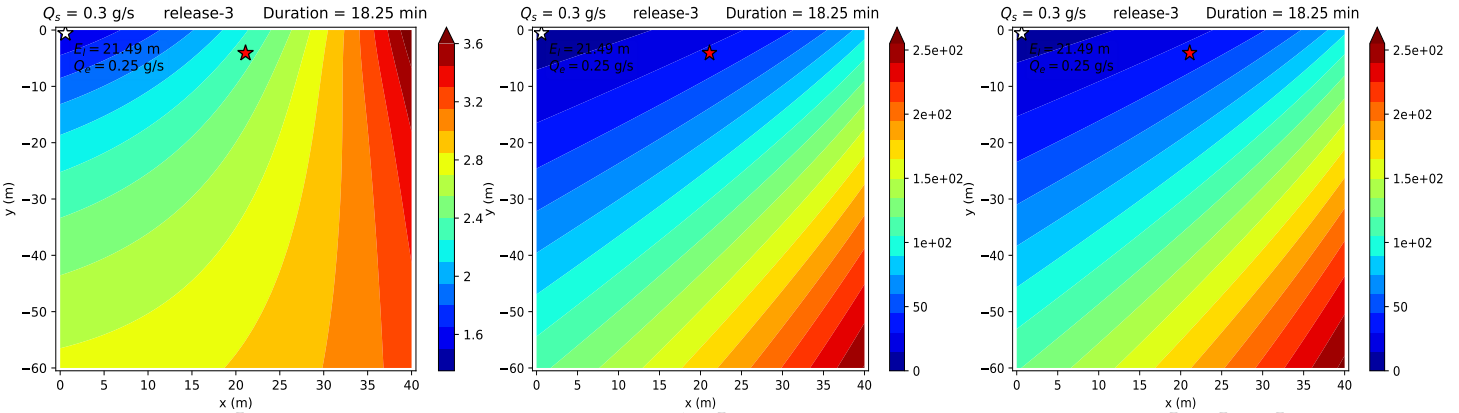
(a) J_p (b) J_w (c) $J = J_p + J_w$

Figure S2. Contour plots of (a) J_p , (b) J_w, and (c) J when fixing the release rate to its inverted value Q_e for release no. 1. Red and white stars respectively show the actual and inverted source locations.



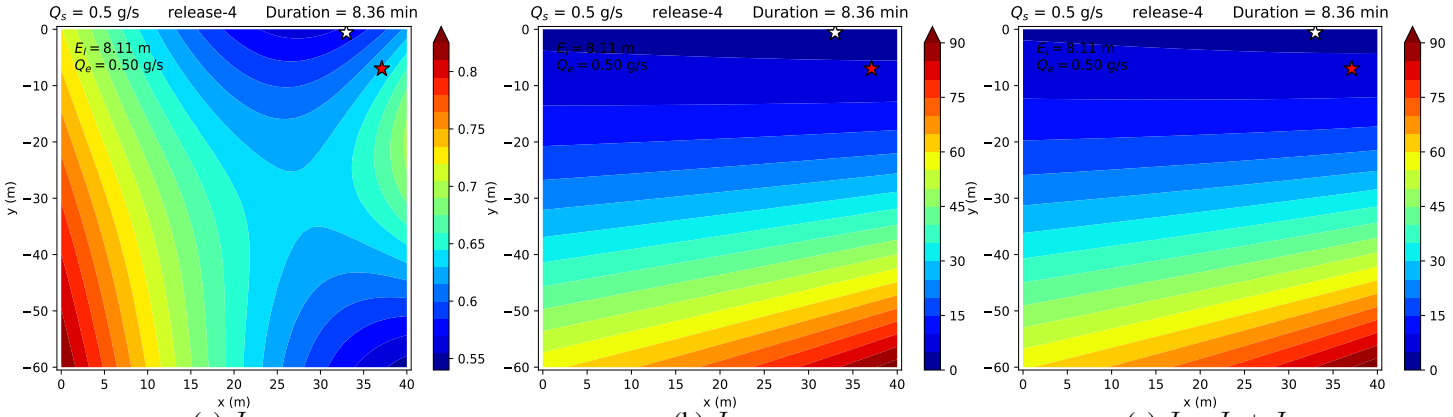
(a) J_p (b) J_w (c) $J = J_p + J_w$

Figure S3. Contour plots of (a) J_p , (b) J_w, and (c) J when fixing the release rate to its inverted value Q_e for release no. 2. Red and white stars respectively show the actual and inverted source locations.



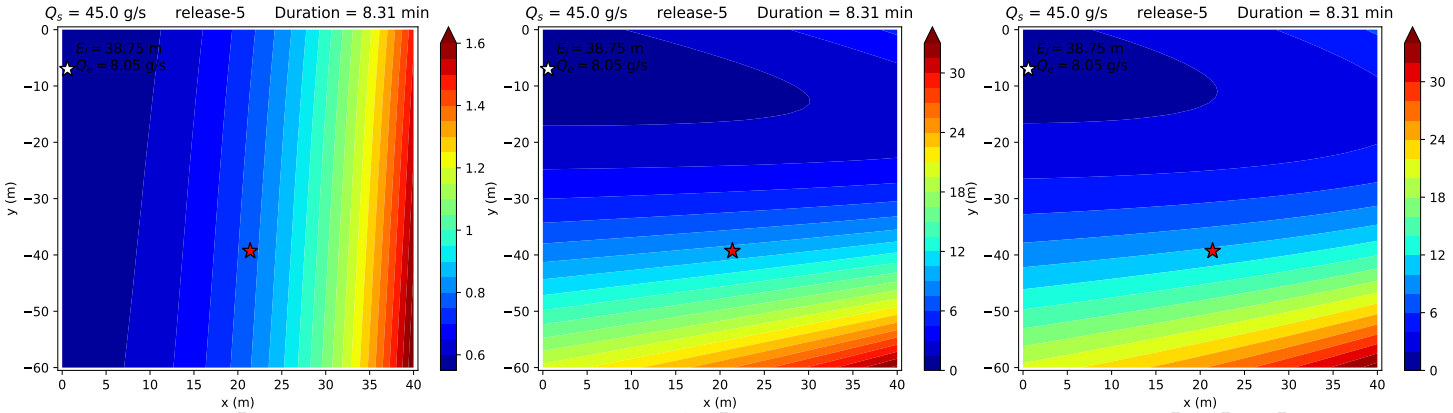
(a) J_p (b) J_w (c) $J = J_p + J_w$

Figure S4. Contour plots of (a) J_p , (b) J_w, and (c) J when fixing the release rate to its inverted value Q_e for release no. 3. Red and white stars respectively show the actual and inverted source locations.



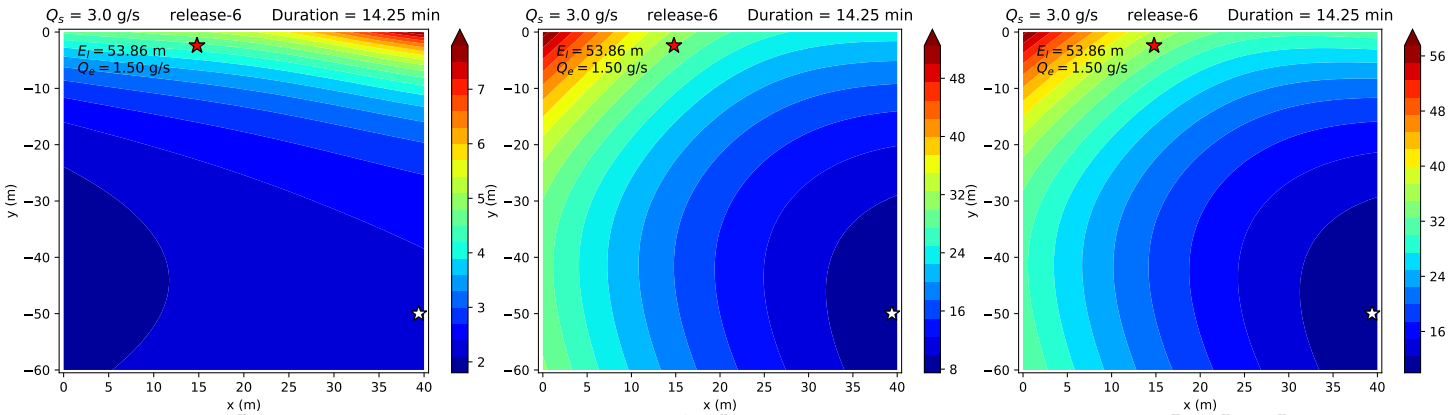
(a) J_p (b) J_w (c) $J = J_p + J_w$

Figure S5. Contour plots of (a) J_p , (b) J_w, and (c) J when fixing the release rate to its inverted value Q_e for release no. 4. Red and white stars respectively show the actual and inverted source locations.



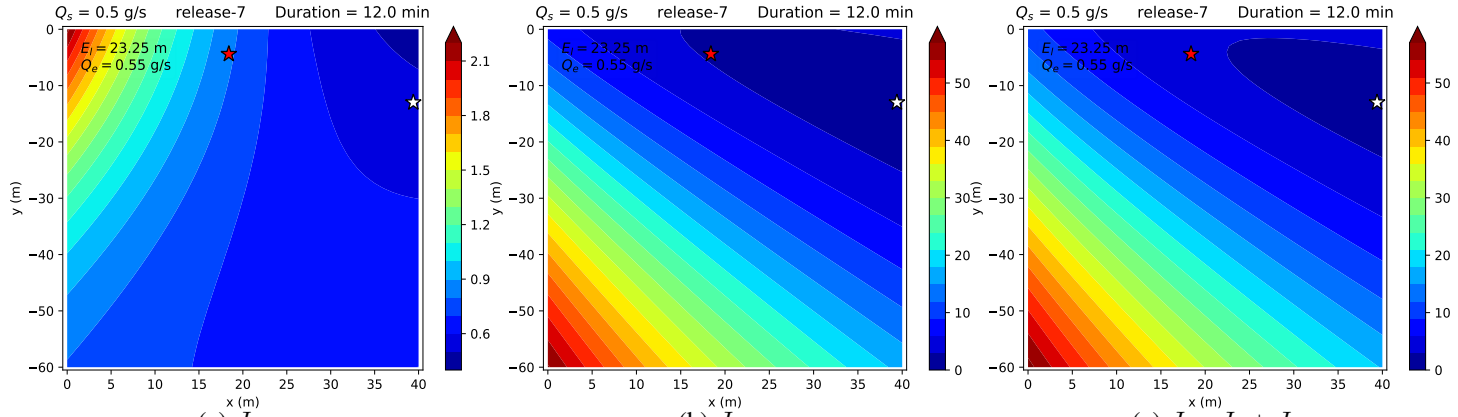
(a) J_p (b) J_w (c) $J = J_p + J_w$

Figure S6. Contour plots of (a) J_p , (b) J_w, and (c) J when fixing the release rate to its inverted value Q_e for release no. 5. Red and white stars respectively show the actual and inverted source locations.



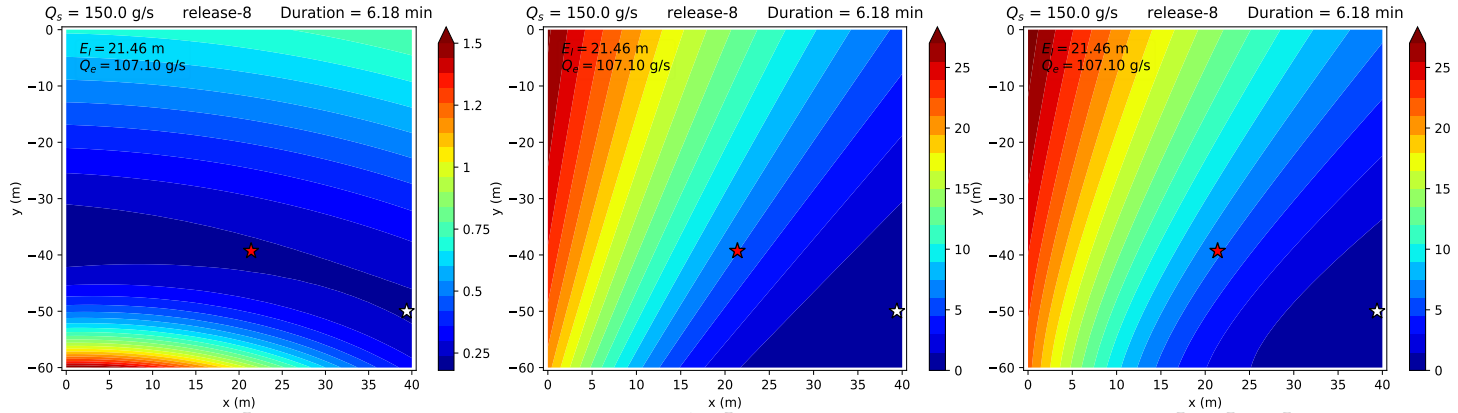
(a) J_p (b) J_w (c) $J = J_p + J_w$

Figure S7. Contour plots of (a) J_p , (b) J_w, and (c) J when fixing the release rate to its inverted value Q_e for release no. 6. Red and white stars respectively show the actual and inverted source locations.



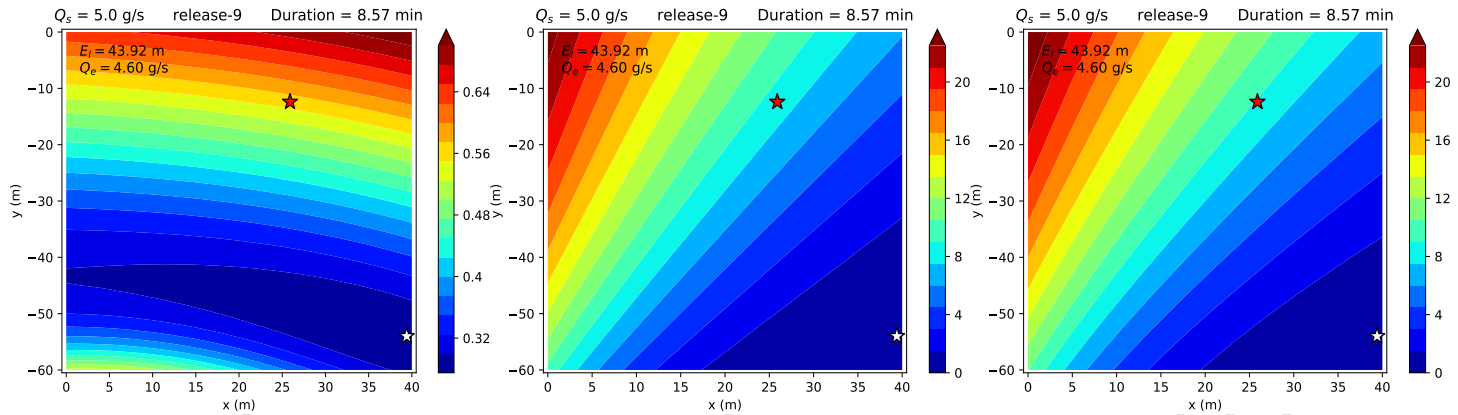
(a) J_p (b) J_w (c) $J = J_p + J_w$

Figure S8. Contour plots of (a) J_p , (b) J_w, and (c) J when fixing the release rate to its inverted value Q_e for release no. 7. Red and white stars respectively show the actual and inverted source locations.



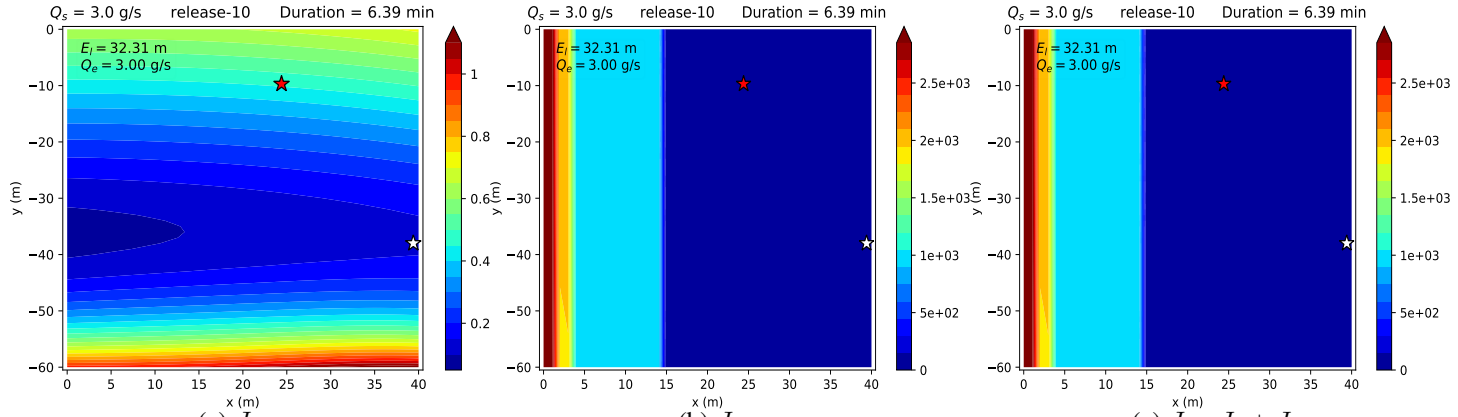
(a) J_p (b) J_w (c) $J = J_p + J_w$

Figure S9. Contour plots of (a) J_p , (b) J_w, and (c) J when fixing the release rate to its inverted value Q_e for release no. 8. Red and white stars respectively show the actual and inverted source locations.



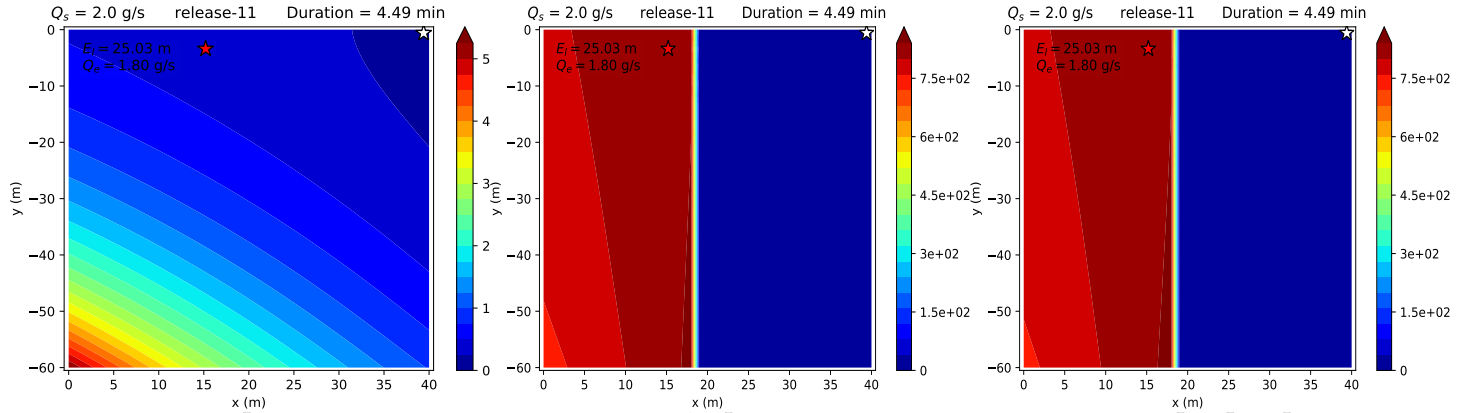
(a) J_p (b) J_w (c) $J = J_p + J_w$

Figure S10. Contour plots of (a) J_p , (b) J_w, and (c) J when fixing the release rate to its inverted value Q_e for release no. 9. Red and white stars respectively show the actual and inverted source locations.



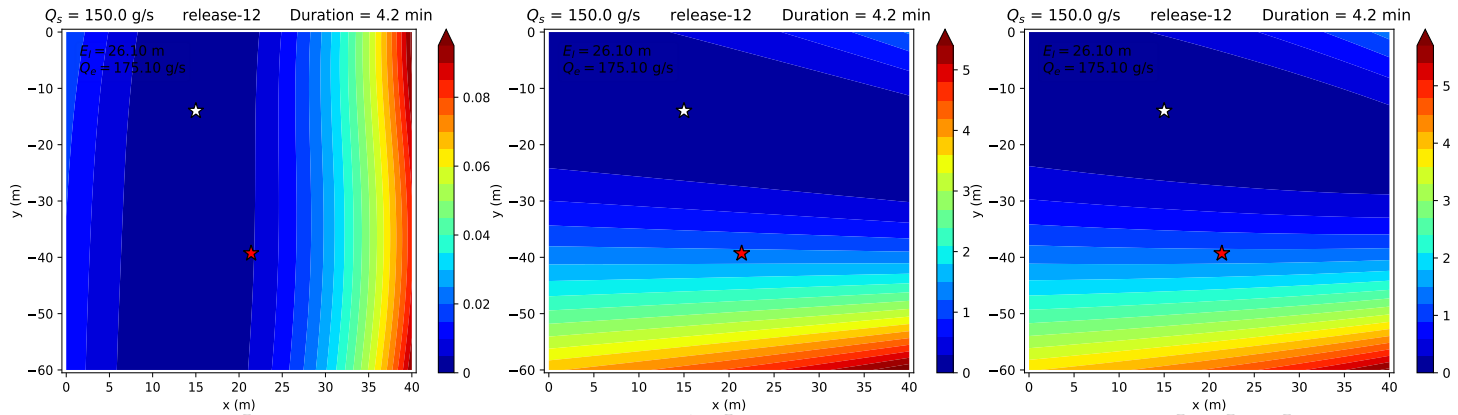
(a) J_p (b) J_w (c) $J = J_p + J_w$

Figure S11. Contour plots of (a) J_p , (b) J_w, and (c) J when fixing the release rate to its inverted value Q_e for release no. 10. Red and white stars respectively show the actual and inverted source locations.



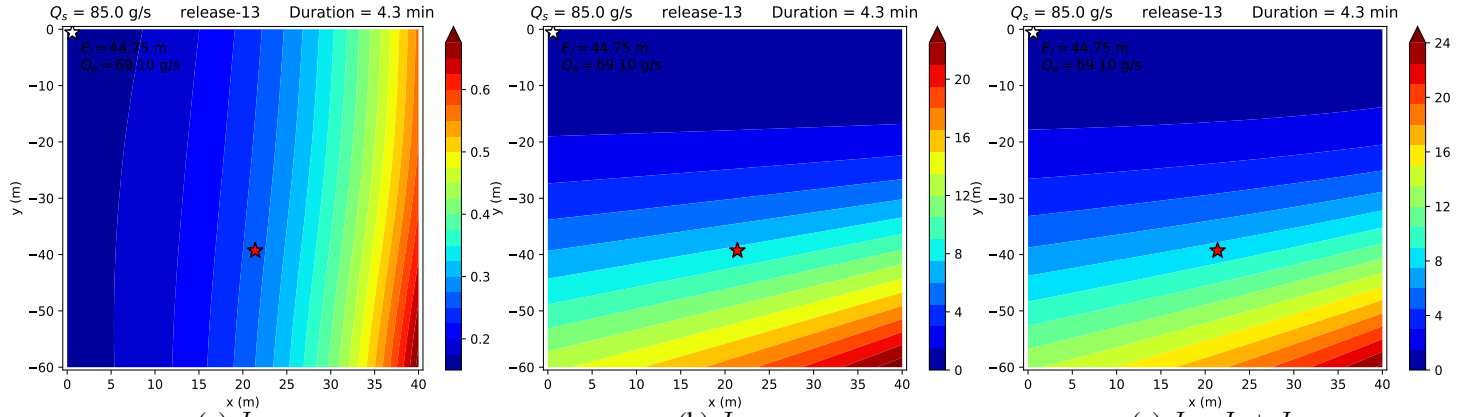
(a) J_p (b) J_w (c) $J = J_p + J_w$

Figure S12. Contour plots of (a) J_p , (b) J_w, and (c) J when fixing the release rate to its inverted value Q_e for release no. 11. Red and white stars respectively show the actual and inverted source locations.



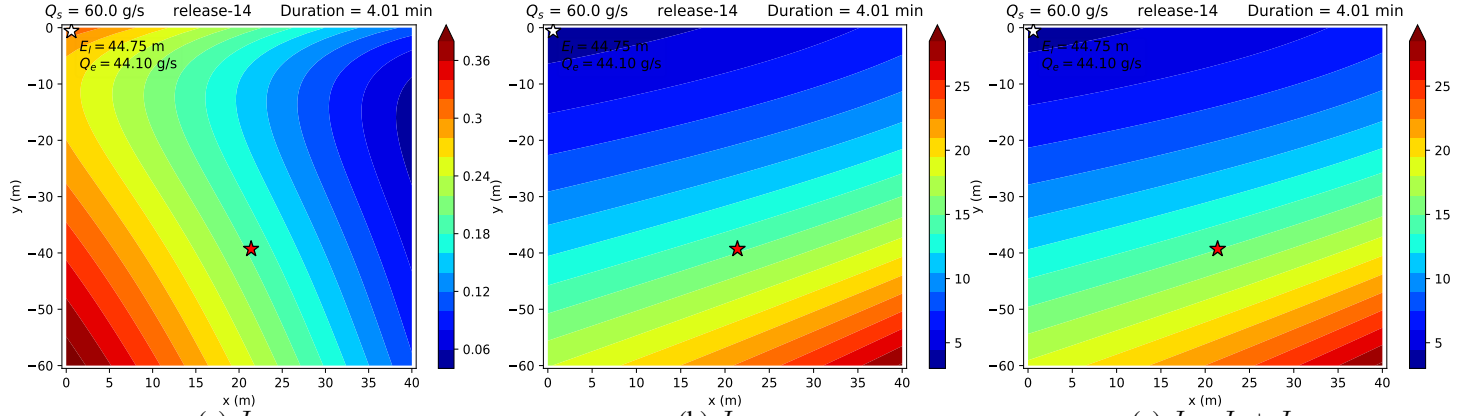
(a) J_p (b) J_w (c) $J = J_p + J_w$

Figure S13. Contour plots of (a) J_p , (b) J_w, and (c) J when fixing the release rate to its inverted value Q_e for release no. 12. Red and white stars respectively show the actual and inverted source locations.



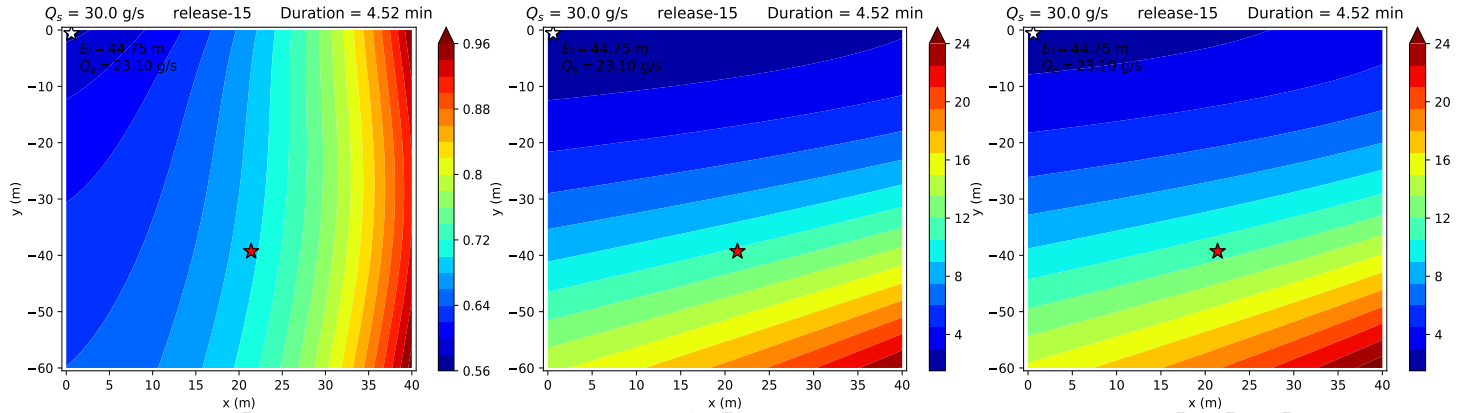
(a) J_p (b) J_w (c) $J = J_p + J_w$

Figure S14. Contour plots of (a) J_p , (b) J_w, and (c) J when fixing the release rate to its inverted value Q_e for release no. 13. Red and white stars respectively show the actual and inverted source locations.



(a) J_p (b) J_w (c) $J = J_p + J_w$

Figure S15. Contour plots of (a) J_p , (b) J_w, and (c) J when fixing the release rate to its inverted value Q_e for release no. 14. Red and white stars respectively show the actual and inverted source locations.



(a) J_p (b) J_w (c) $J = J_p + J_w$

Figure S16. Contour plots of (a) J_p , (b) J_w, and (c) J when fixing the release rate to its inverted value Q_e for release no. 15. Red and white stars respectively show the actual and inverted source locations.

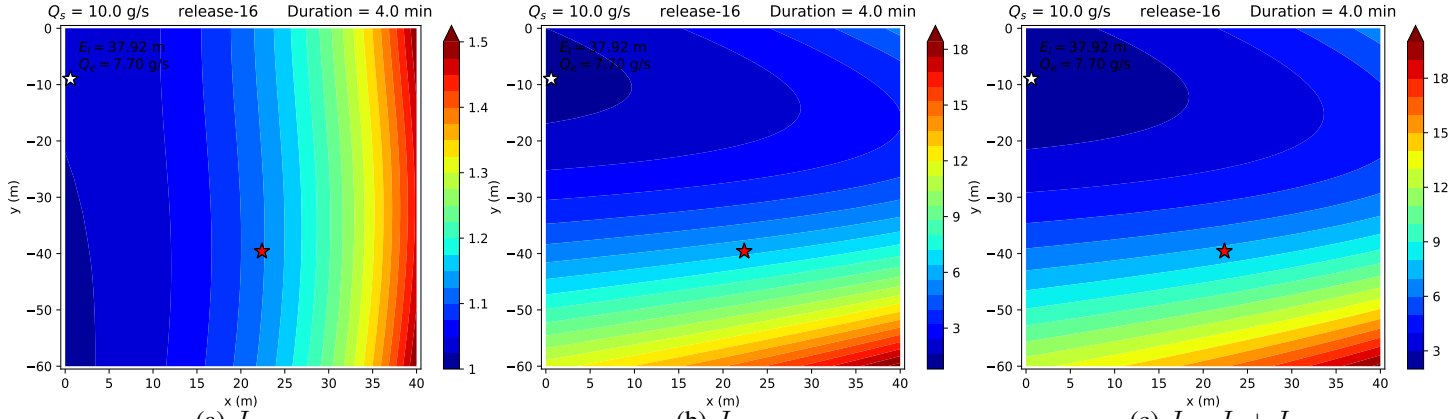


Figure S17. Contour plots of (a) J_p , (b) J_w, and (c) J when fixing the release rate to its inverted value Q_e for release no. 16. Red and white stars respectively show the actual and inverted source locations.

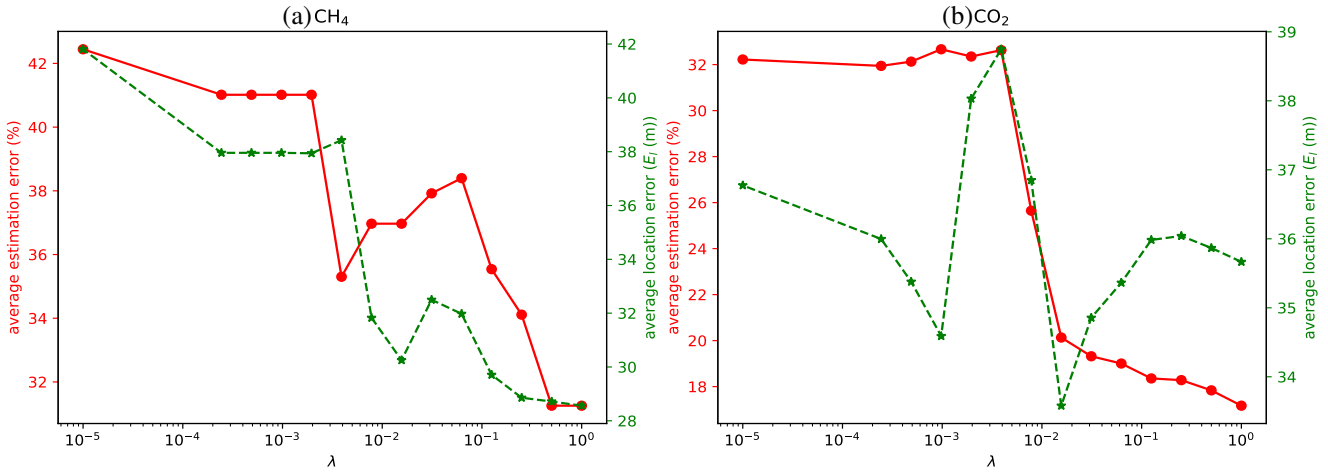


Figure S18. Average errors for all (a) CH_4 and (b) CO_2 releases with respect to λ in the cost function $J = J_p + \lambda J_w$.

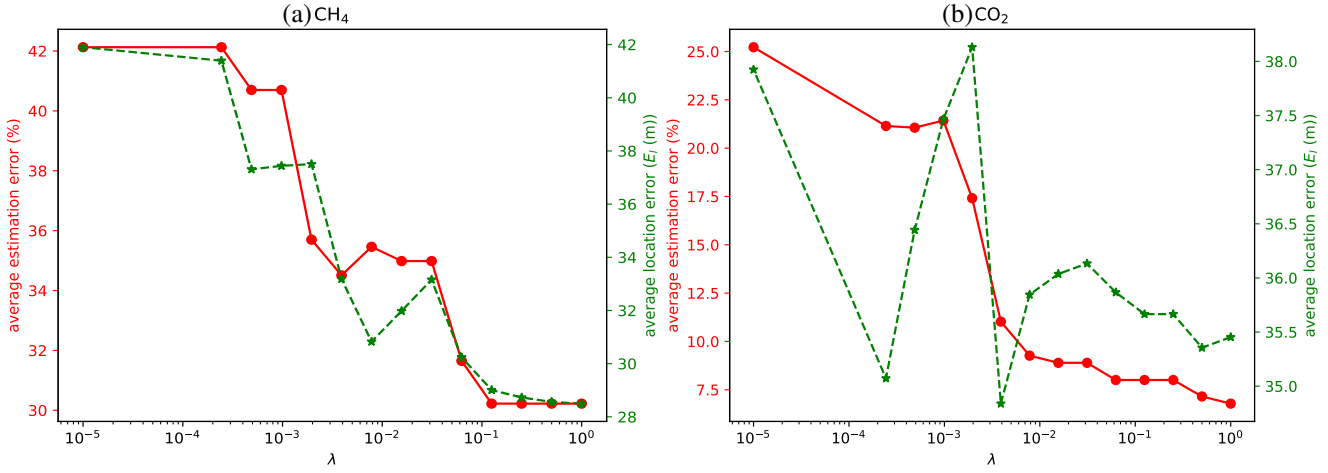
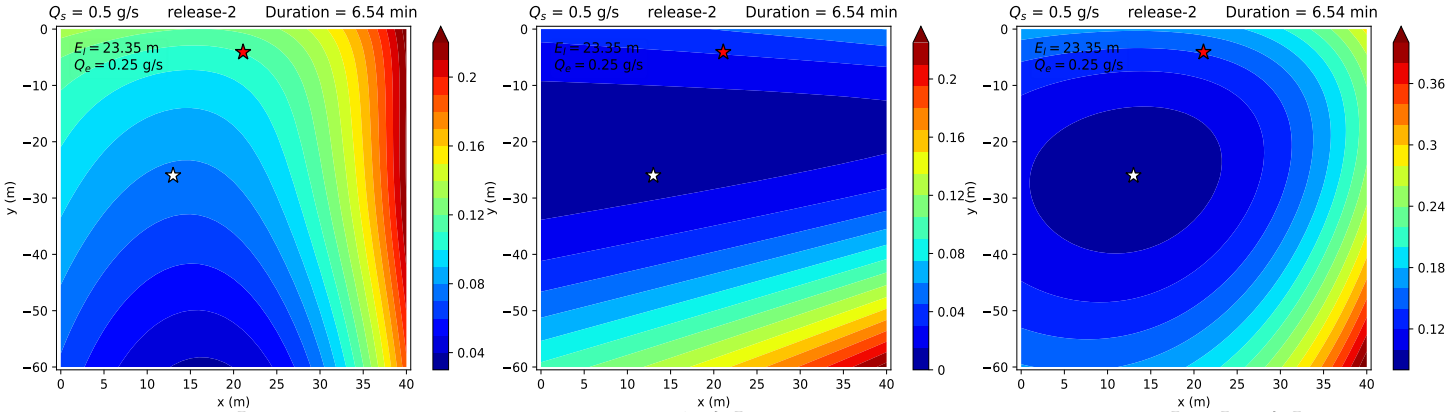
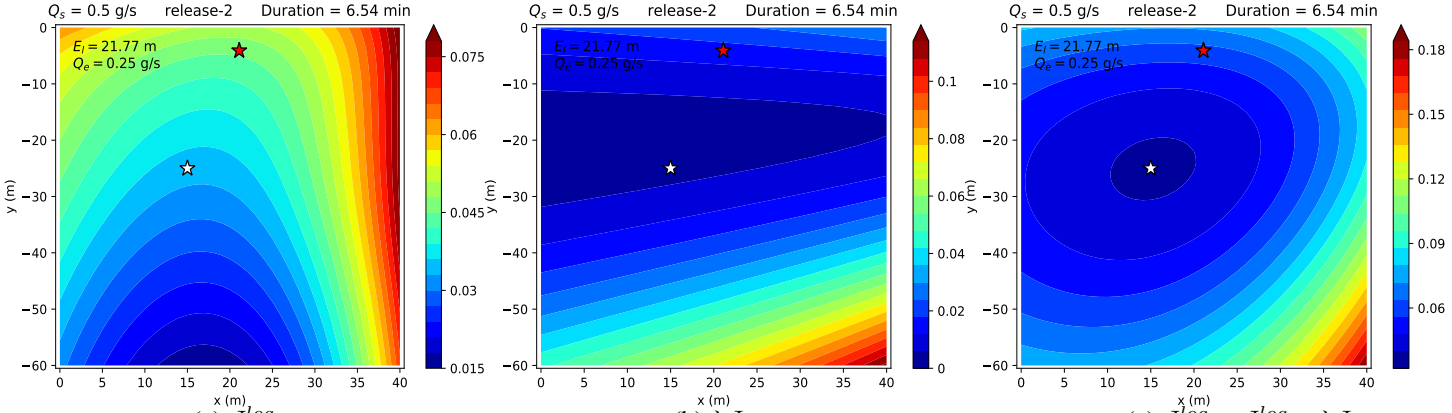


Figure S19. Average errors for all (a) CH_4 and (b) CO_2 releases with respect to λ in the cost function $J^{log} = J_p^{log} + \lambda J_w$.



(a) J_p (b) λJ_w (c) $J = J_p + \lambda J_w$

Figure S20. Contour plots of (a) J_p (b) λJ_w, and (c) $J = J_p + \lambda J_w$ when fixing the release rate to its inverted value Q_e for release no. 2 and when using $\lambda = 1.6\%$. Red and white stars respectively show the actual and inverted source locations.



(a) J_p^{log} (b) λJ_w (c) $J^{log} = J_p^{log} + \lambda J_w$

Figure S21. Contour plots of (a) J_p^{log} (b) λJ_w, and (c) $J^{log} = J_p^{log} + \lambda J_w$ when fixing the release rate to its inverted value Q_e for release no. 2 and when using $\lambda = 0.8\%$. Red and white stars respectively show the actual and inverted source locations.