Applications to belowground pipeline leakage

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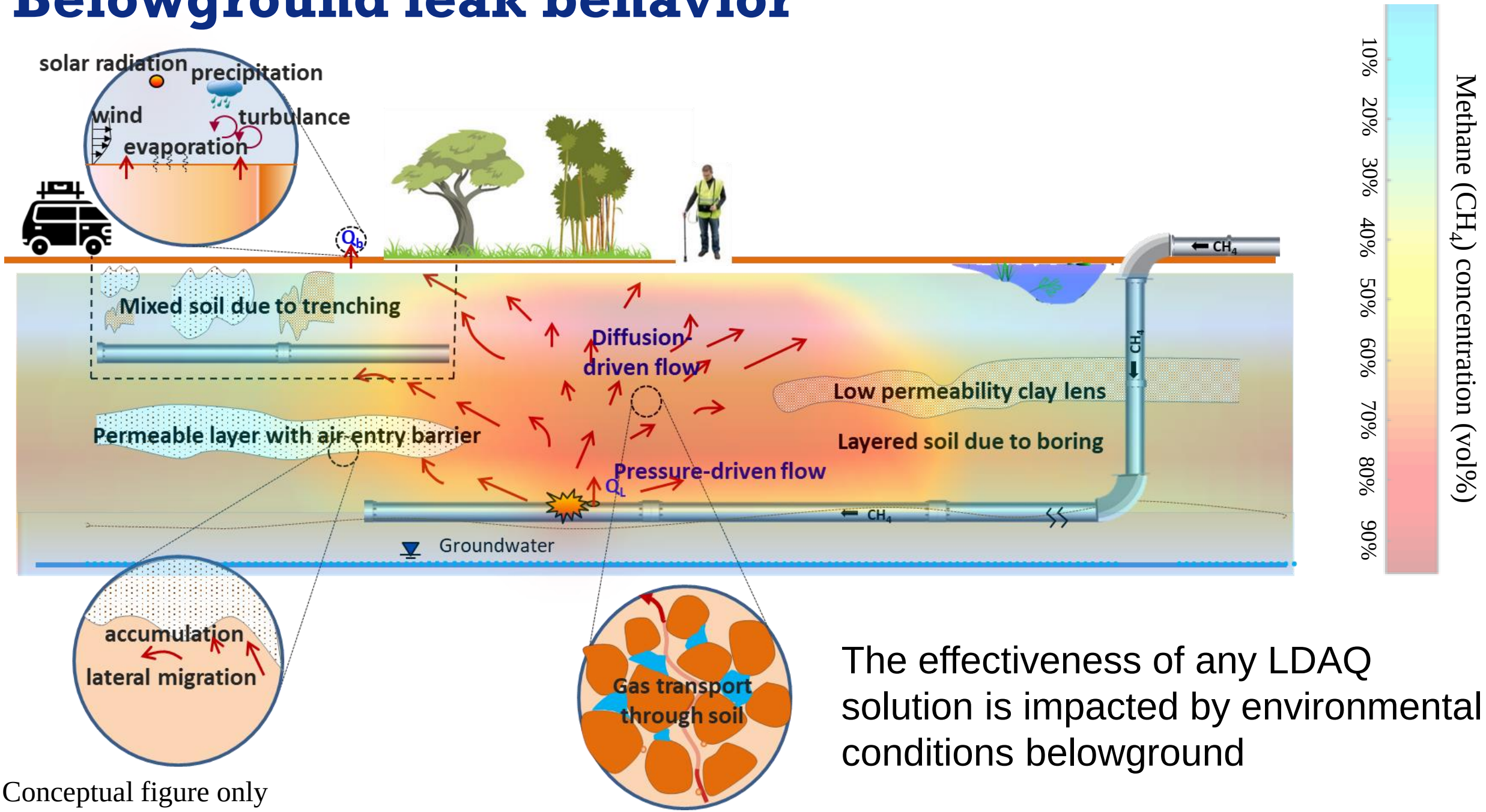
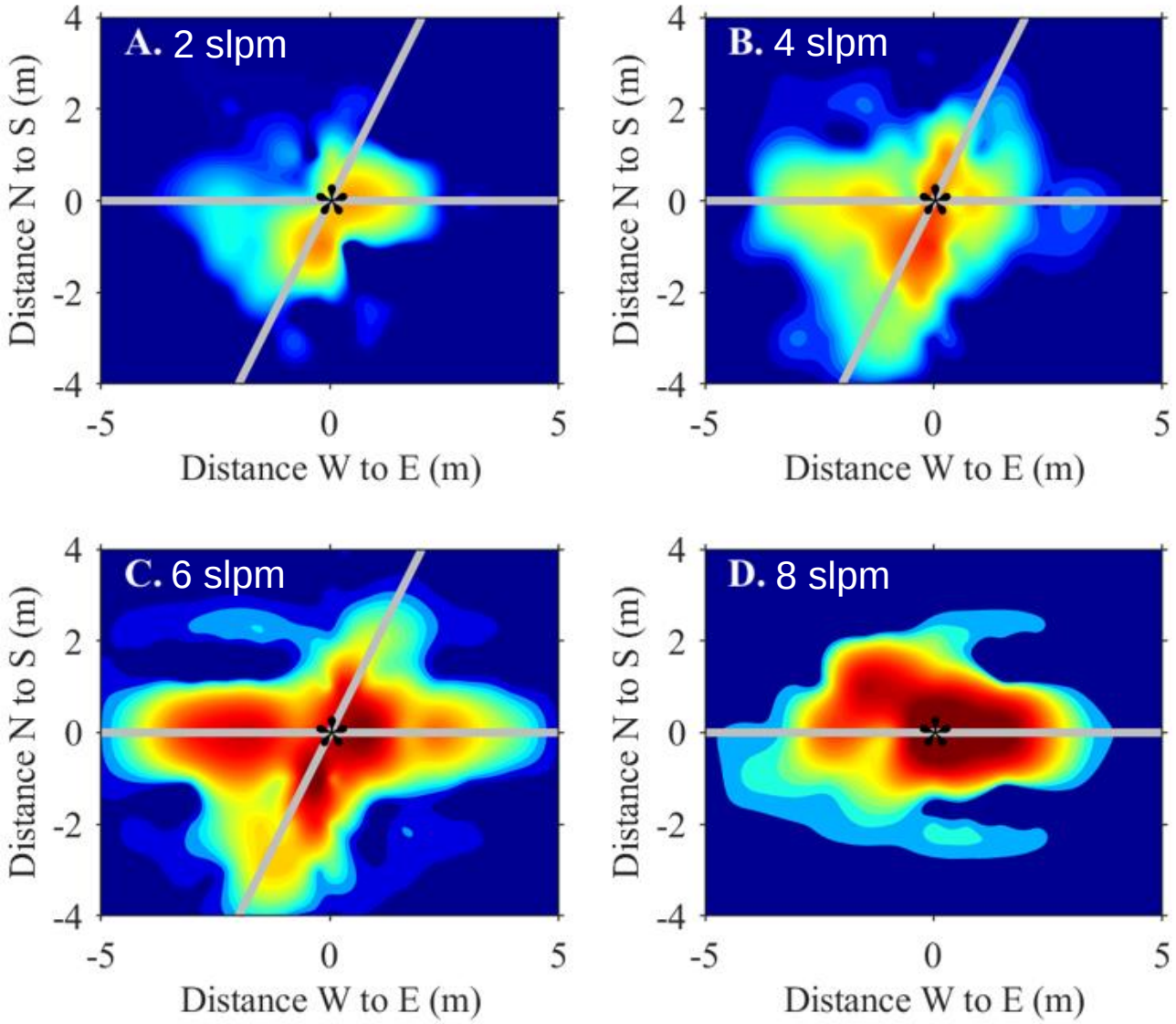
Belowground leak behavior



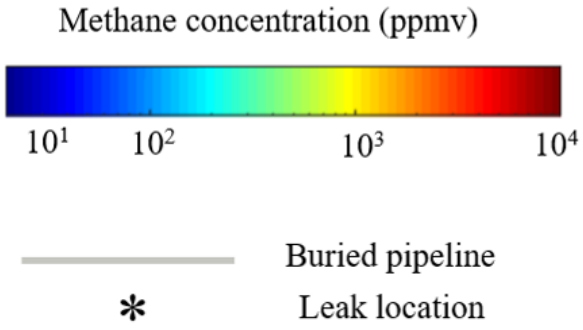
The effectiveness of any LDAQ solution is impacted by environmental conditions belowground

Conceptual figure only

Observed surface concentration from belowground leaks



Diffuse surface presentation of subsurface leaks



Cho et al., 2020, *Elementa*

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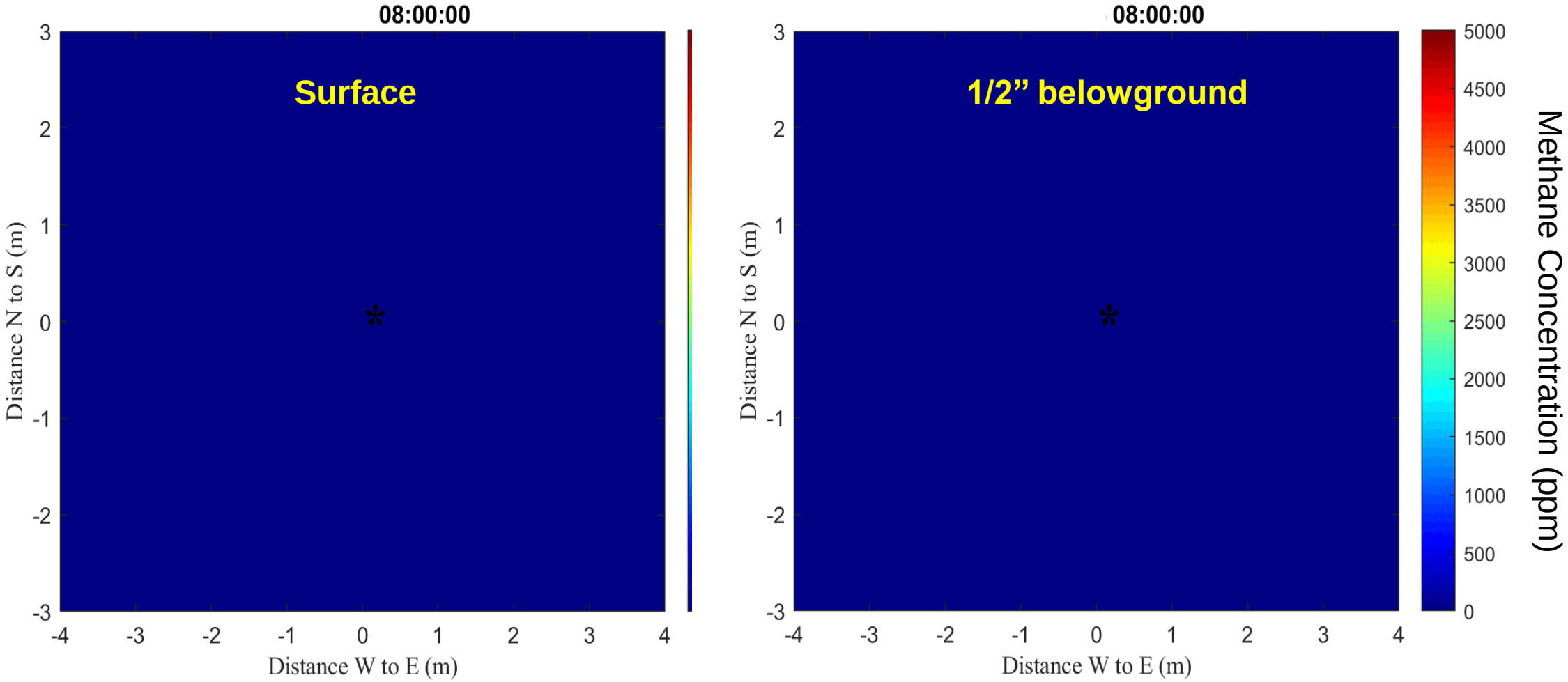
Observed surface and belowground plume behavior

Surface and belowground near surface plots of a controlled belowground leak = 2 slpm over 24 hrs



Lo et al., 2023, *Environmental Pollution*

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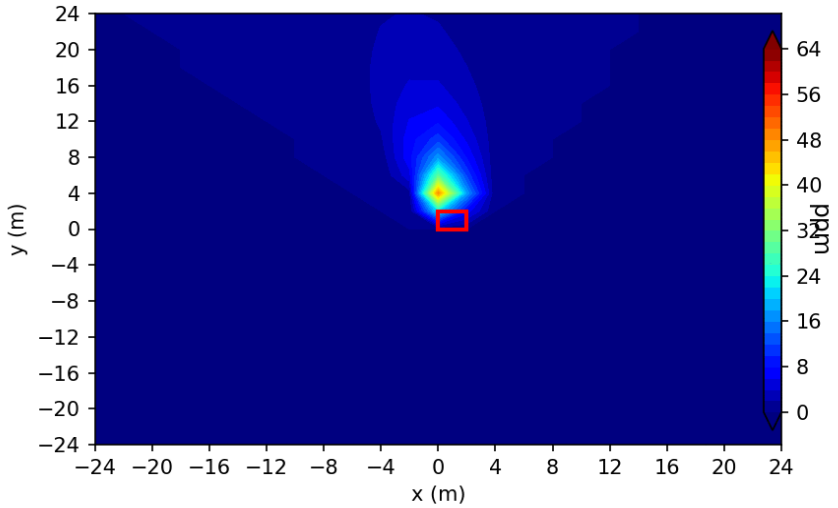
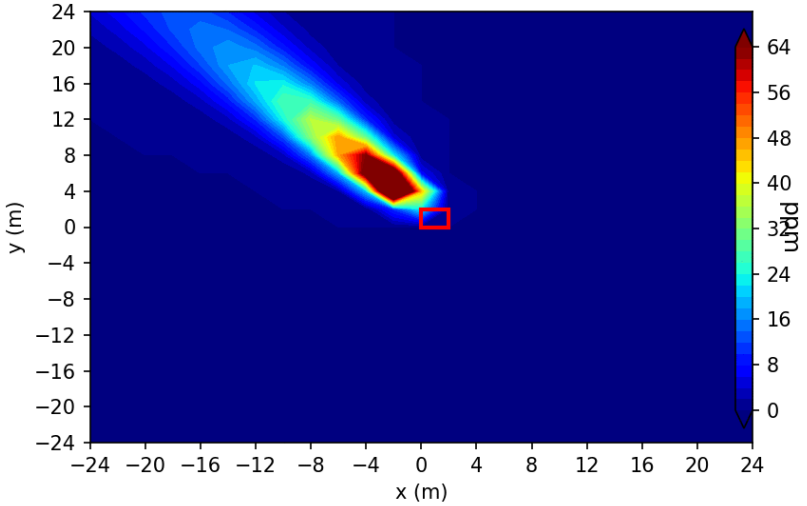
Simulated aboveground methane plume behavior

Atmospheric methane concentrations downwind of a controlled belowground leak = 6 slpm over 24 hrs

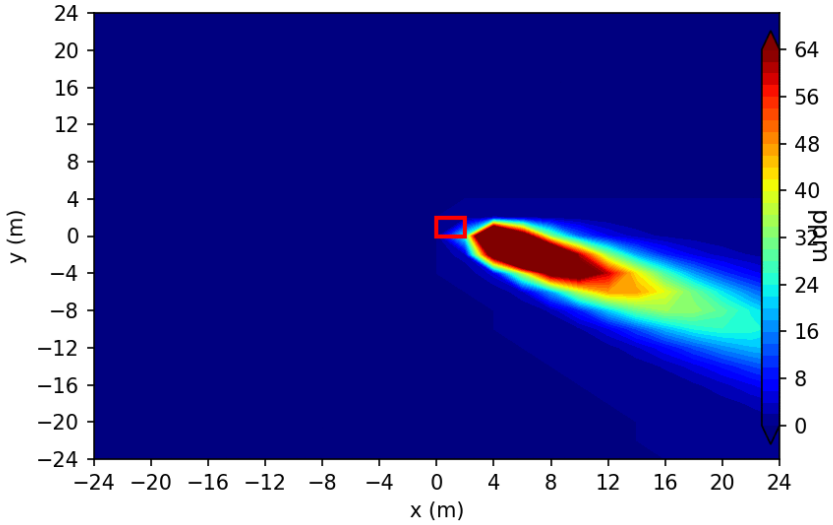
SE wind (day)



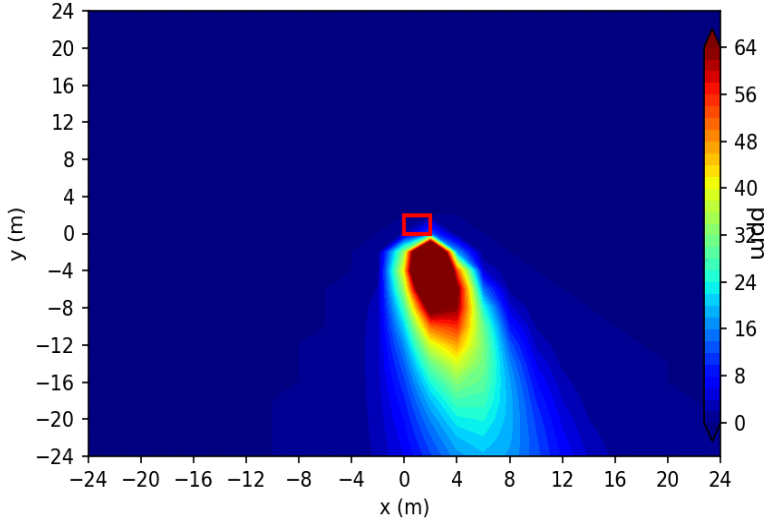
SE wind (night)



NE wind (day)



NE wind (night)



Surface location of belowground leak

Tian et al., 2023

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Connections to leak detection and quantification

- Aboveground solutions do not directly translate to belowground leak scenarios
- The effectiveness of any leak survey method is highly dependent on plume behavior
- Knowledge of the high temporal variations of NG emissions from belowground leaks is required for accurate estimates of belowground emissions
- Emerging tools may augment existing toolkits
- Creative approaches and integration of existing approaches

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