(58-240329-C) **Evaluation of Basin-scale GHG Dispersion simulated by Lagrangian Particle Dispersion Models**

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The ability to estimate greenhouse gas (GHGs) emissions down to the basin- or city-scale is crucial for establishing effective policies geared towards mitigating emissions. Top-down estimates of greenhouse gas emissions using atmospheric measurements of GHGs offer a potential solution. However, these estimates are limited by the accuracy of the transport models that connect emissions to the receptors that measure GHG mole fractions. This study aims to understand how different Lagrangian particle dispersion models (LPDMs) affect footprints, an observation's sensitivity to upwind surface fluxes. These footprints are used to estimate modeled GHG enhancements which are compared to observations to make GHG flux estimates. By testing two different LPDMs, HYSPLIT and LPDM, using the same modeled meteorology, differences in turbulent dispersion were isolated and investigated. Significant differences in horizontal turbulent dispersion were observed between models which had noticeable effects on modeled enhancements. Negligible differences in vertical dispersion were also observed which resulted in minor discrepancies for receptor footprints. Using a well-known point source from a landfill in Indianapolis, IL, the accuracy of both dispersion models will be evaluated. The substantial differences in horizontal dispersion emphasize the importance in evaluating the accuracy of the LPDMs.

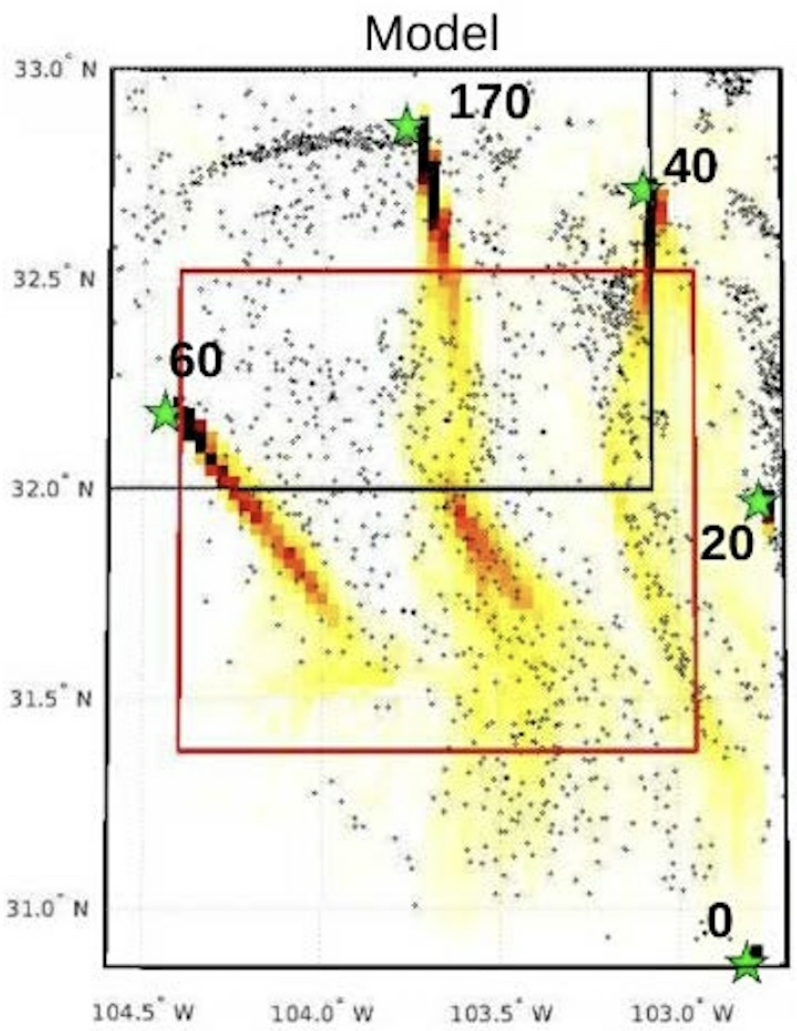

Figure 1. Example of mole fraction footprints computed using LPDM and the associated mole fraction enhancements computed from those footprints when convolved with a prior estimate of Permian Basin methane emissions. From Monteiro et al., (2022).