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Development of an algorithm to meaningfully interpret patterns in street-level methane concentrations

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Methane (CH4) is an important greenhouse gas that has 70x greater heat forcing per molecule than CO_2 over its $\sim$10 year atmospheric residence time. Given this short residence time, there has been a surge of interest in mitigating anthropogenic CH4 sources because they will have a more immediate effect on warming rates. Recent observations of CH4 concentrations around the city of Boston reveal that natural gas distribution systems can have a very large number of leaks. However, there are a number of conceptual and practical challenges associated with interpretation of CH4 data gathered by car at the street level. In this presentation, we detail our efforts to develop an "algorithm" or set of standard practices for interpreting these patterns based on our own findings. At the most basic, we have evaluated approaches for vehicle driving patterns and management of the raw data. We also identify techniques for evaluating data quality and discerning when elevated CH4 may be due to other vehicles (e.g., CNG-powered city buses). We then compare methods for identifying "peaks" in CH4 concentration, and we discuss several approaches for relating concentration, space and wind data to emission rates. Finally, we provide some considerations for how the data from individual peaks might be aggregated to larger spatial scales.