Predictive, Source-Oriented Modeling and Measurements to Evaluate Community Exposures to Air Pollutants and Noise from Unconventional Oil and Gas Development

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Background. The scale and rate of unconventional oil and gas development (UOGD) in the United States has grown dramatically. These operations are complex and heterogeneous, complicating characterization of community exposures to air pollutants and noise from UOGD. Predictive tools are needed to assess exposures over large spatial and temporal scales, and to appropriately focus measurements, exposure, and health studies.

Objectives. ***The main goal of this project is to generate a broadly applicable community model which can assess exposures to air pollutants from UOGD and inform future health studies*****.** We will also conduct targeted field measurements using a stationary and a mobile measurement platform to provide additional inputs to the model, and to evaluate and refine the model. The final model will be named the named **TRA**cking **C**ommunity **E**xposures and **R**eleases or **TRACER** model.

Approach. Our work builds upon a coupled emissions and dispersion model originally developed for methane (http://dept.ceer.utexas.edu/ceer/meet/). We are expanding the model by adding sources of emissions (all field development activities and flaring) and by including a broader suite of pollutants including alkanes and alkenes (up to C10), benzene, toluene, ethylbenzene and xylenes (BTEX), styrene, aldehydes (namely formaldehyde, acetaldehyde and benzaldehyde), polycyclic aromatic hydrocarbons (PAHs, namely naphthalene and methyl naphthalene), hydrogen sulfide (H_2S), sulfur dioxide (SO_2), black carbon (BC) and particulate matter (PM). We will use the updated TRACER model to assess community exposures on a local scale. We are also conducting CAMx modeling to estimate exposures to primary and secondary pollutants from UOGD emissions on a regional scale. Finally, we will assess the implications of our results for the design of comprehensive future exposure and health studies.

We are focusing on the Eagle Ford Shale (EFS) in south central Texas, a large oil and gas production region that includes the production of dry gas, wet gas and oil. This heterogeneity of production types makes the EFS a microcosm of UOGD sites throughout the United States. The TRACER model can be used in other regions with appropriate input data. As part of this work, we will also conduct emissions modeling for the Denver Julesburg Basin.