Tower-based Measurements of CH_4 Dry Mole Fraction and Istopic Ratio ($^{13}CH_4/^{12}CH_4$) in the Northeastern Pennsylvania Marcellus Shale Gas Region

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Fugitive emissions of atmospheric methane (CH_4) from natural gas drilling, production, processing, and distribution activities in the Marcellus Shale geologic formation have the potential to impact the current state of the climate. Thus, it is useful to quantify these emissions from natural gas as well as other sources, both biogenic and anthropogenic (e.g., wetlands, cattle, landfills). Regional emissions can be quantified using an atmospheric transport model with a Bayesian inversion to minimize differences between simulated and observed atmospheric CH_4 concentrations. Towards that end, high-accuracy atmospheric observations of CH_4 dry mole fractions and its stable isotope ($^{13}CH_4$) are made on four communications towers ranging in height between 46 and 61 m AGL. We present results from one year of measurements, focusing on characterizing the enhancements of CH_4 and the calibration technique for the isotopic ratio ($^{13}CH_4/^{12}CH_4$).

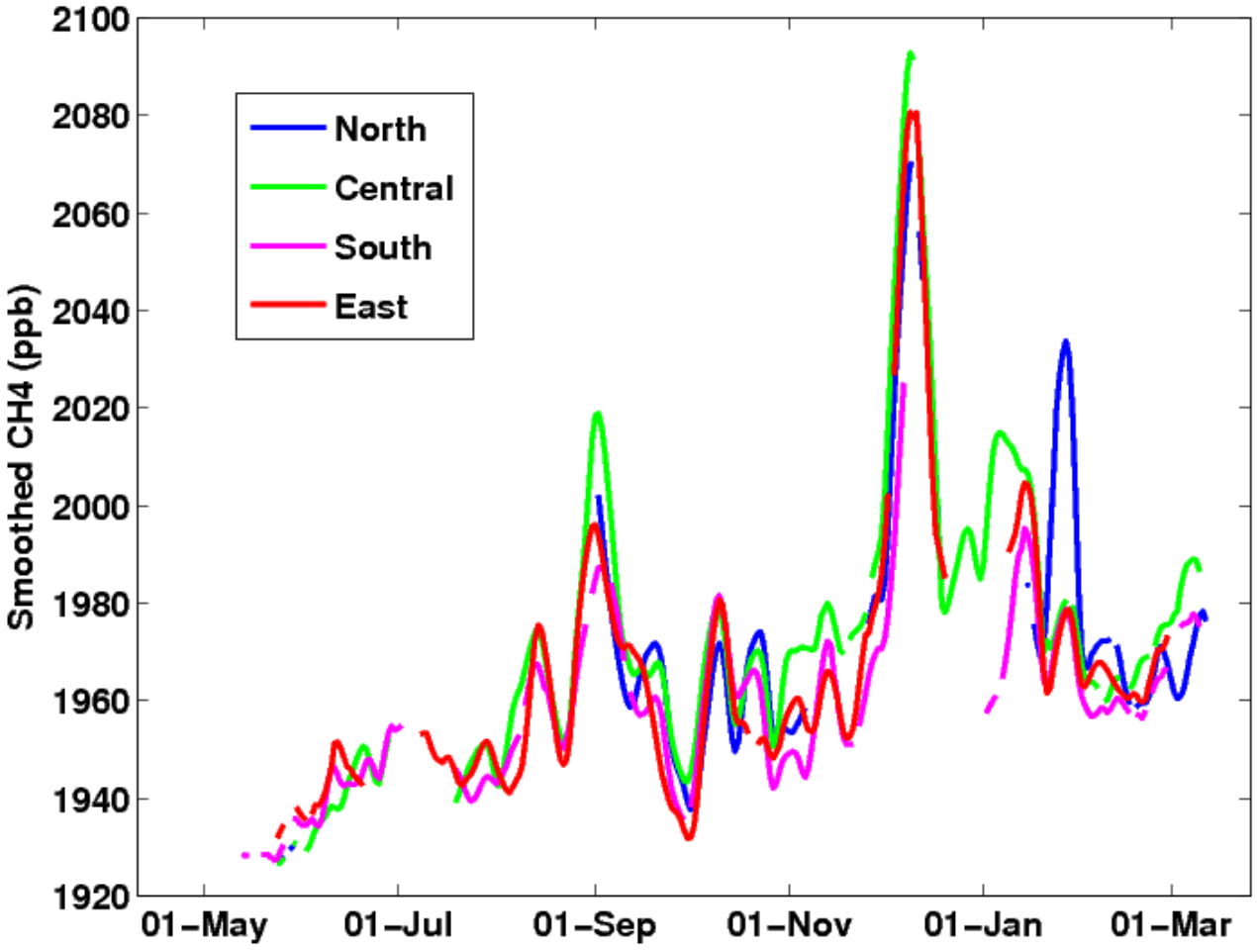

Figure 1. Time series of daytime CH_4 dry mole fractions measured at four towers in northeastern Pennsylvania, smoothed with a 15-day filter.