5.082 Attribution of methane radiative forcing to spatially resolved short-lived precursor emissions.

Early Career Scientist

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Abstract:

The atmospheric lifetime of methane, and therefore its radiative forcing, responds to changes in emissions of precursor gases such as NOx, CO, and non-methane hydrocarbons and to the spatio-temporal structure of those changes. We use the adjoint of the GEOS-Chem chemical transport model to calculate the spatially-resolved sensitivity of methane radiative forcing to changes in precursor emissions. Applying these sensitivities to precursor emissions projected in RCP scenarios, we calculate at fine spatial scale the methane radiative forcing due to particular precursor emission trajectories, and translate this into an equivalent change in methane emissions. The grid scale effective methane emissions allow for more detailed study of regions with large effects on the global budget, or how changes to short-lived precursor emissions trajectories can alter the overall forcing on century timescales. We examine the regional differences between the forcing from precursor emission changes in Beijing, Shanghai, the Pearl River Delta, and the Sichuan Basin, and the impact of the timing of the peak in air quality precursors relative to peak methane emissions on the overall methane radiative forcing.