

Using satellite derived CH₄ / CO₂ columns in CH₄ flux inversions

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We present a method for assimilating CH₄ / CO₂ measurements from satellites for inverse modeling of CH₄ and CO₂ fluxes in TM5-4DVAR inverse modeling system. Unlike conventional approaches, in which retrieved CH₄ / CO₂ ratios are multiplied by model derived total column CO₂ and only the resulting CH₄ is assimilated, our method assimilates the ratio of CH₄ and CO₂ directly and is therefore called the ratio method. It is a dual tracer inversion, in which surface fluxes of CH₄ and CO₂ are optimized simultaneously. The optimization of CO₂ fluxes turns the hard constraint of prescribing model derived CO₂ fields into a weak constraint on CO₂, which allows us to account for uncertainties in CO₂.