



Estimating impact of different GOSAT CH₄ retrievals and OH concentrations on CH₄ flux inversions

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Identifying global CH₄ sources and their emissions is important for understanding the processes that govern the increase of CH₄ in the atmosphere. Differences between satellite retrievals used in inversion analyses can provide varying estimates of global CH₄ emissions. Although the lifetime of CH₄ is about 10 years, discrepancies in the distribution of the hydroxyl radical (OH), will also influence optimized CH₄ emissions. Inversion analyses using the GEOS-Chem four-dimensional variational (4D-Var) data assimilation system are performed for the period from January to December 2010 to assess the impact of the GOSAT CH₄ Full Physics and Proxy retrievals and discrepancies in OH fields in GEOS-Chem on regional CH₄ emission estimates. We compare the performance of the retrievals and show the sensitivity of the inferred emissions to the spatial coverage of the retrievals. We also show that the seasonality of the emission estimates is sensitive to the imposed OH distribution. We find that neither retrieval product corrects well for regional biases between measurements and the optimized CH₄ fields, particularly, in winter months at high latitudes with sparse retrieval coverage. The latter highlights the challenge of quantifying CH₄ emissions at subcontinental scales with the current observing network.