

CH₄ surface flux estimation based on local ensemble transform Kalman filter

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Methane (CH₄) is an important greenhouse gas which is substantially increased during last decade in the atmosphere, raising serious sustainability and climate change issues. With the advancement of satellite observations with global coverage, we aim to study the regional or country-wise contributions of CH₄ emissions to the global CH₄ increase. Present study attempts to estimate the CH₄ fluxes using Local Ensemble Transform Kalman Filter (LETKF) data assimilation technique. Since atmospheric CH₄ is primarily affected by surface fluxes, its variability should be large near the surface. We perform the sensitivity experiment on Observation System Simulation Experiment (OSSE) setting by updating observed changes only into the lower tropospheric CH₄. We also update the observed change into the full column by mimicking the GOSAT observations in the OSSE experiment. It has been found that LETKF is able to retrieve the true fluxes to a larger extent, from the perturbed emission intensities of 20 or 30% relative to the true flux over the East and South Asia regions. We have also found that longer assimilation window (at least 20 days long) is advantageous to CH₄ flux estimation.