Comparison of global sectoral methane emissions inferred by high-resolution inversion of observations from GOSAT and GOSAT-2 during 2019-2020.

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Poster

We present a comparison of methane emission estimated by inversion of GOSAT NIES v02.95 and GOSAT-2 NIES L2 v02.00 observations using a high-resolution inverse model NIES-TM-FLEXPART-VAR (NTFVAR) for the period 2019-2020. Besides satellite observations, we used observations from surface networks consisting mainly of Obspack (GLOBALVIEWplus_v4.0_2021-10-14) and the ICOS network. Our prior emissions include anthropogenic emissions mainly from the EDGAR database (excluding oil and gas) and the oil and gas sector from the GAINS model, biomass burning emissions from GFED, and other sources following Saunois et al. (2020). The model optimizes six emission categories, such as agriculture, waste, biomass burning, coal, oil and gas, and wetland emission, on a biweekly time step. The optimized sectoral fluxes were aggregated to country totals using a high-resolution country mask (0.1°×0.1°). When comparing optimized emissions for large emitters, the inversions are mostly consistent (when differences are within 25% of the prior). USA, Russia, Canada , etc., showed the most consistent emissions across these six sectors between the two inversions. Argentina, China, Peru etc., showed difference that exceed 25% of the prior between inversions. For Argentina, agriculture (52%), biomass burning (33%) and wetland emissions (33%) were higher in GOSAT-2 than GOSAT inversion. For China, GOSAT-2 inferred emissions were lower than GOSAT inversion for the agricultural sector (difference 33% of prior), whereas Brazil (26%), Argentina (53%) and Congo (50%) got more emissions in GOSAT-2 inversion. In the case of India, biomass burning emissions were 70% lower in GOSAT-2 inversion, while other sectors remained consistent with GOSAT inversion. In the oil and gas

sector emissions, prominent difference was for Nigeria (31%), with major produces like USA and Russia getting consistent results. From a sectoral perspective, biomass burning emissions showed sizeable differences across major emitters such as Australia, China, India, Indonesia, Pakistan etc. Difference in wetland emissions in the two inversion was significant for South American countries such as Argentina, Peru, Colombia and Venezuela. Overall the inversions of GOSAT and GOSAT-2 satellite observations provide consistent results for most countries and sectors. Further study with a larger inversion period is required to bring out potential causes for significant difference in some countries/sectors. The regional and sectoral consistency between these two satellites is essential when using them together in inversions to benefit from having more information from observations.

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