INVERSION ESTIMATES OF METHANE EMISSION IN EAST, SOUTH AND SOUTHEAST ASIA IN 2010-2017 USING GOSAT AND GROUND-BASED OBSERVATIONS

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Greenhouse gas Observing SATellite (GOSAT) detected significant enhancements of column-averaged dry-air mole fraction of methane (XCH_4) in East, South and Southeast Asia in the course of its operation since 2009. The attribution and evaluation of these enhancements will benefit the national mitigation efforts for methane in this area. We compared national inventories submitted to the United Nations Framework Convention on Climate Change (UNFCCC) to top-down emissions estimated at country scale by the global high-resolution (0.1° ×0.1°) inverse model NIES-TM-FLEXPART-VAR (NTFVAR). Long-term GOSAT retrievals and ground-based observations were used in the inversion for the year 2010-2017. Prior fluxes contained adjusted EDGAR v4.3.2 emissions scaled to match the country totals by national reports to theUNFCCC, augmented by biomass burning emissions from the Global Fire Assimilation System (GFASv1.2) and wetland emissions from the Vegetation Integrative Simulator for Trace Gases (VISIT) model. The estimated regional total methane emissions is 163.5 Tg $CH_4\,yr^{-1}$(with an uncertainty of 24.3Tg $CH_4\,yr^{-1}$) from twenty-eight countries included in this study, and 94% are from the top ten emitting-countries China (52.2Tg $CH_4 yr^{-1}$), India (36.7Tg $CH_4\,yr^{-1}$), Indonesia (20.3Tg $CH_4\,yr^{-1}$), Bangladesh (11.3Tg $CH_4\,yr^{-1}$), Pakistan (7.9Tg $CH_4\,yr^{-1}$), Vietnam (6.9Tg $CH_4\,yr^{-1}$), Thailand (6.6Tg $CH_4\,yr^{-1}$), Burma (6.3Tg $CH_4\,yr^{-1}$), Philippines (2.9Tg $CH_4\,yr^{-1}$) and Cambodia (2.6Tg $CH_4\,yr^{-1}$). Among these ten countries, natural methane emissions are dominant in Bangladesh and Cambodia, and anthropogenic emissions are dominant in other counties. Statistically significant increasing trends in anthropogenic emissions are detected in China and Indonesia from 2010 to 2017. Optimized high-resolution anthropogenic fluxes show intensive anthropogenic fluxes in megacity clusters like in eastern China, northern India, western Pakistan and southern Indonesia (Figure 1.Posterior anthropogenic methane fluxes (2010–2017 average, unit: mg $CH_4 m^{-2} day^{-1}$)).

Keywords: GOSAT, anthropogenic and natural methane emissions, East, South and Southeast Asia