Supplement



Figure S1: Latitude-longitude distributions of CH₄ at the levels of 800, 500, and 200hPa (the left, middle, and right panels respectively) observed by GOSAT-TIR for the season JFM 2011. The first upper panels (a1-a3) show GOSAT-TIR CH₄, the second upper panels (b1-b3) show GOSAT-TIR a priori CH₄, the third upper panels (c1-c3) the GOSAT-TIR observation points numbers, the fourth upper panels (d1-d3) show GOSAT-TIR CH₄ standard deviation, respectively.



a2) 500hPa: GOSAT-TIR CH4, ppb

a3) 200hPa: GOSAT-TIR CH4, ppb

Figure S2: Same as Fig. S1, but for OND 2011.

a1) 800hPa: GOSAT-TIR CH4, ppb

40°N 30°N 20°N



10 Figure S3: Latitude-longitude distributions of CH₄ simulated by MIROC4-ACTM at the levels of 800, 500, and 200hPa (the left, middle, and right panels respectively) for JFM 2011. The first (a1-a3) and second (b1-b3) upper panels show the difference in CH₄ between GOSAT-TIR and ACTM_{Cao} and ACTM_{WH}, the third (c1-c3) and fourth (d1-d3) panels show STD of ACTM_{Cao} and ACTM_{WH}, respectively



15 Figure S4: Same as Fig. S3, but for AMJ 2011.



Figure S5: Same as Fig. S3, but for JAS 2011.



Figure S6: Same as Fig. S3, but for OND 2011.



Figure S7: Seasonal variation of CH₄ derived for levels of 800 and 200 hPa over considered regions from GOSAT-TIR (solid line), ACTM^{AK}_{Cao} (dashed line), and ACTM^{AK}_{WH} (dotted line), respectively. At the background bar plots represent Cao and WH CH₄ fluxes. Please note the different scale of y-axes (left) for fluxes.



25 Figure S8: Time-altitude cross-section of CH₄ from GOSAT-TIR retrieval, GOSAT-TIR *a priori* and ACTM_{WH} (the left, middle, and right panels respectively) for considered regions.