

The following figures are in the revised manuscript:

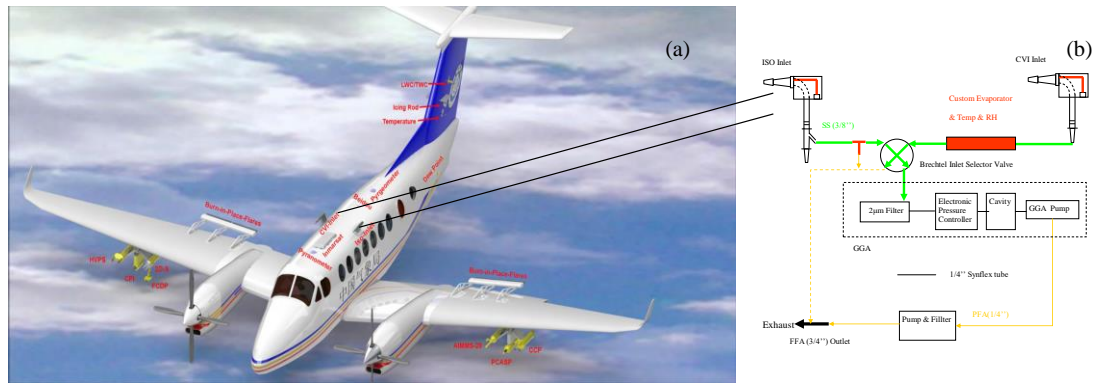


Figure 1. (a) The outside view of the Beechcraft King Air 350ER instrumentation. (b) The schematic diagram of the greenhouse gases sample airflow.

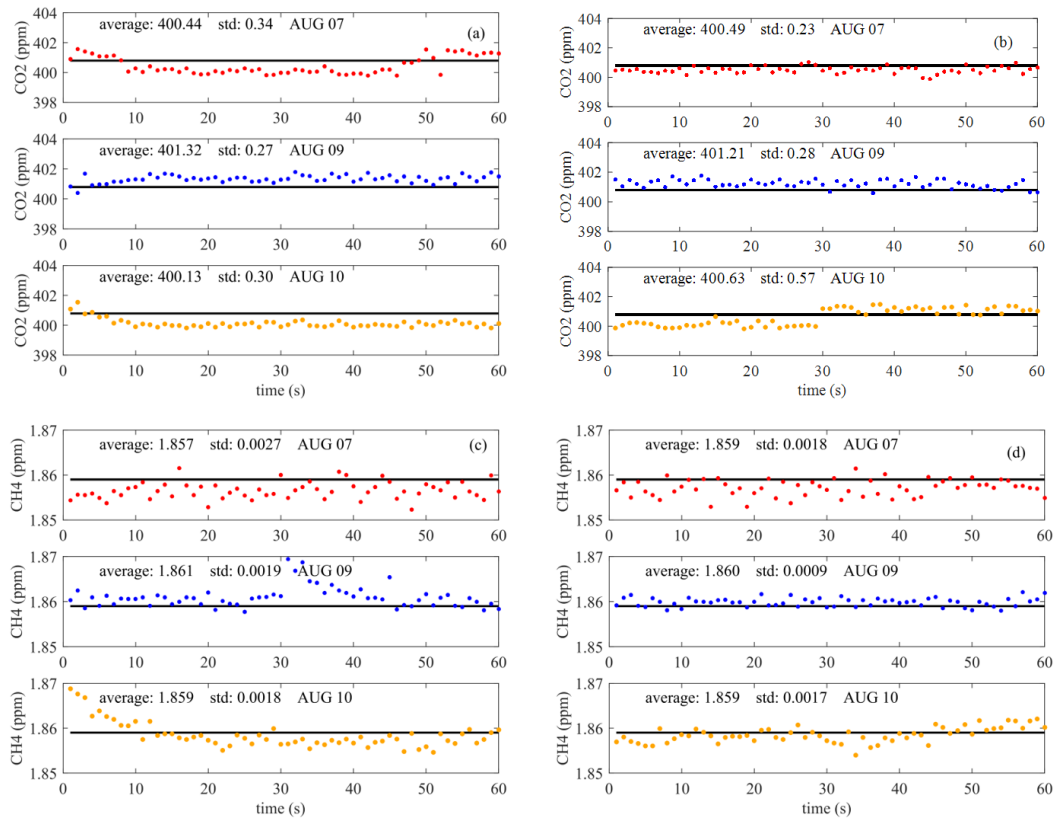


Figure 2. The concentration of CO₂ (a) and CH₄ (b) before the flight, and the concentration of CO₂ (a) and CH₄ (b) after the flight obtained during the calibration, with the value of standard deviation and average of each calibration.

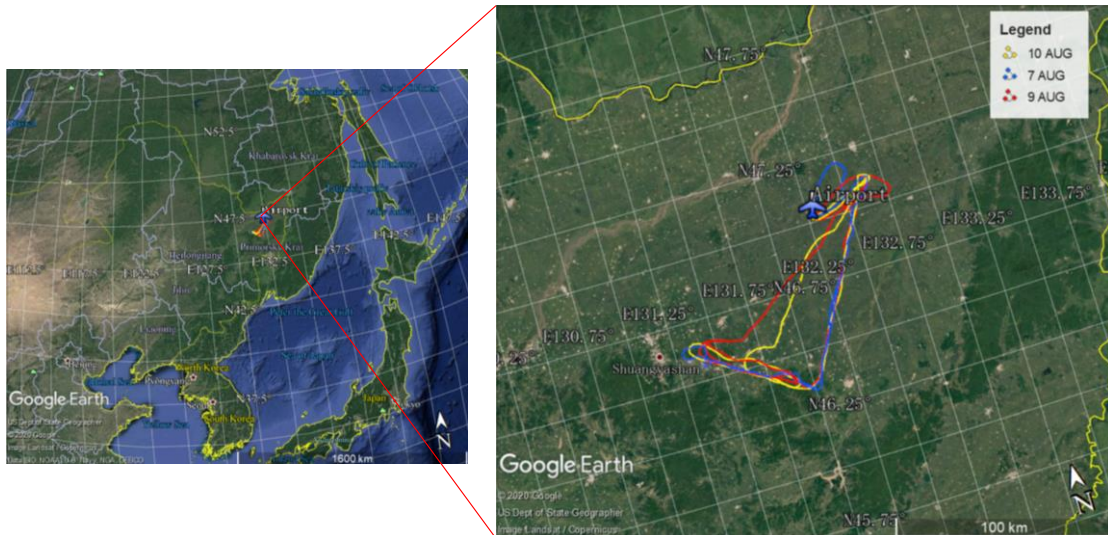


Figure 3. Observation area for aircraft-based measurement of CO₂ and CH₄ over Jiansanjiang, Northeast China, and the flight paths on 7, 9, 10 August.

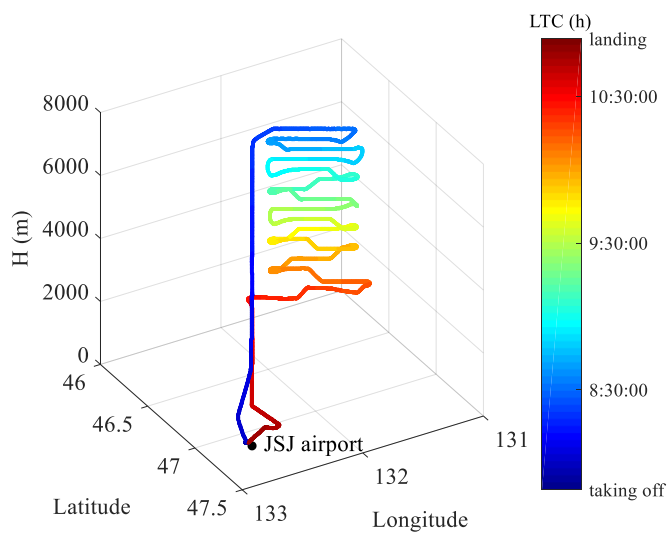


Figure 4. Trajectory on the 7 August, 2018 in Jiansanjiang. The color scale shows the progression of time in local time, where blue represents the start time of the data profile, and red represents the end time.

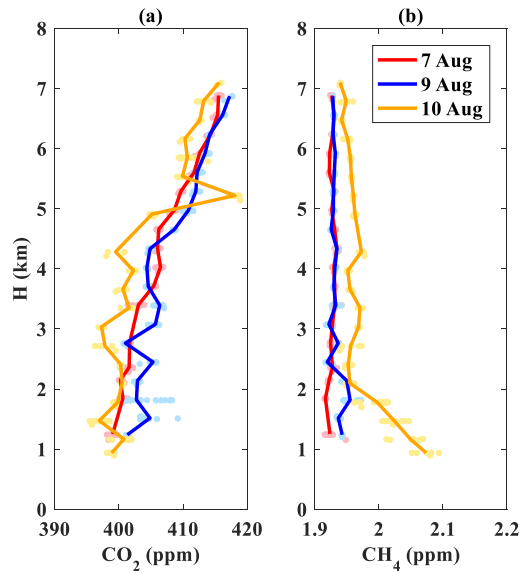


Figure 5. Vertical profiles of (a) CO₂ and (b) CH₄ observed on August 7 (blue), 9 (red), and 10 (yellow), 2018, over Jiansanjiang measured in situ with aircraft. The aircraft-based in situ measurement data are indicated with dots, and averaged data for each flat flight stage are shown as lines.

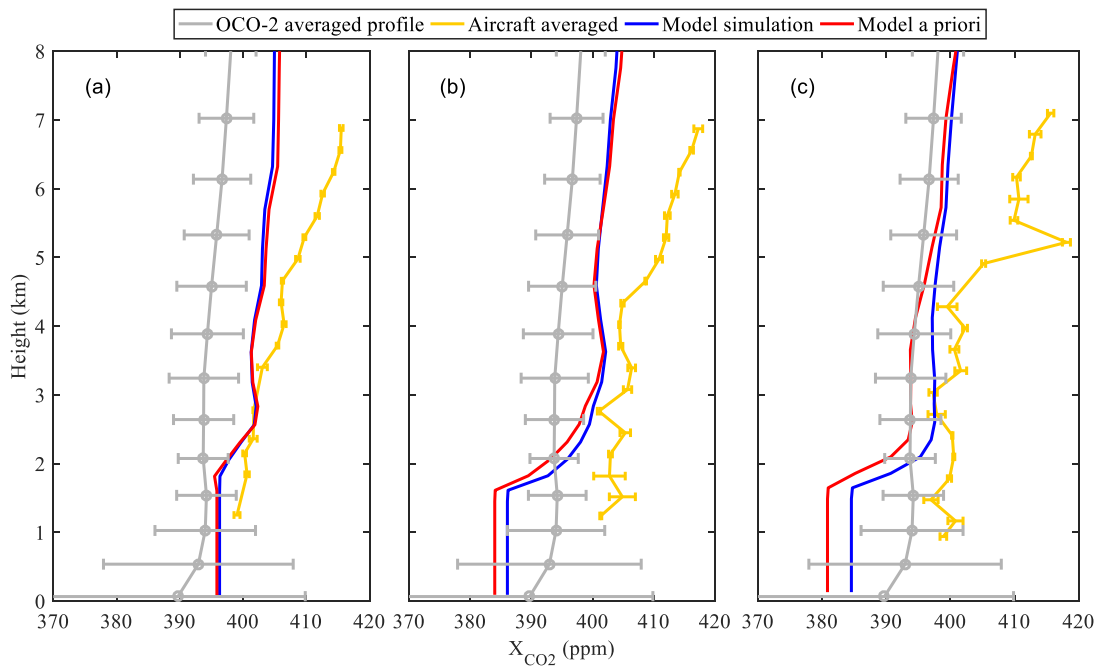


Figure 6. Comparison of aircraft measurements (in situ measurement data are shown by the yellow line) with 1 standard deviation (yellow bars) collected on August (a) 7, (b) 9, and (c) 10, Tan-Tracker (v1) data (blue line) and the a priori profile of it (red line) at the location of Jiansanjiang linearly interpolated to the observation times on August (a) 7, (b) 9, and (c) 10, and the OCO-2 averaged profile (grey line) for the aircraft flight area from August 5 with 1 standard deviation (grey bars).

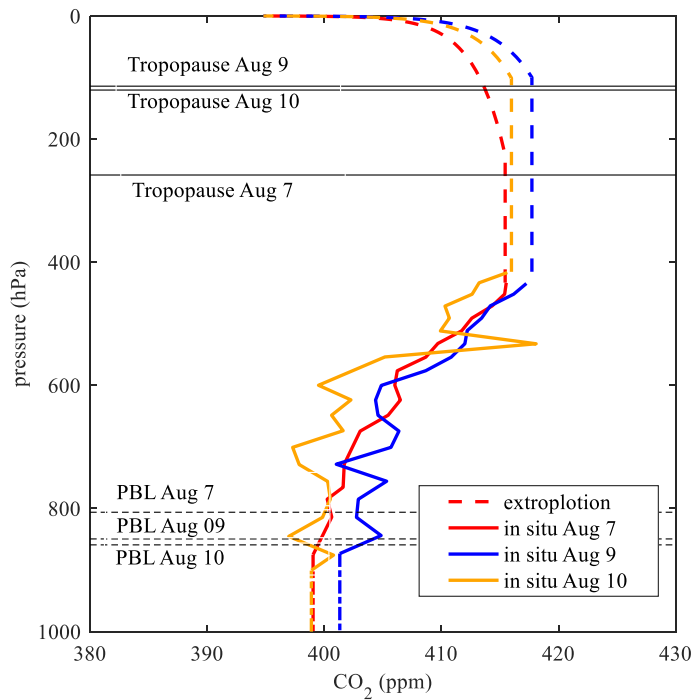
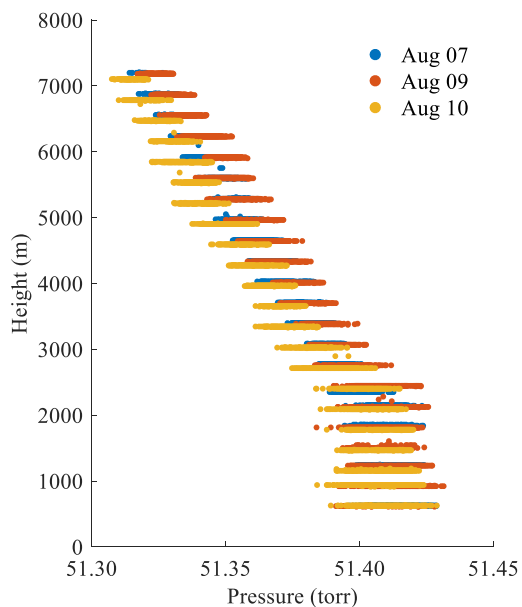
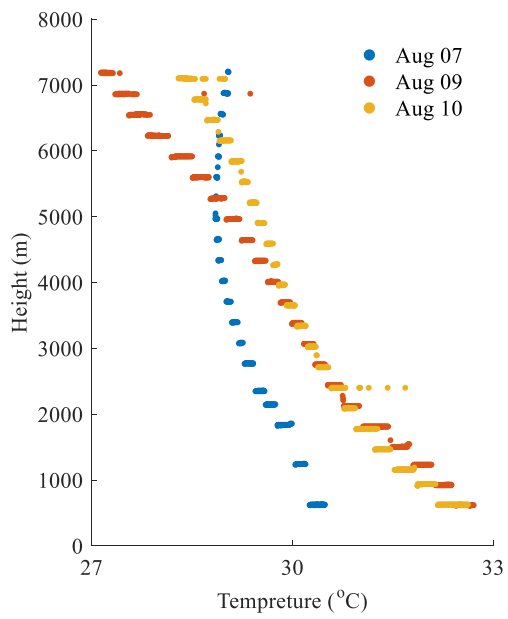


Figure 7. Extrapolated CO₂ profiles observed on August 7, 9, and 10, 2018, over Jiansanjiang by method (2). Red, blue, and yellow solid lines show the aircraft-based (in situ) data collected on August 7, 9, and 10, respectively, averaged for each flat stage of the flight. Dotted lines show the extrapolated parts of the profiles, with colors corresponding to sampling dates in accordance with the solid lines. Black horizontal lines show the tropopause height. Black dashed lines show the PBL height.

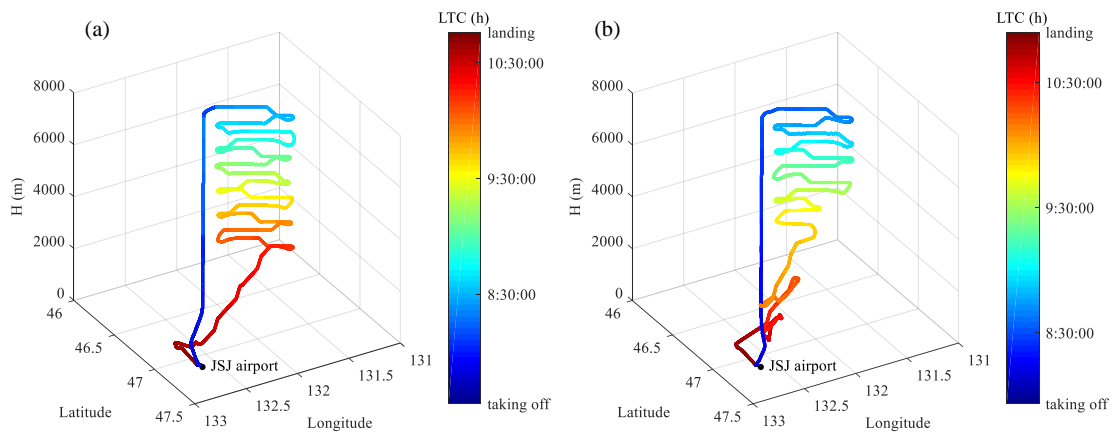
The following figures are for supplement:



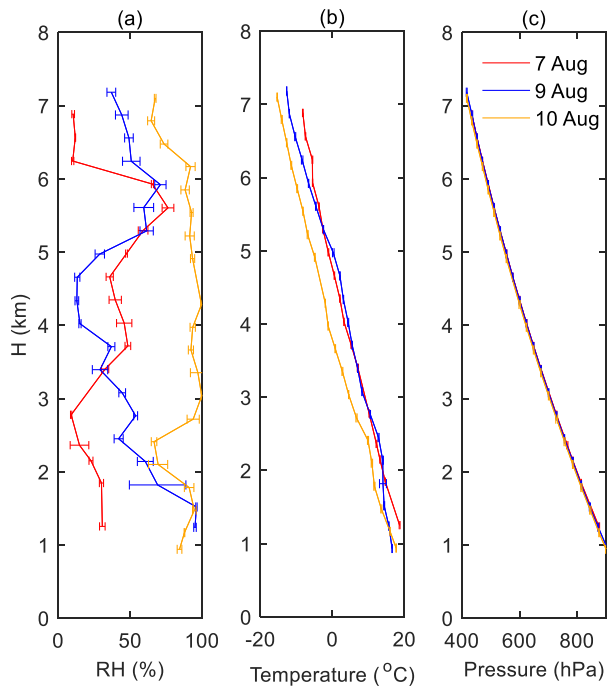
Supplement figure 1. The cell pressure of UGGA during the level flight on 7, 9, 10 August, 2018



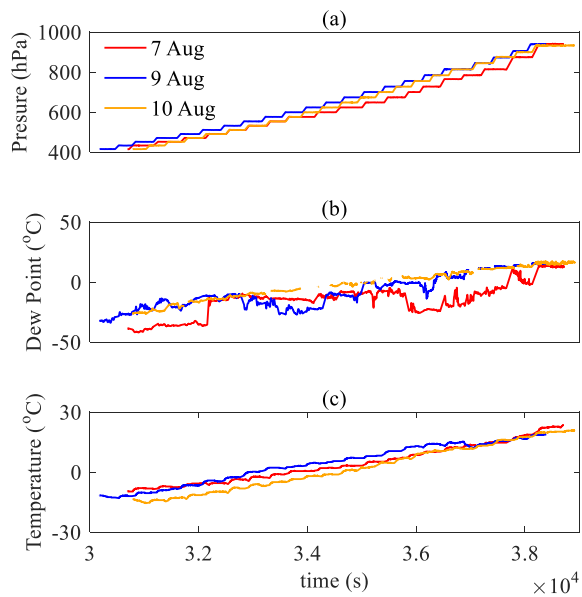
Supplement figure 2. The cell temperature of UGGA during the level flight on 7, 9, 10 August, 2018



Supplement figure 3. Flight trajectory on (a) 9 August and (b) 10 August.



Supplement figure 4. (a) RH, (b) temperature and (c) pressure profiles during the flight on 7, 9, 10 August. 1- σ of the data in the level flight is taken as the uncertainty, shown as the uncertainty bar in the figure. The data process of the meteorology data are the same as that of CO₂ and CH₄.



Supplement figure 5. Time-series measured (a) pressure, (b) dew point and (c) temperature during the flight on 7, 9, 10 August.