

1 **Supplementary Material for the ACP manuscript “CO₂ and its**
2 **correlation with CO at a rural site near Beijing: implications for**
3 **combustion efficiency in China”**

4
5 **Yuxuan Wang, J. William Munger, Shicheng Xu, Michael B. McElroy, Jiming**
6 **Hao, Chris P. Nielsen, Hong Ma**

7
8 **S. 1 Estimates of urban respiration on dCO₂/dCO**

9 Human respiration per day = 1 kg CO₂ d⁻¹, or 0.023 kmol CO₂ d⁻¹
10 [<http://cdiac.ornl.gov/pns/faq.html>]

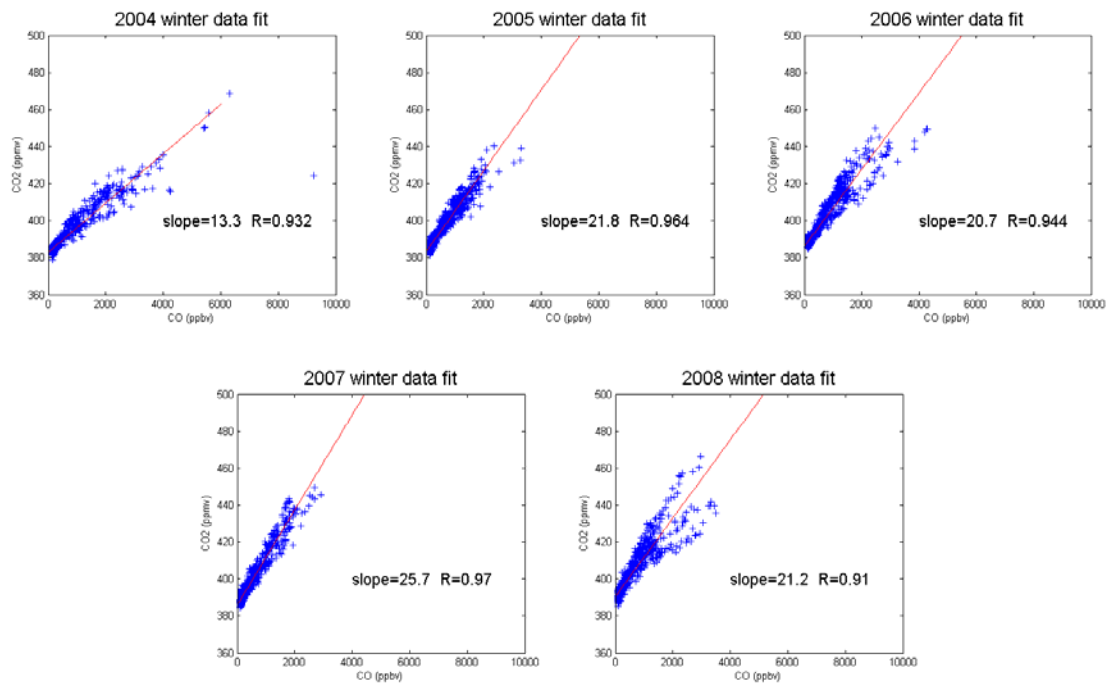
11 Per capita fossil fuel consumption in China = 1.1 MgC yr⁻¹, or 0.25 kmol CO₂
12 d⁻¹ [Marland et al., 2007].

13 Ratio of respiratory C to fossil fuel C = 0.023/0.25 = 0.09 mol/mol.

14 That is, for Beijing urban areas, for every mol fuel C consumed, there is 0.09
15 mol respiratory CO₂.

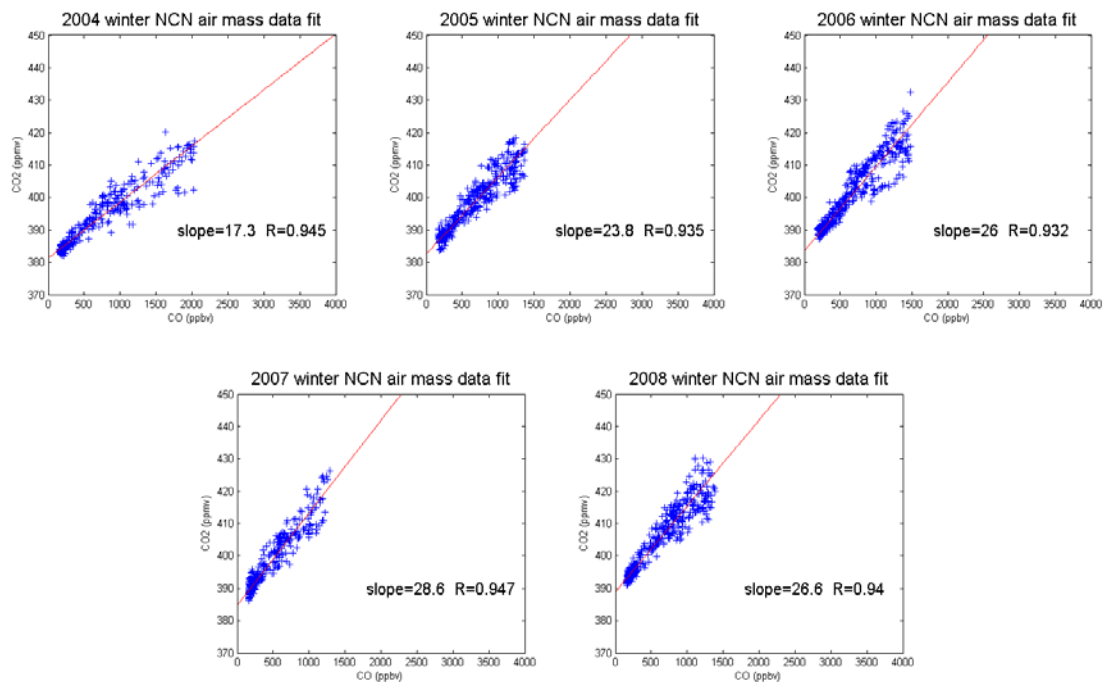
16 Combustion sources over China have a CO₂/CO emission ratio of 21 mol/mol
17 [Zhang et al., 2009; Gregg et al., 2008]. That is, for every mole of fuel C consumed,
18 there is 0.9545 mole of CO₂ emitted and 0.045 mole CO emitted. Adding the 0.09 mol
19 of respiratory CO₂ associated with every mol of fuel C consumption, the overall
20 ‘bottom-up’ CO₂ to CO ratio for Beijing urban area is (0.09+0.95)/0.045 = 23
21 mol/mol. Compared with the CO₂/CO ratio of 21 mol/mol from combustion sources,
22 respiration in dense urban area is small (~10%) but not negligible contribution to
23 budget.

24
25 **S.2. CO₂-CO scatter plots for individual winters (2004-2008)**



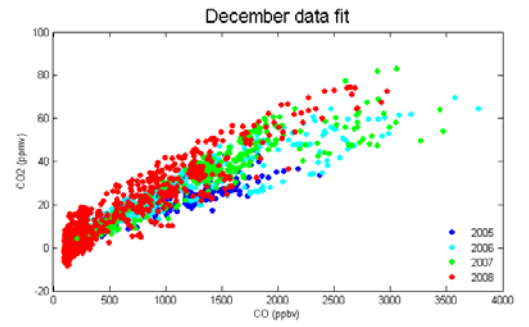
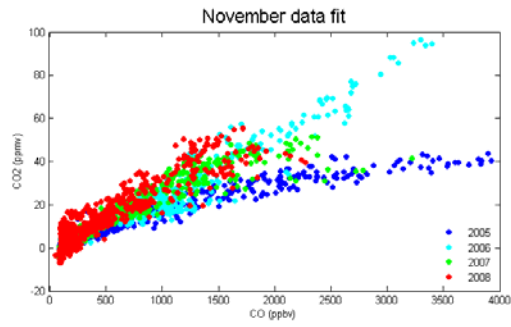
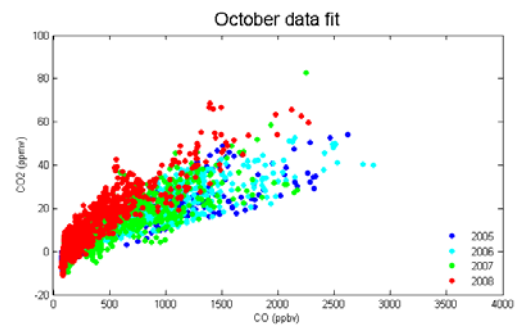
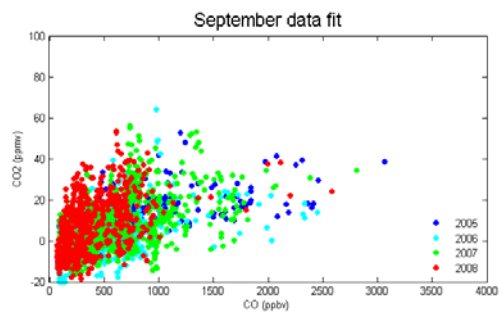
1

2 **S.3. CO₂-CO scatter plots for NCN air masses in individual winters (2004-2008)**



3

4 **S.4. Monthly CO₂-CO scatter plots for September – December, 2005-2008.**



1

2 Note: CO₂ data shown in the plots are de-trended (i.e., taking out the annual increases)

1 **References:**

2 Gregg, J. S., Andres, R. J., and Marland, G.: China: Emissions pattern of the world
3 leader in CO₂ emissions from fossil fuel consumption and cement production,
4 Geophys. Res. Lett., 35, 2008.

5 Marland, G., T. A. Boden, and R. J. Andres: Global, regional, and national CO₂
6 emissions, Carbon Dioxide Inf. Anal. Cent., Oak Ridge Natl. Lab., U.S. Dep. of
7 Energy, Oak Ridge, Tenn., 2007.

8 Zhang, Q., Streets, D. G., Carmichael, G. R., He, K. B., Huo, H., Kannari, A., Klimont,
9 Z., Park, I. S., Reddy, S., Fu, J. S., Chen, D., Duan, L., Lei, Y., Wang, L. T., and Yao,
10 Z. L.: Asian emissions in 2006 for the NASA INTEX-B mission, Atmos. Chem. Phys.,
11 9, 5131-5153, 2009.

12