

Response to Referee's Comments

We would like to thank the referee for taking the time to read the paper carefully and provide helpful suggestions to improve the paper. We have revised the paper according to the referee's comments carefully, where the revised parts are indicated by red font. The detailed revisions are described as follows:

Referee #3

1. Some expression should be consistent throughout the paper, like point instrument data and in-situ data, JiNan and Ji'nan...

Response: We have corrected them. The point instrument/data and Ji'nan have been written as in-situ instrument/data and JiNan, respectively.

2. Maybe there are some mistakes of titles in Figure 11 and Figure 12. Please correct them.

Response: We have corrected them as shown in Fig. 11 and Fig. 12.

3. Section 2.4, I suggest to list all the fit settings in a table for NO₂ and SO₂.

Response: The all fit settings for NO₂ and SO₂ are summarized in Table 2.

4. Section 3.1.1: I agree that the wind direction has the main influence on air mass variations. However, you could also give other parameters: humidity and pressure, as discussion in section 2.1 about temperature comment.

Response: The humidity and pressure are in the range of 32% ~61% and 994hPa~1009hPa during the entire measurement period in NCP area. Similar statements of humidity and pressure have been given in the paper, line 10-12, Page 5.

5. The quality of figure 4 should be improved, like dates, color bar. I think it is best to give all results in Figure 4 for all cycles. You can present them in supplement material.

Response: Fig. 4 has been improved and all results are presented. The results for Cycle 3 and Cycle 4 are demonstrated in Fig .S1 in supplement material.

6. Figure 9: the dates in the left corners of the subplots are really hard to read. Please correct them.

Response: We have corrected the Fig. 9.

7. Figure 13 e and f: I suggest to give and another number of figure 13 e and f together. And I think if you make a correlation analysis using all data regarding to wind direction, it is more robust.

Response: We have split up the Fig. 13 and given an own number for Fig. 13 e and f. Now, these results are shown in Fig. 13 and Fig. 14. There are four times (12 June, 18 June, 25 June and 3 July) to measure the route (SJZ to DZ). Unfortunately, the in-situ instruments have some problems and lack of in-situ data on 25 June. So, total time of measurements of SJZ-DZ route is three, 12 June (south wind), 18 June (north wind) and 3 July (south wind). We have binned three data sets with respect to wind direction and do a correlation analysis for the complete dataset. The results show that NO₂ near-surface concentration mainly results from vehicle exhaust, although the correlation coefficient under southerly wind slightly better than that under northerly wind during the measurement periods as shown in line 21-24, Page 13.

8. Figure 15: could you tell us which error is exactly represented by the error bars, standard deviations? Please clarify it.

Response: The error bars indicate the OMI error and the standard deviation of mobile DOAS observations within $0.1^\circ \times 0.1^\circ$ pixel, line 22-24, Page 14.

Thanks for your opinions and very appreciated your time.

If you have any questions about the manuscripts, please let me know.