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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "In-situ measurement of atmospheric $CO_2$ at the four WMO/GAW stations in China" *by* S. X. Fang et al.

**S. X. Fang et al.**

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Thanks very much for the reviewer for the comments on this manuscript. It is so important to improve the quality of this manuscript. The following are replies to the reviewer1.

Detaild comments:

1.2.2 measurement system : Measurement system should be written brieïňĆy. Especially how you dry the air.

Reply: Yes, we added the description (especially for the air drier) to the revised manuscript. Please refer to the revised version.

2.3.4 Impact of surface wind : Please explain what data did you use to draw the

ïňĄgures (fig 5-8) Did you use 1 hr data or 1day average for both CO2 and wind ? Did you use all the data? If you use data at night when CO2 concentration is very high, CO2 average may be much higher and it must be very difïňĄcult to evaluate source and sink intensities. Could you add some indicator of sources and sinks for each direction on ïňĄg 5-8 for easy understanding? Because thid analysis is very basic, sometimes your explanations are hard to conïňĄrm the facts. You may concise the text.

Reply: Yes, we plotted figure 5-8 with 1 hr data during whole days. We tried to draw them using daytime data only (9:00 am to 16:00 pm). The Fig. 1 is an example (from LFS station). The results do displayed lower CO2 values. However, the difference of CO2 mole fractions on 16 sectors was weakened or not obvious (plus the error bar, $1\sigma$). This is probably because, during the daytime, the boundary layer is higher than the night and the vertical mixing is very rapid. The emission from the local sources maybe diluted quickly and the effect on the CO2 mole fractions on each sector is indistinct. Oppositely, during the night, due to the lower boundary layer height and stable air conditions, the influence of local sources could be seen easily because the emissions would be accumulated rapidly on each direction. Although during the daytime, the observed data are more seemed to be “regional” representative, the effect of local sources still exists even in the midday when the boundary layer is the highest. We used the whole day data to draw the plots and intend to roughly identify the “possible” effect of local sources on the CO2 results. Based on this analysis, in the “evaluation of regional events” section, we flagged the data on sectors where CO2 mole fractions were higher. It is good to add indicator to the figures or concise the text. We tried to add some indicator (for example: marking locations of potential local sources). However, this would make Fig. 5-8 to be very hard to read because there is already so much information (wind rose distribution of CO2 mole fraction, wind speed and the sectors marked as local representative) on them. As you suggested, we erased some ambiguous text in this section.

3.In Fig 5-8 : How did you distinguish data between locally inïňĆuenced or not? It



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looked that you just picked up relatively higher sectors for local one. Is it good way?

Reply: As replied above, we draw the plots using the whole day data. The data at night should be able to indicate the influences of local sources because the relatively lower boundary layer height and stable air conditions could capture the contribution of local source easily. Additionally, due to the complex topography around the three regional stations, we think difference among 16 sectors might be mainly ascribed to the emissions from local sources. Because the higher values are likely due to the effect of local sources, we flagged the data on the sectors where CO2 values are very high. In addition to do this, the data may be further flagged based on the tracer analysis (e.g. carbon monoxide or black carbon) to identify the anthropogenic sources. Regrettably, we do not have the record of CO or BC during the same period.

4.3.5 long-term trend : You cannot use linear ïňĄt to evaluate growth rate in this case, because they have seasonal variation. Only WLG data has different duration. You should use curve ïňĄtting technique similar to Thoning, changing trend part to linear ïňĄtting (a + bt). WLG should have similar increase rate if you use correct technique. Ithink that 1.2 ppm/y is wrong.

Reply: Thanks very much for your correction. In the revised manuscript, we used the method by Thong et al and found that the growth rates were more reasonable. The value for WLG is 2.2 ppm yr-1. We re-wrote the section 3.6 in the manuscript. Please refer to the updated draft.

5.P 27319 Fig 2. explanation " See text for detail" => "See section 3.5 in detail"

Reply: Thanks. We replaced the sentence in the revised draft.

6. P 27326 Fig 9. What does 5m mean in the ïňĄgure?

Reply: Sorry I made a mistake in the original manuscript. The monthly CO2 values at LAN, LFS and SDZ were calculated from results 10 m a.g.l. and values at WLG were from 80 m a.g.l. I have revised this.



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7.P 27292 line 8 Fang et al (2003) is not listed as reference

Reply: Sorry I made a mistake. The reference should be “Fang et al. (2013). We corrected it in the new draft.

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 27287, 2013.



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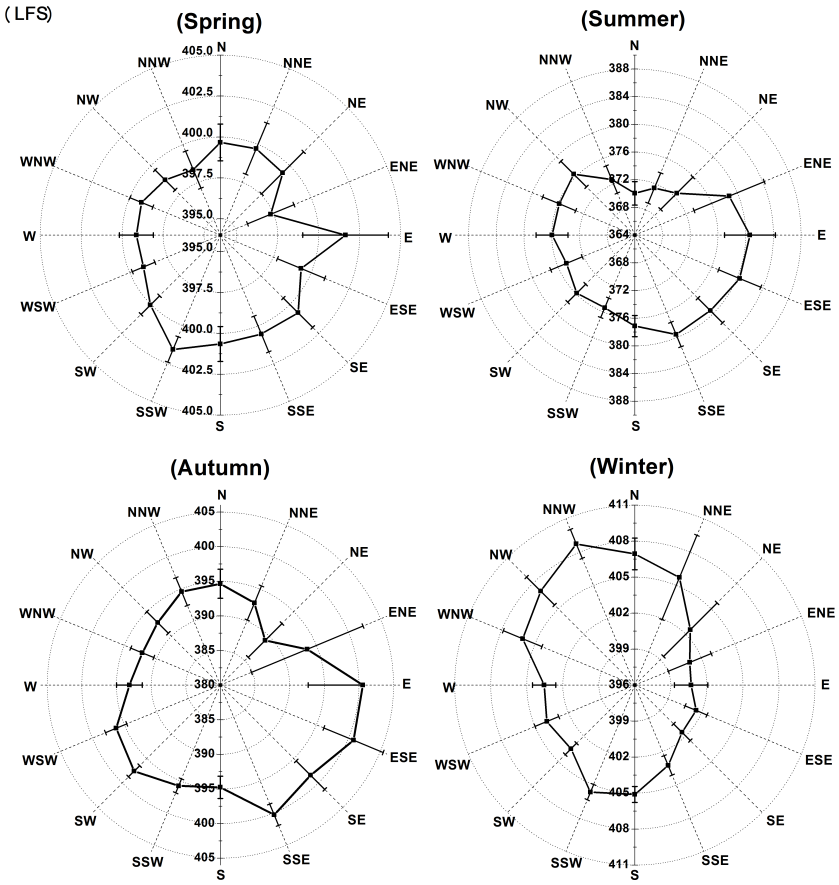


**Fig. 1.** Windrose distribution of CO2 at LFS using daytime data only



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