

Interactive comment on “In-situ measurement of atmospheric CO₂ at the four WMO/GAW stations in China” by S. X. Fang et al.

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According to the referee 2's comments, we updated the manuscript and re-wrote partly of section 3.4–3.5. Reply to your comments are updated.

1.3.4 Impact of surface wind Reply: As you commented, the referee 2 also pointed out that bias may be induced when using local surface wind to identify the local sources and sinks of CO₂ at the three regional stations. We agreed with that and re-wrote the section 3.4 (Impact of local surface wind). In the updated manuscript, we erased the argument of surface wind effect on the observed CO₂ concentration at the three regional stations. Instead, we flagged the CO₂ data series on surface wind directions where very adjacent sources located (less than 10 km) such as villages, factories, train, etc.

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By doing so, we aim at excluding this data which is prone to be affected by very local sources. The following data processing steps are similar to the original manuscript. However, in contrast to the ACPD version where particular wind sectors were identified to be locally influenced based on wind rose analyses for each season and station (see Fig2. 5 to 8 in the ACPD manuscript), only more specific wind sectors were classified as locally influenced. As said above, those sectors were selected according to the distribution of potential sources and not according to the actual observations. The same wind sectors are now chosen for all seasons.

The WMO/GAW global station WLG is very remote and its surrounding topography around is rather gentle. There, the surface wind was proved to be suitable for identify the background CO₂ information (Zhou et al., 2004). Therefore, we didn't change the data selection policy for WLG in the revised manuscript.

2. In Fig 5-8 : How did you distinguish data between locally influenced or not? It looked that you just picked up relatively higher sectors for local one. Is it good way?
Reply: As replied above, at the three regional stations, we flagged the CO₂ data series on surface wind directions where very adjacent sources located. The difference in the new approach is that we first look at the map and identify the potential local sources. We still used three steps to filter the data in the new draft. 1) To select the data during daytime hours, 2) To flag the CO₂ concentrations under certain wind directions where very local sources exist (We identified potential local sources in the following sectors: SSW-SW and N sector for LAN, N for LFS, and S-SSW-...-NNW for SDZ.), 3) To flag the CO₂ records when surface winds speed is below 1.5 m s⁻¹. The rest of the data is considered to be “regional” representative. However, it is still hard to “exactly” distinguish between regional and local CO₂ mole fractions at those stations because there are so many factors affecting the concentration including sources, sinks, terrain, meteorological conditions, long-distance transport etc. The WMO/GAW global station WLG is very remote and its surrounding topography around is rather gentle. The surface wind is proved to be suitable for identify the background CO₂ information (Zhou et al.,

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2004). In the revised manuscript, we didn't change the data selection policy.

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