

Review report of the manuscript “Transport pathways of carbon monoxide from Indonesian fire pollution to a subtropical high-altitude mountain site in western North Pacific”.

General comments:

This is an interesting study looking at the long range transport impacts on the observed enhancements in pollutants at the high altitude pollution monitoring station in Taiwan. It explains the challenges and significance of air pollution events which will disperse to a larger area. However the manuscript needs some improvement to bring more clarity on the study. Specific points of concern are given below. In general English also needs a significant improvement (some in notified, but many I did not). This work can be accepted for the publication after the successful revision of the following points.

Specific concerns:

Lines 44-45: How do both extreme and weak El Niño events relate with forest fires, what is the basis here? This looks little contrasting to me. Weak El Niño should not result in extreme dry conditions and that would be non-conducive for fire events.

Lines 50-51: Please check the grammar the sentence is grammatically not correct.

Line 51: Check the grammar

Lines 64 and 65: The average atmospheric life time of CO is two months and that of CH₄ is close to 12 years. Any episodic increase in CO may not have direct impact on average CH₄ atmospheric life time through OH radical chemistry because CO is prone for more local variations and so are OH radicals. Only sustained increase of CO in all the regions may cause that effect but it is very vague to state that, CO increase may increase the CH₄ life time through OH processing. Kindly bring more clarity on this statement.

Line no. 74: I would suggest to give the site details separately. It has been merged with introduction which does not sync. You can revise the introduction by keeping the studies reported from LABS and objectives for this study. Bring out the site details along with more details on local meteorology in a separate section. Local meteorology at the study site is missing and would be needed for the reader to understand your results.

Line 79: “The LABS is often found within the free troposphere”. Again the statement is very vague. Please try to show the ABL height in reference to the station height for different seasons. The ABL height plays an important role in the interpretation of long range transport and local emissions. Measurements of CO experience boundary layer local emission effects if the station is within boundary layer. This should be considered carefully while deciding the effect of long-range transport. Further the site looks to be in between dense forest region how do you remove the local forest fire event effects from the long range transport from Indonesia?

Lines 102-103: What is the CO trend in 16 years? Have you considered the trend while estimating the enhancement during 2006 and 2015? Because long term CO may have natural variability (de-seasoned) in its mean and that needs to be removed while calculating the enhancement.

Line 129: first line indent is not followed here.

Figure 2: What is the natural trend of CO over the years removing the episodic events? How do you separate the natural variability with episodic enhancements due to forest fires? If the more fire activity is bringing more CO then why year 2014 has not shown any enhancement even through fire activity and Niño 3.4 are comparatively high. Same is the case in the year 2009.

Figure 3: This correlation is drawn for which pressure level of satellite data?. In situ measurements are point measurements at the surface whereas, satellite data are area averaged and column integrated. If the columnar area averaged data are used will it represent the true scenario of LABS? And the further interpretation of enhancement is logical? The clarity is missing here. This is important because satellite may have picked the local fire event enhancements too. It would be better to incorporate a fire event intensity distribution diagrams (for the years 2006 and 2015) around the LABS site and then overlap air mass trajectories (use of polar plots may help) receiving at the site to see the real influence of the detected fire events. This should normally correlate with the enhancement. After establishing this relationship dynamics can be explained.

Lines 218-219: Did you subtract the 2006 and 2015 data from long term mean of MOPITT CO observations or the other way around? You were looking for the enhancements, then long term mean should be subtracted from 2006 and 2015 data to see the magnitude of enhancement. Please re-verify this statement.

Line 224: What is the uncertainty of MERRA-2 reanalysis data and how significant it is in your interpretation of impact of GpH and wind distribution while explaining the transport pathways?

Lines 290-291: What is the time scale of CO transportation from the source region to the observational site via meridional transport?. Whether it fits observed changes?

Summary and Conclusions: It looks more like a discussion rather than conclusion. Please bring crisp 4-5 salient points of this study in conclusion. Figure 10 and related content can go as a discussion. It does not sync again in summary and conclusion.