Response to Dr. Meiyun Lin

(Note: Reviewer comments are listed in grey, and responses to reviewer comments are in black. Pasted text from the new version of the paper is in italics.)

1. The manuscript is missing an importance reference on the connection among ENSO, intercontinental pollution transport, and ozone variability.
Meiyun Lin, L.W. Horowitz, S. J. Oltmans, A. M. Fiore, Songmiao Fan (2014): Tropospheric ozone trends at Manna Loa Observatory tied to decadal climate variability, Nature Geoscience, 7, 136-143, doi:10.1038/NGEO2066.
This paper used observations at Mauna Loa Observatory in Hawaii, multi-decadal model hindcasts (including those driven by observed SSTs) and idealized CO-like tracers to show that the eastward extension and equatorward shift of the subtropical jet stream during El Nino enhances long-range transport of Asian pollution towards the eastern North Pacific, raising free tropospheric ozone over the subtropical North Pacific region. La Nina manifests in an opposite way. They also found that long-range transport of Asian pollution has weakened in the 2000s due to more frequent La Nina-like conditions (the negative phase of the Pacific Decadal Oscillation).
It seems like that the ozone response to Pacific cooling shown in your Figure 1 resembles the response to El Nino discussed in the above paper. Their findings should be summarized in the Introduction and discussed in Section 5.

Thanks Meiyun for your thoughtful and valuable comments. Your paper presented an excellent work regarding the interactions among ENSO, SST anomaly, pollution transport and ozone variability, and fits well the scope of this study. We have summarized your key conclusions in the Introduction. In our study, we also find that SST increase in North Pacific tends to weaken the zonal westerly wind at lower-middle latitudes (25°N - 45 °N) in the Northern Hemisphere while strengthen it at higher latitudes (Figure 9, see the revised manuscript or below), which further influence the O_3 long-range transport. The corresponding cooling in North Pacific, on the other hand, may exert an opposite effect. Since our analysis mainly focus on the surface O_3 changes in boreal summers while your findings are more relevant to O_3 changes in spring and autumn, we will do more analysis about these seasons and compare directly with your work in the follow-up studies.

"The La-Niña-like decadal cooling of the eastern equatorial Pacific Ocean in the 2000s was proved to weaken the long-range transport of ozone-rich air from Eurasia towards Hawaii during boreal springs (Lin et al., 2014)."

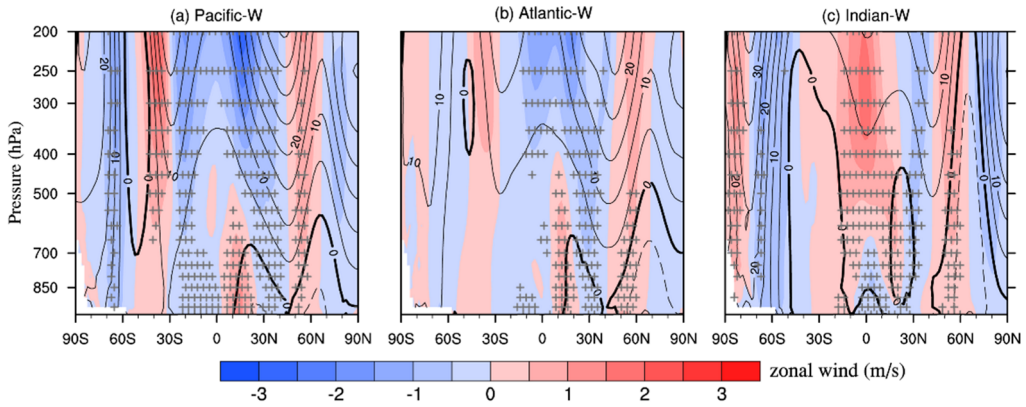

Figure 9. Zonally averaged changes in zonal wind (color contour, m/s) and geopotential height (contour, m) for (a) Pacific-W, (b) Atlantic-W and (c) Indian-W relative to CTRL in boreal summer. Black solid and dashed lines in the contours indicate positive and negative geopotential height anomalies, respectively (Contour interval: 5 m).The + symbol denotes areas where the zonal wind changes are significant at the 0.05 level evaluated with a Student t-test.

2. Lines 113-115 (Page 4), the description for the findings of Lin et al. (2015, Nature Communications) is not quite accurate. You stated "Lin et al. (2015) had found that more frequent deep stratospheric intrusions appear during ENSO springs". By "ENSO springs", it is not clear which phase of the ENSO. Please change that to "during strong La Nina springs".

Thanks for mentioning this. We have clarified the relevant text based on your suggestions:

"Lin et al. (2015) found that more frequent deep stratospheric intrusions appear over the western US during strong La Niña springs owning to the meandering of polar jet towards it. This process can increase western US surface O_3 levels remarkably."