Review "Associations of interannual variation of Summer Tropospheric Ozone with Western Pacific Subtropical High in China from 1999 to 2017 " by Zhang et al.

General

Surface ozone can post great threats to public health and vegetation growth. Ozone pollution in China has become a severe environmental issue in the recent decades. Surface ozone varies at different time scale from diurnal to interannual scales. The interannual variation and long-term trend of surface ozone are difficult to investigate partially because of lack of long term observations. Therefore, numerical models become a powerful tool in addressing this issue. In this work, Zhang et al. used the Weather Research and Forecasting model coupled with Chemistry, WRF- Chem, to investigate interannual variations in summertime ozone for 18 years from 1999-2017 over China. Through EOF analysis and sensitivity simulation experiments, they linked summer ozone variation with the interannual variation in the Western Pacific Subtropical High (WPSH). The topic is suitable to Atmospheric Chemistry and Physics. The research ideas are innovative. The analysis are in some depth. The results are meaningful and interesting.

I provide the following comments/suggests for the authors to consider when revising their paper.

This is a simulation-based analysis. Therefore, how WRF-Chem performs is critical. The authors presented some validation validations at short time scales (Figure S1). How about at interannual scale? How well the model can capture the interannual variation and trend is most relevant to this work. The authors can use the recent (since 2013) surface measurement for this validation.

When the authors explored the underlying mechanisms for the linkage between summertime surface ozone and WPSH, they considered air temperature, precipitation, and wind (Abstract, Figures 5 and 6). Radiation is missing. As known, radiation is one of the most important drivers for surface ozone formation. Therefore, please take radiation into consideration.

There are many differences in the correlation of a WPSH index with surface ozone between Figure 4 and Figure 8a, which are puzzling. Can the authors please explain the differences?

One key figure seems missing: what are the spatial distributions of the composite anomalies of surface ozone in positive and negative phases of WPSH from the model simulations? How do the two distributions differ? The authors can compare these differences with those in recent observations (select two years with the largest difference in the WPSH index) and discuss your observations.

The authors can also briefly discuss relative importance of other climate modes, such as ENSO, and the East Asian monsoon to the interannual variation in surface ozone over China, comparing with WPSH.

Both abstract and conclusions lack of quantitative information (only two pieces of information in abstract, zero piece of information in conclusions). Please add more quantitative discussion.

Minor

Figure 1, please show the domain for the subregions studied (CY, CC, MYR, YRD, PRD, and BTH) in this figure or another figure.

Figures 4b and 8, please only show significant correlations, or indicate where the correlation is significant ($p<0.05$).