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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The influence of typhoons on atmospheric composition deduced from IAGOS measurements over Taipei" *by* Frank Roux et al.

Anonymous Referee #1

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Comments on the manuscript entitled, 'The influence of typhoons on atmospheric composition deduced from IAGOS measurements over Taipei', Roux et al. submitted for plausible publication in Atmos. Chem. Phys.

This paper deals with the effects of typhoons on ozone concentration and relative humidity distribution in the upper troposphere over Taipei (Taiwan) using IAGOS data sets collected by two China Airlines during summer 2016. This study is very important, in principle, since detail knowledge of water vapour and ozone budget in the upper tropospheric plays a vital role in a global weather-climate system. The paper is well written and contains significant data and original materials. However, the manuscript needs

moderate revision before publications. My specific comments are following under :

(1) The authors have shown a significant increase in ozone concentration in the proxy of dry air and low CO concentration which occurs in the middle and upper troposphere. I do agree with the authors that the enhanced ozone is primarily associated with the passage of typhoon. But my main concern, even the authors themselves have stated that lightning associated with a typhoon may cause enhancement of ozone. Then how sure we are that the observed enhanced ozone in the middle and upper troposphere is of stratospheric origin. I suggest doing a back-trajectory analysis. (2) Potential vorticity (PV): PV is a dynamical tracer for stratosphere-troposphere exchange (STE) processes but in the absence of diabatic heating and frictional forces. During a typhoon, the convective tower will have a high value of PV, which is generated due to latent heating associated with it. A detailed study on the evolution of PV structures associated with a typhoon has been carried out by Grad et al. (2011). Thus one needs to take caution during a typhoon while linking high PV value as the air of stratospheric origin. However, Leclair De Bellevue et al. (2007) have mentioned that latent heat can be negligible outside the convection core in the upper troposphere. In this aspect, a detailed discussion is required in the manuscript. (3) There may be a thermal sensor in the aircraft. Thus it will be good to show the thermal structure (maybe temperature inversion). (4) Near Taipei, there is an ozonesonde launching station at Banqiao (25 degree N, 121.3 degree E) or elsewhere. It will be quite supportive of the IAGOS observations if one can show the ozonesonde profiles during any of the typhoon cases (till 3-4 days after typhoon landfall). This will also validate IAGOS data in the convective situation. (5) The tropopause structure has a key role in STE and also during a typhoon. Thus, I suggest authors take nearby radiosonde data (twice a day) to show the thermal structure and also the wind information. (6) Ratnam et al. (2016) have shown a significant increase in upper tropospheric ozone associated with north Indian Ocean tropical cyclones. It is shown that a particular sector of the cyclone has high ozone and low humidity. I also suggest the authors look into this possibility in the existing data set and discuss the results. (7) Figs.4, 7 and 10 can be combined.

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