

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2021-204

Anonymous Referee #1

Referee comment on "Air quality deterioration episode associated with a typhoon over the complex topographic environment in central Taiwan" by Chuan-Yao Lin et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-204-RC1>, 2021

This manuscript studies a unique mechanism that the typhoons approaching to Taiwan from the east and the presence of the central mountain range result in a weak counter flow system behind the mountain range (lee vortex) and enhanced air pollution there, particularly at around the mountain slope rather than the coastal regions with emissions, during the summertime. The mechanism is clearly presented with both observations and model simulations (WRF-Chem). As the ACP journal scope is focused on studies with general implications for atmospheric science rather than investigations that are primarily of local or technical interest, my primary concern is about how the interesting results here are to be generalized to other locations of the world. Such a statement is better included. Second, there are several parts where additional justification and explanation are necessary. For example, description on observations is weak, for both TEPA monitoring and campaign observations (for example, in-situ measurement techniques, sampling flow rates, and ion analysis). Also, the roles of biogenic VOCs emitted from the forests near the mountain regions should be discussed. Overall, I would recommend publication but only after major revisions on these issues.

Specific comments:

1, line 113-114: Specify measurement techniques for PM_{2.5} and O₃, whose data are heavily used.

- Lines 135-136: Were high-volume air samplers used for sampling and subsequent

chemical analysis? What was the flow rate? Measurement methods for sulfate, nitrate, ammonium, and EC/OC should be described. Maybe the sampling periods are 11 h (not 12 h)?

- What is this number (46734) for?
- Line 217: For the buildup of OC, what are the roles of biogenic VOCs emitted from the forests near the mountain regions? I thought model simulations could tell the importance.
- Lines 220-222: Chemical aging was not important for the buildup of sulfate?
- Line 229: Which species are emitted from agriculture?
- Line 267. Bifurcated air flows meeting in the western Taiwan may form a kind of convergence. Why does the convergence result in subsidence rather than updraft?
- Line 285: Do the authors mean change over time?
- Line 306-307: Titration of O₃ by freshly emitted NO might be another reason for the low ozone near the sources?
- Line 335-336: Are the correlation coefficients as high as 0.72 and 0.81 from hourly values?
- Lines 398-400: Here mentioning a branch flowing over the ocean to the south? Please clarify.
- Table 2: July 15, 2018 is Sunday. Any emission change on this day?
- Figure 4. Add explanation of the colored lines in the caption or legend.
- Figure 5a. Land-sea breeze is well resolved with the model with a resolution of 3 km. This should be better highlighted, with some comparison to coarser resolution model cases. Are there any reasons why the simulated wind speeds are often higher? And any potential influence of the stronger wind on the model results of O₃ and PM_{2.5}?
- Figure 16. Mention unit of the PM_{2.5} mass concentrations in the caption.
- Figures 8 and 9: Which altitude are the shown streamlines for?