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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Influence of tropical cyclones on tropospheric ozone: possible implication" *by* S. S. Das et al.

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The paper "Influence of tropical cyclones on tropospheric ozone: possible implication" by Das. S. S. et al. discusses the role tropical cyclones may play in controlling tropospheric ozone level. The paper is based on the analysis of ozone and humidity measurements in the vicinity of two tropical cyclones which occurred in the Bay of Bengal in 2012 and 2013. The paper also takes advantage of a series of WRF simulations which describes the dynamical field in the vicinity of the cyclones.

Understanding the role of tropical convection in the stratosphere to troposphere exchange is certainly a scientific question which falls well within the scope of ACP. This is made even more interesting by the impact these processes could have on near surface

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conditions. Although studies of this kind are not knew the authors present results of two cyclones which could potential add relevant information on these exchange processes. Das S. et Al. also appear to reach quite substantial conclusions by the end of the paper (pages 19315 lines 4-20) but these don't seem to be fully supported by the evidences presented in the paper.

In particular I don't think the paper demonstrates to a sufficient level:

1) that the ozone enhancement is attributable entirely to a stratospheric intrusion and not to local source (e.g. lightning), tropospheric advection, or anthropogenic origin.

2)that the intrusion in the troposphere would add as a significant stratospheric sink as suggested in line 7-10 on page 19307

3) how significant such exchange process is for the overall ozone budget of the troposphere and what its possible impact on the living organisms could be (page 19307 line 27 and page 19308 line 15-19).

4)whether the tropical cyclones in the bay of Bengal could be considered representative of the tropical cyclones in other part of the tropics.

5) what is the extent of the area for which the ozone enhancement area has been recorded.

6) how significant the enhancement of surface ozone detected during the passage of the cyclones is when compared to the normal level of variability at the station.

7) how well the WRF-ARW is able to describe the dynamical field around the cyclone.

I would think the paper would become significantly stronger if an estimate of the overall ozone mass exchange though cyclones would be attempted by the authors on the basis of the measurements they acquired and the number of tropical cyclones that exists.

Detailed comments:

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Page 19306 Line 18 : at least one of the many references should be mentioned here.

Page 19306 Line 18 : I would think the properly of Ozone as GHG don't depend so much on its location in the atmosphere

Page 19306 Line 24 : I don't think that categories such as "bad" and "good" are particularly useful for the discussion here especially because it is not clear to whom such change would be good or bad.

Page 19308 lines 9-10: at least at the first order the amount of radiation that reach the surface should not depend on the specific vertical profile of ozone as much as on its total column amount.

Page 19313 line 14: I don't think it can be safely assumed that tropical cyclones have no lightning for example: http://journals.ametsoc.org/doi/abs/10.1175/MWR-D-11-00236.1

Page 19314 line 24: I think the provides only once piece of evidence in support of the thesis the authors suggest rather than a demonstration similarly I would be more cautious in the conclusion c.

Page 19315 lines 11-14: I don't think this statement is fully supported by the evidences presented by the authors. The enhancements the authors suggest (which I assume can only be local) is probably offset by a slow ascent happening on the large scale. Understanding the balance between these two competing processes would be the only way to the long-term impact tropical cyclones may have on the ozone concentration of the troposphere.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 19305, 2015.