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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Problems regarding the tropospheric O_3 residual method and its interpretation in Fishman et al. (2003)" *by* A. T. J. de Laat and I. Aben

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Comment by S. Na.

There are two things that need to be clearly separated here: one is the variation of TTOCs in time, and the other are geographical patterns/variations.

In our article we try to show that the TTOC as determined by Fishman et al. [2003] is largely determined by the Logan [1999] climatology. Since the Logan climatology does not have any zonal variations north of about 30 N, we must therefore conclude that the "Indian plume" is caused by the latitudinal variation in Logan TTOCs, surface elevation and tropopause height variations. A careful examination of the Fishman et al [2003] TTOC shows that this pattern is actually persistently present in his product throughout the year. This hints at a geophysical (elevation) effect.

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Note that we do not argue that the TTOC patterns over India are not real, we just disagree with the interpretation in Fishman et al., [2003].

Time variations of TTOCs are a completely different story. Although it is beyond the scope of this article to go into detail on the topic of the interpretation of extra-tropical TTOCs, it is important to mention that these variations are due to three processes: in situ produced O3, O3 from stratosphere-troposphere exchange and tropopause height variations. All three processes vary both on long seasonal timescales as well as on short synoptical timescales (note that for example for India both tropopause heights and in situ tropospheric O3 production maximize during local summer). As a result, interpretation is very complicated. We would like to refer an upcoming publication early next year on an analysis of this topic using a global chemistry-GCM simulation. However, for the interpretation of the TTOCs over India it is important to note that observations show that surface O3 levels are maximum during spring, not during summer. Thus it is unlikely that the summertime O3 maximum is caused by atmospheric boundary layer pollution.

For more information on the topics raised in this comment we would like to refer to the answer to the comment by Fishman.

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3, S2172–S2173, 2003