Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2018-884-RC2, 2018

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Detection and Classification of Laminae in Balloon-borne Ozonesonde Profiles: Application to the Long Term Record from Boulder, Colorado" *by* Kenneth Minschwaner et al.

Anonymous Referee #3

Received and published: 9 November 2018

Review submitted: 9 November 2018

General Comments:

This paper outlines a new approach to the identification of laminae in ozonesonde profiles using the long-term record of profiles from Boulder, Colorado. The authors note the sensitivity of their approach in the UT/LS region is greater than prior approaches. Much of the improvement results from the switch from using an absolute standard for partial pressure/concentration differences in ozone as a function of altitude to a percentage

Printer-friendly version

Discussion paper

change – the authors use a 10% criterion. Their result, therefore, is perhaps unsurprising – concentrations in the upper portions of troposphere below the tropopause tend to be lower, perhaps making meeting the absolute standard more difficult.

It would be useful for the authors to show a comparison of the prior approach(es) as applied to the Boulder data set to the current approach to better and more clearly identify the laminae. In the present version, the authors identify gravity wave (GW) and non-gravity wave (NGW) laminae. While the authors note the similarity in the frequency of NGW laminae to Rossby wave frequencies identified in prior papers, it would be useful to use those prior techniques to specify the Rossby wave frequency.

The new technique is applied to a single data set – Boulder. That midlatitude site is located fairly close to and just downwind of the Rocky Mountains. How well does the technique work in other locations? What constraints (if any) are there in application of this new approach? How would this technique do with laminae due to "notches" appearing due to SO2 interference (e.g., Morris et al., 2010, J. Atmos. Ocean. Tech.) in the cathode cell reactions of the ozonesonde?

The authors also note that negative laminae occurred more frequently than positive ones. What is the physical mechanism responsible for this difference in frequency? How does the detection of laminae relate to instrument response time and ascent rate? Given that the magnitudes of the laminae are critical to their detection, if ascent rates are too fast or response times too slow, how will that impact the detection of laminae?

Recommendation: The authors take a novel approach to identification of laminae in ozone profiles. The approach may well compliment past approaches that have been applied in prior papers. As you can see above (and in some detailed comments below), I have some additional detailed questions that the authors should answer before publication. That said, this paper will make a valuable contribution to the literature and should be published.

Specific Comments:

p. 2, line 11 – maybe add the L. Pan et al. (GRL, 2014) paper on stratospheric intrusions associated with convective events.

p. 3, line 4 – data are indeed gathered throughout the entire ∼3-hours of the flight (both ascent and descent), "...at 1-sec resolution during the flight with burst altitudes typically at or above 30 km."

p. 3, line 8 - 9 – "...descent phase of the sounding, descending data are rarely examined; mixing ratio profiles used here..."

p. 4, line 32 – I think Sparling did some work in scale-invariance as well... (e.g., Sparling et al., 2006, JGR).

p. 5, line 9 – "...false laminae..." It would be good to better define how you know they are false detections.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2018-884, 2018.

Printer-friendly version

Discussion paper