

Interactive comment on “Relative drifts and stability of satellite and ground-based stratospheric ozone profiles at NDACC lidar stations” by P. J. Nair et al.

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Received and published: 8 February 2012

General comments

This paper is a valuable addition to the literature comparing measurements of the vertical distribution of ozone. It compares ground-based measurements from the Network for the Detection of Atmospheric Composition Change (NDACC) with those from four types of satellite instrument. It shows, to me, surprisingly good agreement between the measurement types. Such common stability is important if small changes are to be observed over several changes, as is likely under the combined effect of ozone ‘recovery’ from the now-decreasing halogen levels and from the effects of climate change. It also

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shows that such conclusion can be drawn from the current NDACC stations and instruments. The methodology in this paper is sound and the results of wide importance.

I have a few concerns which should be addressed prior to publication. Most are specific. However I would also like to raise three more general ones. First, the statistical analysis presented here seems good to me, but is simple: trends are calculated from linear regression. I suggest that some degree of additional analysis is presented – for example, are there annual cycles in the differences? What about autocorrelation at different time-scales? It is OK to present simple statistics for the final analysis, but the authors do need to show that this is valid. As I said above, I am surprised how good the agreement seems to be.

Second, while most of the paper is clear and well written, Section 4 (Results and Discussion) is less so. I make a few suggestions below, but the authors should look carefully through this section to make sure that the points they want made are clear. Part of this is making the relevance of some comments clear; part is clarifying the text. It is worth doing.

Third, the authors should consider putting some of the information in the instrument descriptions into tables. This needs careful consideration of how viable it is, but if it can be done it would be helpful to the reader.

Specific comments

474, 18-21: This was recognised before them, so if Weatherhead and Anderson are used, make it an example.

475, 7-11 A short summary of the main results from Nair et al 2011 would be helpful.

476, 13 I would delete ‘self-calibrating’ here and leave it for section 2.4. It is probably worth pointing out in the summary that the lidars exhibit good stability against all other instruments.

476, 21 ‘..range-corrected...’

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477, 16 ‘... and 8 channels at TMF...’ (delete comma)

477, sxn 2.1 A comment on the effect of changes in the lidar setup on the quality and stability of the ozone records would be instructive.

478, sxn 2.2 Similarly for the ozonesondes.

478, sxn 2.2 Given the on-going revision in the ozonesonde records, the authors should state exactly which ozonesonde data sets they used.

478, 28 ‘... sensor solution were used for ozonesonde measurements from...’

481, 9 Should it not be 14 years? I.e. from Sept 1991 to November 2005. And write ‘year’.

482, 24/25 What is the sensitivity of the results to the spatial criteria used. What if either set of criteria had been used for all satellite overpasses?

486, sxn 3.2 See above – this is OK but needs some justification.

486, 18 ‘...these units, and ozone...’

487, 19-27 Some comments are needed on the quality of the Arletty temperature data and on any trends found in them. This description is not sufficient given the problems that temperature errors, particularly drifts, can cause.

491, 2-4 Not sure what this sentence means – makes better sense without the final 4 words but I am not sure if that is what is meant.

491, 6 ‘... for consistency, ...’

491, 7 ‘...series and the drift is derived..’

491, 10 ‘... used as the reference ...’

491, 20 ‘Aura MLS exhibits comparable drifts to those of SAGE II and HALOE even though it has...’

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492, 16 ‘They are similar to those...’

492, 18 I am not sure what the point of this reference to ‘certain altitudes’ is. What should the reader understand from this?

493, 2-11 Same here. Greater clarity needed. If what is written is correct, what is the message?

494, 4-14 I assume the point of this paragraph is to say that there are larger drifts between SAGE II and HALOE than between other instrument pairs, but that this needs to be interpreted in the light of the other comparisons, i.e. with other instruments effectively being used as transfer standards. If so, shorten the paragraph.

495, 9 ‘... drifts to the long-term...’

495, 9-11 ‘... a strong candidate for extending the observations of SAGE II and HALOE. Here we assess...’

496, 5-7 I understand this point numerically, but what should I believe is right?

498, 20-22 Too strong. This study provides strong evidence to show that Aura MLS could be used to extend the SAGE II and HALOE and for the combined record to be suitable for trend studies. However more work is needed. ...

498, 23 Is ‘satellite calibration’ really a goal for NDAACC? Personally, I do not think it should be, but at least double-check that it is before saying so!!

Figs 2&4 Use the layout for Fig 7, otherwise they are likely to be too small.

Fig 8, capt. ‘.. left panel), OHP...’ (no space)

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 471, 2012.

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