Atmos. Chem. Phys. Discuss., 9, S670–S672, 2009 www.atmos-chem-phys-discuss.net/9/S670/2009/ © Author(s) 2009. This work is distributed under the Creative Commons Attribute 3.0 License.



ACPD

9, S670–S672, 2009

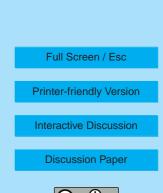
Interactive Comment

Interactive comment on "Variability and trends in stratospheric NO₂ in Antarctic summer, and implications for the Brewer-Dobson circulation" by P. A. Cook and H. K. Roscoe

Anonymous Referee #1

Received and published: 9 March 2009

The main purpose of this paper is to study the variability and trends in stratospheric reactive nitrogen with the aim to diagnose changes in the Brewer-Dobson circulation. The authors use mid-summer NO2 vertical columns obtained from zenith-sky measurements made at two Antarctic stations (Faraday 1990-95, Rothera 1996-2007) to study the trends in NO2 and NOy. They conclude that their technique, i.e. the atmospheric photochemical box model used together with their RT model and analysis routine are a useful method to analyse NO2 slant columns. They find that the NO2 and NOy columns have a large inter-annual variability with a broad maximum around 2000. The authors show that these changes are robust to a variety of alternative settings and conclude that this indicates a possible similar change in speed of the Brewer-Dobson



circulation with opposite sign (broad minimum around 2000).

General comments:

I am a bit torn about this paper for the following reasons: The authors provide a very thorough and detailed description of the method used to interpret their NO2 slant column measurements. This is certainly very informative but at the same time highly technical. The actual scientific interpretation and discussion - as promised in the title - only happens at the very end. However, the authors also write that there will be a follow-up paper presenting a "quantitative interpretation of their NO2 and NOy trends in terms of changes to the Brewer-Dobson circulation". My suggestion would be to either tighten the technical part and extend the discussion a) to include a proper trend analysis and not just a straight line fit, b) to then also include whatever else is planned for the "more quantitative version"; and c) reflect this appropriately in the title OR to stick with the paper pretty much as is but submit it to a more technically orientated journal such as AMT (Atmospheric Measurement Techniques) and then submit the follow-up paper to ACP.

IF the paper should stay with ACP, then I would strongly suggest that the authors provide a trend analysis (multi-linear regression) which apart from the linear trend includes e.g. QBO, ENSO, solar cycle and possibly a volcanic term. This would be much more convincing given the aim of the paper (implications for the Brewer-Dobson circulation) and the high inter-annual variability clearly displayed by the data set. Also, if the paper stays in ACP, I really would expect to see more emphasis on the discussion of the trends and implications for the Brewer-Dobson circulation.

Specific comments and suggestions:

1) Could you please provide a couple of lines (basic background) about the instrument that was used for the measurements and also the RT model.

2) Some of the figures are quite hard to read and I had to look at them on the screen

9, S670–S672, 2009

Interactive Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper



quite strongly enlarged; would be helpful if they could be edited for easier reading (e.g. at least enlarge axis title).

3) Figures 1a+c should have a second y-axis (e.g. on the right side of the figure) with the actual SZA values rather than using one axis with SZA/15.

4) Page 839, lines 6-9: "... demonstrating that further processes are involved". These "further processes" have been discussed in McLinden et al., and that should be mentioned here; please add the ref: McLinden, C.A., S.C. Olsen, M.J. Prather, and J.B. Liley, Understanding trends in stratospheric NOy and NO2. J. Geophys. Res. 106(D21): 27787-27793, 2001.

5) Page 840, line 11: should read something like that: "..., but the AMF also depends on the wavelength";

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 837, 2009.

ACPD

9, S670–S672, 2009

Interactive Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

