

***Interactive comment on* “Large decadal scale changes of polar ozone suggest solar influence” by B.-M. Sinnhuber et al.**

Anonymous Referee #2

Received and published: 16 December 2005

General comments

The paper addresses the important issue of solar influence on climate with the example of decadal scale variations of winter ozone in the middle stratosphere at the Arctic station Ny-Alesund and the two Antarctic stations Neumayer and South Pole. As a further proof SBUV data for a longer period of time and larger spatial coverage are presented. The authors suggest a mechanism by which energetic electron precipitation directly influences middle stratospheric ozone in winter. They further speculate that the link between early winter ozone and mid-winter EP flux could have an impact on climate. In general the paper contains interesting results. However, these need to be discussed in more detail and put onto a firmer ground before publication is recommended.

Specific comments

In the introduction very briefly changes in stratospheric ozone related to changes in solar UV radiation are mentioned. In the suite of the paper this is however no longer referred to and the indirect influence of 11-year solar UV variations are neither compared to the effect of EEPs nor discussed and presented in detail. I agree with reviewer 1 that this work needs to be adequately reported (e.g., Kodera and Kuroda, 2002; Gray et al., 2001) and compared to the proposed EEP mechanism. To do this, further work is required as already suggested by reviewer 1. A correlation with other more commonly used indices like F10.7, Ap, MgII etc should be presented as comparison to the proxy for the flux of energetic electrons.

Abstract The abstract only mentions decadal oscillations in Arctic ozone but in the paper also results from Antarctic stations are presented which are however not that clear. If the focus of the paper is on the northern hemisphere this should be then clarified throughout the manuscript. May be "Arctic" could be exchanged by "polar" like in the title.

Page (P) 12105, Line (L) 5: "Here we present long-term observations " The results from the three different stations cover only 14 years, i.e. only a little bit more than one solar cycle, this is not long-term for me. The question also arises how significant the results are for such a short period of time. Should be reformulated. The SBUV data cover a longer time frame but I still wouldn't call this long-term. Also in section 2 it should be mentioned for which years the observations are available, this is so far only seen in the first figure.

P12106L-9/-10: The comment on the QBO is interesting but not further investigated in the paper, so this should be said here.

P12107 L9/10: Why is the ozone anomaly for DJF shown together with the July-December average of the electron data. It is mentioned in the text that very similar results are obtained for different averaging periods. So why don't they use the same

Full Screen / Esc

Print Version

Interactive Discussion

Discussion Paper

period for both?

P12107L5-7: electron measurements do not provide a direct measure of electron precipitation but it is used anyway as proxy for the flux of energetic electrons. I wonder whether it would be more appropriate to use e.g. the Ap index.

Figure 3: What is the reason for removing 1990 and 1991 (it looks rather like 1991 and 1992!)? Obviously the line would go down if these points were included and would therefore not fit to the data from Ny-Alesund. The main conclusion that a positive correlation between ozone and the solar cycle exists would be destroyed, too.

P12110, Conclusion, first sentence: the large decadal scale variation is not shown for early winter but for DJF, so "early" should be removed. In general the conclusions are too short and leave many open questions. The results should be discussed here in more detail.

The paper addresses the dynamically active season. The summer as dynamically undisturbed time of the year might be even better to look for a clear solar signal.

Technical corrections

Figure1a: It would be useful to include percentage ozone variations on the right hand side y-axis. Figure captions Fig1b: units of the F10.7cm solar flux? Fig1c: " shown in panel (a) (red line) "

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 12103, 2005.

[Full Screen / Esc](#)[Print Version](#)[Interactive Discussion](#)[Discussion Paper](#)