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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "UV radiation below an Arctic vortex with severe ozone depletion" *by* B. M. Knudsen et al.

**Anonymous Referee #1**

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This manuscript discusses the effect of ozone depletion in the Arctic vortex on levels of UV irradiance during springtime, particularly April when the solar elevation is sufficient to provide appreciable UV. The effect of the vortex is modelled using ozone data as the only variable from year to year, for clear sky days. The model is validated by comparison with UV measurements made in Tromso, which give excellent agreement considering the uncertainty inherent in the measurements, and model input data. However, the manuscript somehow loses focus by presenting only clear sky data yet discussing it alongside cloud information from every year. The most interesting results - the relative effects of cloud and ozone at these latitudes, have not been addressed.

There are several points that need to be clarified:

Abstract and Introduction - both imply work with radiation on vertical surfaces, yet the calculations and measurements in the paper are both for horizontal surfaces. Clarify eg P4681 l3 clear sky UV fields of erythemal irradiance on a horizontal surface.

In addition, the manuscript does not make any comparison with summer levels in the body of the text. Remove summer levels and vertical surface comments from the abstract as they are misleading.

L21 - Put this in context - what difference would 7DU make to the UV?

P4682 l9 Definition of the UVI - the definition given is for the erythemally effective irradiance. The following sentence explains how this is then converted into a UVI - the two are not equivalent. Rewrite.

P4684 l21 There is a discussion about cloud that begins the results section, and figs 1, 2 and 5 both all indicate cloud cover. Please remind the reader that all UV data is calculated for clear sky conditions only. This is one suggestion for the place where this might be done. Were the calculations made for every day, regardless of cloud indications, for the reference years? Please clarify.

Figure 5 This can be misleading at first glance. Panels a,b,c might be taken to imply that cloud is as important as ozone in determining absolute levels of UV (as indeed it is). However, the UV values are all calculated for clear skies (ozone-only dependent) and the high absolute UV (the UVI) in 1996 is due to the southerly extension of the vortex. Once again the presentation (and discussion) of cloud data alongside clear sky model output is confusing. What would be most instructive is the absolute UV under the cloudier skies of 1982 and 1997 compared to the clearer 1996.

P4685 l11,17 Clarify at these points, and in the captions for figures 6 and 7, that the vortex moves and at any location only the days when the location was inside / outside the vortex are considered in the analysis. Otherwise one might expect fig 7 to cover only the white part of fig 6b.



**ACPD**

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Minor points: Fig 1 caption: squared should be squares Figs 2,4 It is not always easy to identify the black edge of the vortex as latitude and land lines are the same colour - could they be changed to white or some other hue? Fig 6 Both parts are labelled b.

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Interactive comment on Atmos. Chem. Phys. Discuss., 5, 4679, 2005.