

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

Anonymous Referee #2

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With some exceptions the manuscript is well written and the methods used are up to date. However, the findings are not very new. This is not well discussed and regarded in this manuscript. Most of the results are based on model results that confirm earlier findings, for which the references are missing (e.g. to be found in WMO ozone assessments). The new experimental results are sparse and they are not well related to the rest of the manuscript. The purpose of their presentation does not become clear for the reader: The UVSPEC model has been validated with more suitable spectroradiometric measurements and the validation has been extensively described in the scientific literature. If the purpose of the presentation is the introduction of this type of measurement, then more detail should be given on the experimental setup.

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The last statement of the abstract is not scientifically valid. The authors seem to assume that all dynamical changes are non-anthropogenic. This is not justified. On the contrary, climate changes are considered to cause changes in the dynamical behaviour of the atmosphere. This may also be the case for the occurrence of ozone mini-holes. It is therefore strongly suggested to remove the last statement of the abstract.

Introduction: The authors state: “The worst effect of ozone depletion is arguably to be below a severely depleted vortex during springtime, where substantially elevated levels of UV radiation are expected. This can happen in Antarctica and southern parts of South America (Pazmiño et al., 2004) and in the Northern Hemisphere (NH) north of about 50° N.”. This statement is very questionable, both with respect to the biological impact (which might be higher for lower *sza*) and with respect to atmospheric sciences (why should there be a limit at 50° N?). It is suggested to remove these statements or give references.

Page 4681, first line: the argumentation concerning the eye is misleading. For the eye the radiance from certain directions is the relevant quantity, not the irradiance on a vertical plane. Furthermore vertical planes are not used any more in the following.

Page 4681, line 4: there is a newer reference for UVSPEC available with Kylling as a coauthor

Page 4681, line 11: the albedo can be increased up to 100%, not only 95%

Page 4682, line 14: why should the UV with *sza* greater than 75 be harmless? There is no known biological lower limit, and such radiation might still be relevant at high latitudes.

Page 4682, line 27: there is no reason given why an albedo of 36–44% was used. Actually it might be too low in the UV, which might also be one of the causes for the small discrepancy of 6% between measurement and model results.

Page 4686, line 2: the finding that UV is increased in the Arctic is not new. Please give

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references (e.g. as summerized in EC reviews or WMO ozone assessment).

Page 4686, line 5: the impact on mid-latitudes is not a theory, but has been observed already. The results are published, e.g. in Seckmeyer et al.: New Maximum UV Irradiance Levels Observed in Central Europe, Atmospheric Environment, 1997.

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