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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Solar irradiance at the Earth's surface: long-term behavior observed at the South Pole" *by* J. E. Frederick and A. L. Hodge

Anonymous Referee #2

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General remarks

Measurements of solar irradiances in the UV-A and visible spectral range performed at the South Pole over a period of 17 years are analysed and interpreted with respect to cloud effects and possible links to the solar cycle. Finally the investigation opens out into an interesting but still unanswered scientific question. The paper is clearly structured and well written disclosing a comprehensible train of thoughts. I recommend publication after taking into account the following minor aspects.

Minor comments:

Page 2, section 2: Despite an existing reference a short description characterizing the radiative transfer model would be helpful for the reader.

Page 6, section 3: The theoretical analysis to explain the effects of irradiances exceeding the clear sky case is based on a 1-D assumption. A priori, and as the authors know, the interaction of real cloud field structures with radiation means a 3-D problem and related effects depend on the specific macroscopical cloud structures (vertical extension, diameter, coverage etc.), as well as on solar zenith angle and viewing angle. Furthermore, the microphyisical composition, especially whether a cloud is composed of ice crystals or water droplets, affects the scattering behaviour. The 1-D assumption underlying the analysis seem to be appropriate here. But, and apart from snow cover at the surface, to which extent it is actually the cloud type typically forming at the South Pole that substantiates the 1-D approach? A few sentences relating theoretical analysis and antarctic meteorological conditions for the formation of cloud types that justify a 1-D treatment would make the statements in section 3 even more conclusive.

Figure 1 and Figure 2: The y-axis label should be 'Irradiance / Wm-2'. Indications like 'Measured', 'Computed', and '320-340 nm' are already mentioned in the caption, nevertheless, to allow a better discrimination of the figures at first view I recommend to place them directly in the figure.

Figures, 3, 4, 7, 8, 9, 10: As in Figures 5 and 6 the y-axis label should be 'Irradiance ratio', the indication of the wavelength interval could also be placed within the figure.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 25871, 2010.