Atmospheric Chemistry and Physics
An Interactive Open Access Journal of the European Geosciences Union

Atmos. Chem. Phys., 8, 4799-4810, 2008
www.atmos-chem-phys.net/8/4799/2008/

Comparison of UV irradiance measurements at Summit, Greenland; Barrow, Alaska; and South Pole, Antarctica

G. Bernhard, C. R. Booth, and J. C. Ehramjian
Biospherical Instruments, San Diego, USA

Abstract. An SUV-150B spectroradiometer for measuring solar ultraviolet (UV) irradiance was installed at Summit, Greenland, in August 2004. Here we compare the initial data from this new location with similar measurements from Barrow, Alaska, and South Pole. Measurements of irradiance at 345 nm performed at equivalent solar zenith angles (SZAs) are almost identical at Summit and South Pole. The good agreement can be explained with the similar location of the two sites on high-altitude ice caps with high surface albedo. Clouds attenuate irradiance at 345 nm at both sites by less than 6% on average, but can reduce irradiance at Barrow by more than 75%. Clear-sky measurements at Barrow are smaller than at Summit by 14% in spring and 36% in summer, mostly due to differences in surface albedo and altitude. Comparisons with model calculations indicate that aerosols can reduce clear-sky irradiance at Summit by 4–6%; aerosol influence is largest in April. Differences in total ozone at the three sites have a large influence on the UV Index. At South Pole, the UV Index is on average 20–80% larger during the ozone hole period than between January and March. At Summit, total ozone peaks in April and UV Indices in spring are on average 10–25% smaller than in the summer. Maximum UV Indices ever observed at Summit, Barrow, and South Pole are 6.7, 5.0, and 4.0, respectively. The larger value at Summit is due to the site's lower latitude. For comparable SZAs, average UV Indices measured during October and November at South Pole are 1.9–2.4 times larger than measurements during March and April at Summit. Average UV Indices at Summit are over 50% greater than at Barrow because of the larger cloud influence at Barrow.

Final Revised Paper (PDF, 2594 KB) Discussion Paper (ACPD)

Citation: Bernhard, G., Booth, C. R., and Ehramjian, J. C.: Comparison of UV irradiance measurements at Summit, Greenland; Barrow, Alaska; and South Pole, Antarctica, Atmos. Chem. Phys., 8, 4799-4810, 2008. Bibtex EndNote Reference Manager