Comparison of UV Climates at Summit, Greenland; Barrow, Alaska; and South Pole Station, Antarctica

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Spectroradiometric measurements of solar ultraviolet (UV) irradiance at Summit, Greenland; Barrow, Alaska; and South Pole are compared. 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 have little impact at both sites, 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 345 nm 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 and South Pole are 6.7 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.

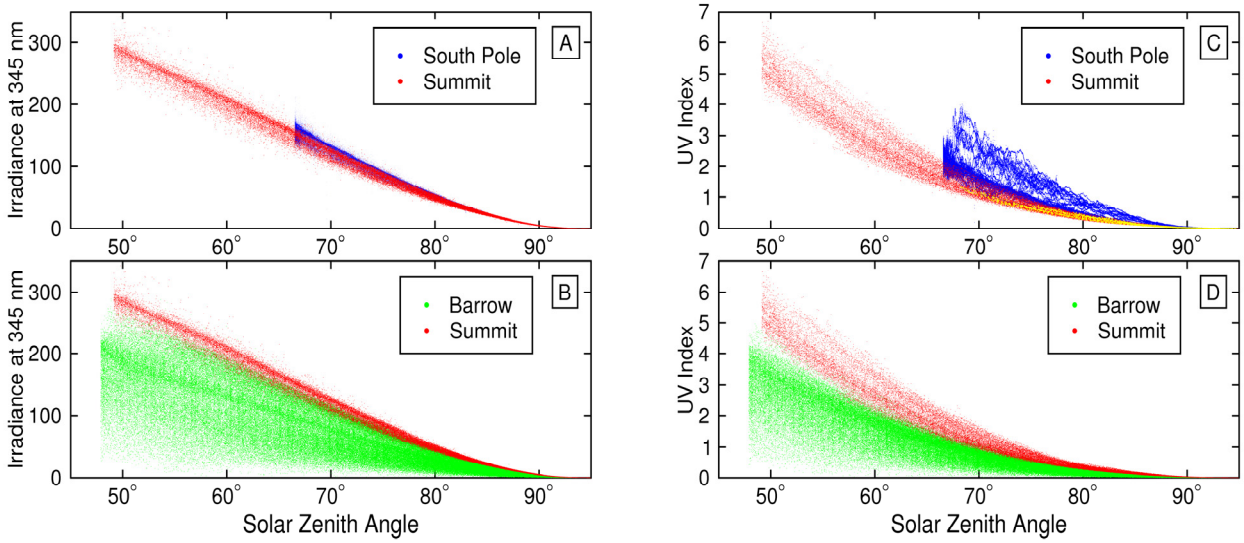

Figure 1. **Panel A:** Measurements of irradiance at 345 nm at South Pole and Summit in units of μW/cm^2. The slightly larger values at South Pole for equivalent SZAs are mostly due to the difference in Sun-Earth distance, with the Sun closer to the Earth during the austral summer. **Panel B:** Measurements of irradiance at 345 nm at Barrow and Summit. The region with the largest point-density in Barrow data is made up by clear-sky measurements during summer when albedo at Barrow is small. **Panel C:** UV Index at South Pole and Summit. Data from the South Pole fall into two groups: larger values than at Summit are measured in the austral spring (September – November) when the ozone hole greatly increases the UV Index at the South Pole. UV Indices measured between mid-December and March at the South Pole are similar to maximum UV Indices measured at Summit for equivalent SZAs at the two sites. **Panel D:** UV Index at Barrow and Summit.