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Re-evaluation of the 1950–1962 total ozone record from Longyearbyen, Svalbard

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Abstract. The historical total ozone measurements taken with Dobson Spectrophotometer #8 at Longyearbyen (78.2° N, 15.6° E), Svalbard, Norway, in the period 1950–1962 have been re-analyzed and homogenized based on the original measurement logs, using present-day procedures. In lack of sufficient calibration information, an empirical quality assessment was performed, based on a climatological comparison with ozone measurements in Tromsø, using TOMS data at both sites in the period 1979–2001, and ground-based Dobson data in the period 1950–1962. The assessment revealed that the C wavelength pair direct-sun (DS) measurements are most trustworthy (and most frequent), while the WMO standard reference mode AD direct-sun has a systematic bias. Zenith-blue (ZB) measurements at solar zenith angles (SZA) <78° were adjusted to DS data using different empirical functions before and after 1957 (the start of the International Geophysical Year). ZB measurements at larger SZAs were homogenized by means of a normalization function derived from days with measurements over a wide range of SZAs. Zenith-cloudy measurements, which are particularly frequent during the summer months, were homogenized by applying correction factors depending on the cloud type (high thin clouds and medium to low thick clouds). The combination of all measurements yields a total of 4685 single values, covering 1637 days from September 1950 to September 1962; moon measurements during the polar night add another 137 daily means. The re-evaluated data show a convincing consistence with measurements since 1979 (TOMS, SAOZ, Dobson) as well as with the 1957–1962 data stored at the World Ozone and UV Data Centre (WOUDC).

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