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The Intercomparison of Brewer and Dobson Spectrophotometers Total Ozone Measurements at the Marambio Base, Antarctica

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There are various ways to measure the amount of total ozone, one of which is the use of spectrophotometers. At the Marambio Base located in the Antarctic Peninsula region, total ozone is measured by two collocated instruments: a Brewer spectrophotometer, which is operated by the Czech Hydrometeorological Institute, and a Dobson spectrophotometer, which is operated by the National Meteorological Service of Argentina. The Brewer spectrophotometer was installed in February 2010, while the Dobson spectrophotometer is in operation since 1987. In the period between August and April, both instruments make several total ozone observations every day. The mean daily total ozone data collected by these instruments in the period between January 2011 and December 2013 were compared and assessed in relation to the mean daily amount of total ozone and the number and standard deviation of its measurements, solar zenith angle, and the type of total ozone measurement (direct sun, zenith cloud). The relationships were approximated using linear regression models and the statistical significance of differences between the groups of measurements was tested by ANOVA. The Brewer spectrophotometer total ozone observations were in average 1 % higher than the Dobson spectrophotometer measurements; the ratio of the Brewer and Dobson total ozone measurements and its variability however changed significantly based on the total ozone measurement type. The number of total ozone observations per day significantly affected the variability of the ratio between the Brewer and Dobson measurements. Selected days with a high difference between Brewer and Dobson total ozone measurements were then studied in more detail regarding not only the number and standard deviation of total ozone observations, but also the particular total ozone situation over the Antarctic Peninsula.