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Indicators of Antarctic ozone depletion

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Abstract. An assimilated data base of total column ozone measurements from satellites has been used to generate a set of indicators describing attributes of the Antarctic ozone hole for the period 1979 to 2003, including (i) daily measures of the area over Antarctica where ozone levels are below 150 DU, below 220 DU, more than 30% below 1979 to 1981 norms, and more than 50% below 1979 to 1981 norms, (ii) the date of disappearance of 150 DU ozone values, 220 DU ozone values, values 30% below 1979 to 1981 norms, and values 50% below 1979 to 1981 norms, for each year, (iii) daily minimum total column ozone values over Antarctica, and (iv) daily values of the ozone mass deficit based on a O_3<220 DU threshold. The assimilated data base combines satellite-based ozone measurements from 4 Total Ozone Mapping Spectrometer (TOMS) instruments, 3 different retrievals from the Global Ozone Monitoring Experiment (GOME), and data from 4 Solar Backscatter Ultra-Violet (SBUV) instruments. Comparisons with the global ground-based Dobson spectrophotometer network are used to remove offsets and drifts between the different data sets to produce a global homogeneous data set that combines the advantages of good spatial coverage of satellite data with good long-term stability of ground-based measurements. One potential use of the derived indices is detection of the expected recovery of the Antarctic ozone hole. The suitability of the derived indicators to this task is discussed in the context of their variability and their susceptibility to saturation effects which makes them less responsive to decreasing stratospheric halogen loading. It is also shown that if the corrections required to match recent Earth Probe TOMS measurements to Dobson measurements are not applied, some of the indictors are affected so as to obscure detection of the recovery of the Antarctic ozone hole.

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