



Early signatures of ozone trend reversal over the Antarctic

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We report on a detailed time series analysis of long total column ozone (TO) records based on multi-satellite observations of daily resolution. We concentrate on three geographic latitudes over and around the Antarctic area, specifically on three circles at 58.5°S, 59.5°S, and 79.5°S. Almost continuous observations are available at the two former latitudes, however data are missing during the polar winter periods at 79.5°S, because the measurement technique requires sunlight. The methodology is motivated by level crossing statistics, where subsets of the records above or below particular threshold levels are evaluated. Long term trend reversal at around the turn of the century is detectable for low TO levels already in the raw time series in the “ozone hole” region (79.5°S). In order to overcome the apparent non-stationarities of the time series, we determined daily TO differences (Δ TO) belonging to the same geographic longitudes between the different latitudinal circles. The result is a stable, stationary behavior for small (absolute) Δ TO values in the period January-February-March without any significant detectable trends. The high absolute value Δ TO subsets (September-October-November) indicate a robust trend reversal already in the middle of nineteen-nineties. The observed trend reversal in the total column ozone time series is consistent with the temporal development of the stratospheric halogen loading. However, a close correspondence of ozone and halogen turn-around years is not expected because of the statistical uncertainties in the determination of the ozone turn-around, and the many contributing factors to ozone depletion processes.