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Variability of the total ozone trend over Europe for the period 1950–2004 derived from reconstructed data

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Abstract. The total ozone data over Europe are available for only few ground-based stations in the pre-satellite era disallowing examination of the spatial trend variability over the whole continent. A need of having gridded ozone data for a trend analysis and input to radiative transfer models stimulated a reconstruction of the daily ozone values since January 1950. Description of the reconstruction model and its validation were a subject of our previous paper. The data base used was built within the objectives of the COST action 726 "Long-term changes and climatology of UV radiation over Europe". Here we focus on trend analyses. The long-term variability of total ozone is discussed using results of a flexible trend model applied to the reconstructed total ozone data for the period 1950–2004. The trend pattern, which comprises both anthropogenic and "natural" component, is not a priori assumed but it comes from a smooth curve fit to the zonal monthly means and monthly grid values. The ozone long-term changes are calculated separately for cold (October–next year April) and warm (May–September) seasons. The confidence intervals for the estimated ozone changes are derived by the block bootstrapping. The statistically significant negative trends are found almost over the whole Europe only in the period 1985–1994. Negative trends up to -3% per decade appeared over small areas in earlier periods when the anthropogenic forcing on the ozone layer was weak. The statistically positive trends are found only during warm seasons 1995–2004 over Svalbard archipelago. The reduction of ozone level in 2004 relative to that before the satellite era is not dramatic, i.e., up to -5% and -3.5% in the cold and warm subperiod, respectively. Present ozone level is still depleted over many popular resorts in southern Europe and northern Africa. For high latitude regions the trend overturning could be inferred in last decade (1995–2004) as the ozone depleted areas are not found there in 2004 in spite of substantial ozone depletion in the period 1985–1994.

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