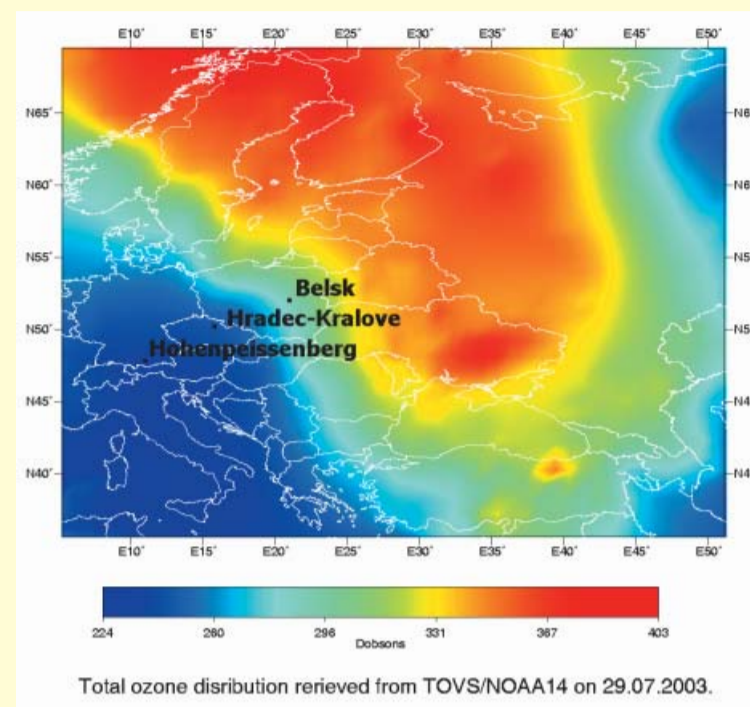


ABSTRACT

Total ozone amount has been operationally derived from NOAA/TOVS data in Satellite Research Department of Institute of Meteorology and Water Management since 1993, and has been daily calculated for the area covering Central Europe. Such a relatively long series is unusually valuable for the trend analysis. However, such an application requires a series to be fully homogenous and of good quality. Meanwhile, during 13 year period of the ozone retrieval from satellite data, both software and instruments have been changed several times. Simultaneously, there are some gaps in series caused by the lack of satellite data.

The total ozone amount series is presented as well as the steps undertaken for its homogenization. The analysis was performed for monthly mean values using the ground total ozone measurements from Belsk, Hradec-Kralove, Hohenpeissenberg. The well known in climatology Standard Normal Homogeneity Test (SNHT) by Alexandersson was applied. The obtained results are presented and discussed.



DATA

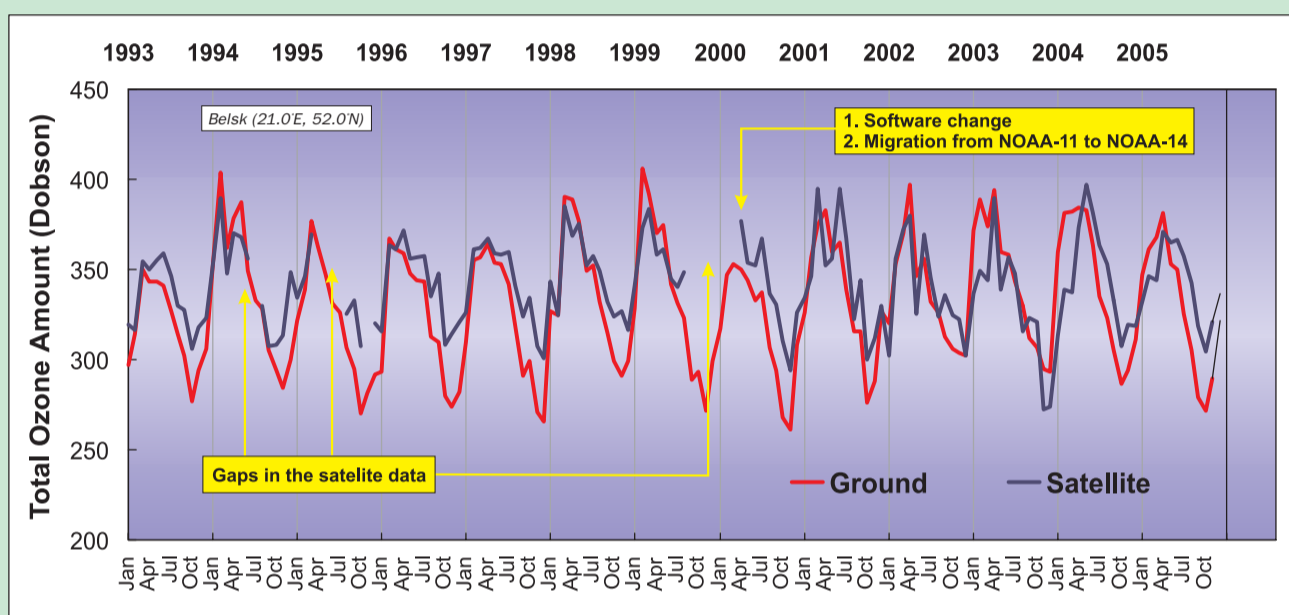
Analysis was performed for monthly mean values of the total ozone amount for the period 1993-2005.

Total ozone amount derived from NOAA/TOVS satellite data with the use of the following algorithms:

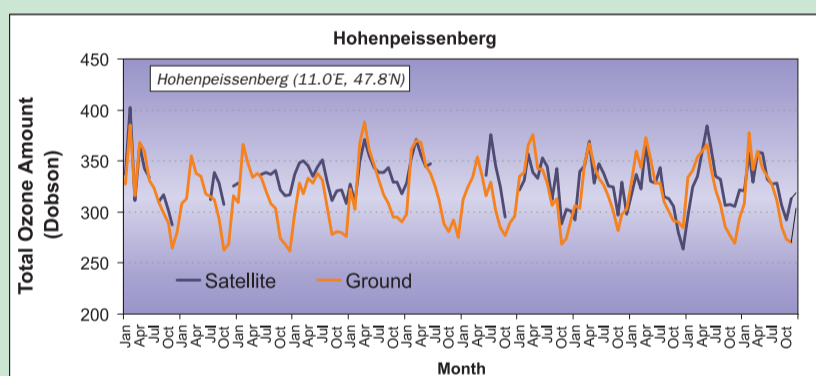
- 1993-1999 an iterative scheme based on the physical model; the first guess ozone profile is obtained from the correlation between ozone concentration and the brightness temperatures observed in HIRS carbon dioxide channels. Calculations for 3x3 individual HIRS field of view.
- 2000-2006 PC-TOVS software package based on the ITPP from Wisconsin University; the first guess ozone profile from TIGR database. Calculations for 3x3 individual HIRS field of view.

Ground total ozone measurements for three stations (Belsk, Hradec-Kralove and Hohenpeissenberg) made with Dobson spectroradiometer originated from WMO World Ozone and Ultraviolet Data Centre.

COMPARISON WITH GROUND DATA

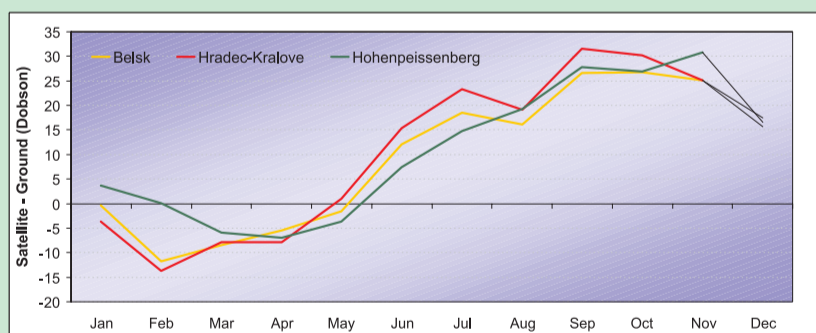


Monthly mean total ozone amount derived from NOAA/TOVS data (orange line) and measured by Dobson spectroradiometer (dark blue line) for the 1993-2005 period

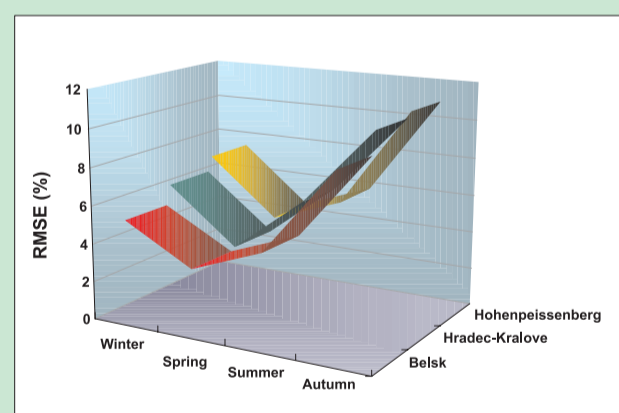


	Belsk	Hradec-Kralove	Hohenpeissenberg
Mean difference	9.4 D	11.8 D	11.6 D
Mean square difference	18.7 D	23.0 D	22.8 D
Standard deviation for difference	20.2 D	19.8 D	19.7 D
Correlation coefficient	0.83	0.8	0.78
RMSE	5.7 %	7.4 %	7.2 %

Results of the comparative analysis for the both total ozone data sources at the selected stations (1993-2005) (difference means satellite - ground)



Annual course of monthly mean difference between 'satellite' and 'ground' total ozone calculated for selected stations and for the 1993-2005 period



HOMOGENEITY TEST

The SNHT test was applied to the series of ozone data separately for each month. Ground measurements were used as a reference data. The figures illustrate the SNHT test values for chosen months. The inhomogeneity in the series is marked by the test values higher than the limit T_i value.



SNHT values for 'satellite' total ozone series for Belsk vs ground measurements for **August**



SNHT values for 'satellite' total ozone series for Belsk vs ground measurements for **April**



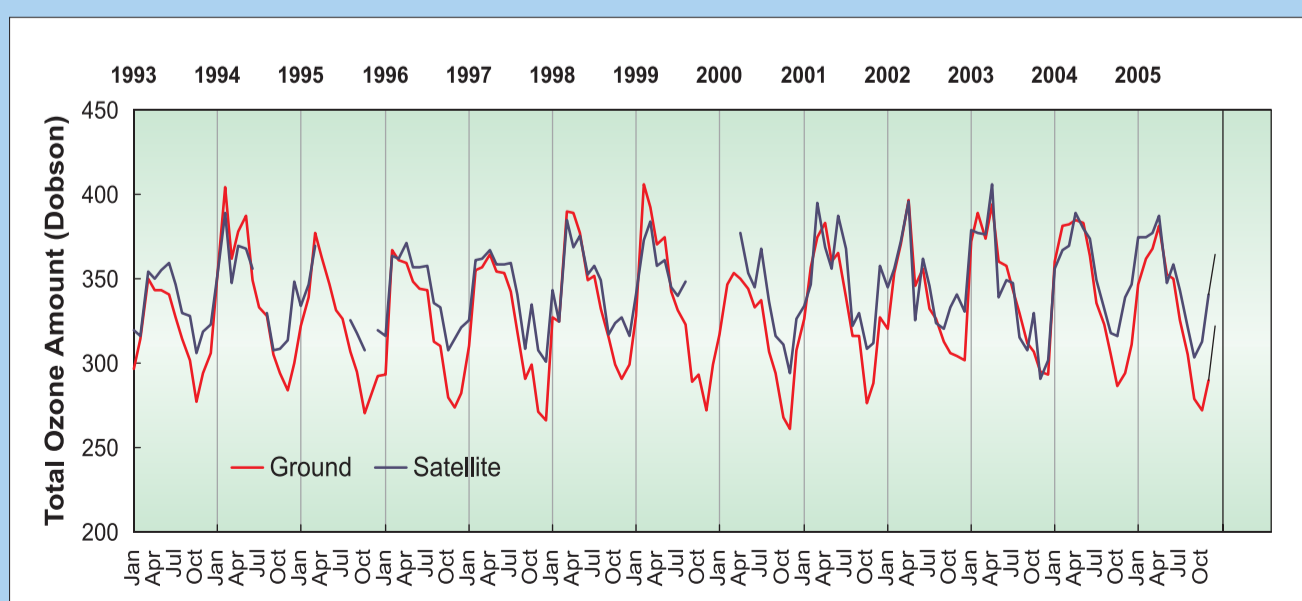
SNHT values for 'satellite' total ozone series for Belsk vs ground measurements for **December**



SNHT values for 'satellite' total ozone series for Belsk vs ground measurements for **December** after adjustment

CONCLUSIONS

- The total ozone amount derived from NOAA/TOVS satellite data tends to be overestimated.
- Strong seasonal variability in quality of the total ozone amount derived from NOAA/TOVS data has been observed, therefore, the analysis of homogeneity was performed for each month separately.
- Standard Normal Homogeneity Test that is widely used in homogeneity testing of the climatological series also proved to be very useful in analysis of the satellite derived total ozone series.
- For all selected stations, the inhomogeneity of the satellite derived total ozone series was found for most of the autumn and winter months in the years 2002 - 2003. It may be caused by the change in satellite pass (noon NOAA-11 to morning NOAA-14) and the processing algorithm that occurred in that time.
- As a result of adjusting procedure, the homogeneous 'satellite-derived' total ozone series was obtained, however, big gaps in data in 1995 and 1999-2000 lessened the climatological value of the series.



ACKNOWLEDGMENTS

The work was partly funded by grant of the Polish Ministry of Science SPUB-M 618/E-217/SPB/COST/KN/DWM 50/2005-2006 and Polish Chief Inspectorate for Environmental Protection.

Ground total ozone data (monthly means) originated from WMO World Ozone and Ultraviolet Data Centre.

The homogeneity analysis was performed with the usage of the freeware version of the AnClim software (Stepanek, P. (2006): AnClim - software for time series analysis. Dept. of Geography, Fac. of Natural Sciences, MU, Brno.)