



Long term ground based total ozone observations for Oslo and Andøya compared to satellite data

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Objectives of the project: Improve the national monitoring of the ozone layer and the UV radiation by applying Earth Observation data

- Ground based total ozone observations from Oslo for the period 1979-2007 and Andøya for the period 1994-2007 are compared to various column ozone satellite products
- Assessment and analyses are done and trend analysis for both sites will be performed employing satellite data. The results will be compared to the trends based on the ground based data.
- First results of the project is presented here

Acknowledgments

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Ground based ozone observations in Oslo and at Andøya

The Norwegian national monitoring programme of ozone currently includes 2 sites; Oslo (60°N, 11°E) and Andøya (69°N, 16°E) with Brewer total ozone observations. At Andøya there is also an ozone lidar providing measurements of the ozone concentration at altitudes from ~8 km to ~50 km on days with clear sky (<http://alomar.rocketrange.no/alomar-lidar.html>).

The Brewer instrument at the roof of the Physic Dep. University of Oslo has been in operation since the summer of 1990. For the period 1979 to 1998 total ozone data from a Dobson spectrophotometer are available (Svendby and Dahlback, 2002). For Andøya there are total ozone observations from the Brewer instrument for the period 1994–2007.

Daily comparisons of ground based ozone observations and satellite overpass data for the year 2005 and 2007

The years 2005 and 2007 represent two different ozone situations in the Arctic and sub-Arctic region. In 2005 low ozone values were observed during spring due to ozone depletion as a result of very low stratospheric temperatures, while the ozone levels in 2007 was only slightly below long term mean values.

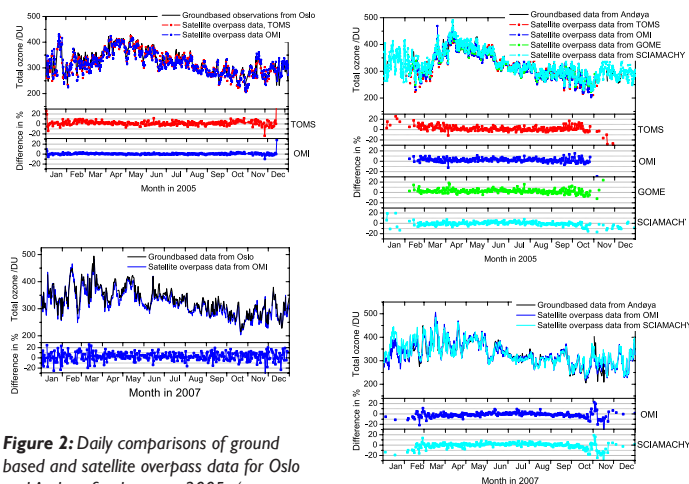


Figure 2: Daily comparisons of ground based and satellite overpass data for Oslo and Andøya for the years 2005 (upper panels) and 2007 (lower panels).

	TOMS		OMI		GOME		SCIAMACHY	
	Ave. %	St.dev	Ave. %	St.dev	Ave. %	St.dev	Ave. %	St.dev
Oslo, 2005	1.72	4.30	0.53	1.47				
Oslo, 2007			2.81	8.65				
ALOMAR, 2005	2.41	9.64			2.51	8.66	-0.67	4.21
ALOMAR, 2007			-1.63	8.65			-0.69	6.53

Table 1: Summary of the annual average deviations of daily overpass satellite data from the daily ground based observations

Satellite data used in the study

In this study we have used overpass data mainly provided through the PROMOTE ozone service (<http://www.gse-promote.org>) and NASA Ozone Maps and Data (http://toms.gsfc.nasa.gov/ozone/ozone_v8.html) but data from TEMIS (<http://www.temis.nl/protocols/O3total.html>) are also used. The monthly mean data used are mainly provided through PROMOTE site. The figures below give an overview of the available overpass data and the time periods and instruments.

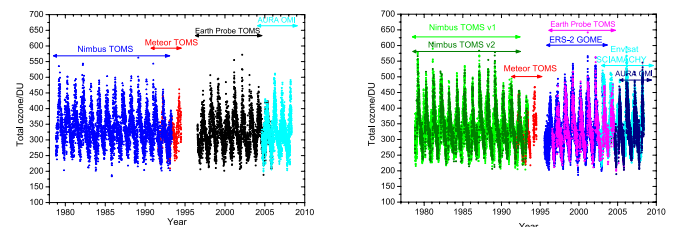


Figure 1: Overpass data for Oslo (to the left) and Andøya (to the right) for the whole period with available satellite data of ozone.

Comparison of monthly mean ozone observations

We have compared the monthly mean ozone values calculated from the ground based data with the monthly mean ozone data for the grid with highest overlap with the ground based sites. The figures below show the deviations of the available satellite ozone data from the ground based monthly mean ozone values for all years.

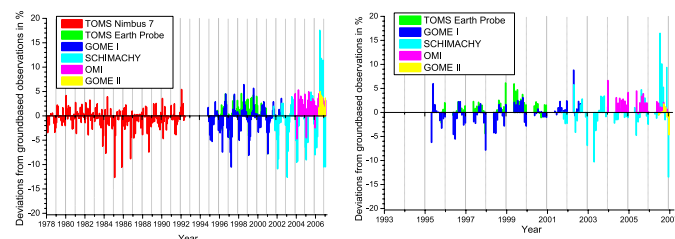


Figure 3: Differences between the ground based monthly mean ozone observations from Oslo and Andøya and the monthly mean ozone data from the available satellite products. Oslo is shown to the left, and Andøya to the right.

References

- Svendby, T.M. and Dahlback, A. (2002) Twenty years of revised Dobson total ozone measurements in Oslo, Norway. *J. Geophys. Res.*, 107D, 4369, doi: 10.1029/2002JD002260.
- Lund Myhre, C.L., et al. Monitoring of the atmospheric ozone layer and natural ultraviolet radiation. Annual report 2007 (in press). Available in pdf-format from NILU: www.nilu.no