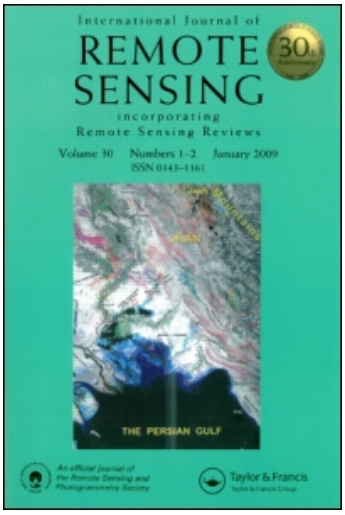

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Technical note: Validation of ENVISAT (SCIAMACHY) versus Dobson and TOMS atmospheric ozone measurements in Athens, Greece: Input for the upcoming IPY campaign

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Technical note

Validation of ENVISAT (SCIAMACHY) versus Dobson and TOMS atmospheric ozone measurements in Athens, Greece: Input for the upcoming IPY campaign

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The intercomparison of the daily column ozone observations obtained by the SCanning Imaging Absorption SpectroMeter for Atmospheric CHartographY (SCIAMACHY), the Total Ozone Mapping Spectrometer (TOMS), and Dobson spectrophotometer over Athens, Greece, during 2002–2006 is attempted here. The results presented will be employed for the validation of the SCIAMACHY instrument, which is flown on the European Space Agency's Environmental satellite (ENVISAT) and provides its daily column ozone observations to the International Polar Year 2007–2008 activity, since 1 March 2007.

1. Introduction

Nowadays, there is a consensus in the scientific community that the anthropogenic activities are resulting in an increase in tropospheric ozone (e.g. Cartalis and Varotsos 1994, Jacovides *et al.* 1994, Kondratyev and Varotsos 2001a, b, Varotsos *et al.* 2001) and a decrease in the stratospheric ozone (e.g. Varotsos *et al.* 2000). In particular, the stratospheric ozone depletion is considered as one of the strongest anthropogenic signals in the Earth system. Nearly two decades after the signing of the Montreal Protocol, stratospheric ozone loss is as severe as ever over the Arctic, and the timing of ozone recovery is uncertain. In this context, the 'Ozone layer and UV radiation in a changing climate' (ORACLE-O3) project running during the International Polar Year (IPY) 2007–2008 implies quantification of polar ozone losses in both hemispheres by employing ground-based and satellite observations.

The aim of the present technical note is to present the preliminary results from the intercomparison of the column ozone observations over Athens that were derived from ground-based and satellite-borne instrumentation just before the the International Polar Year 2007–2008 activity (see Cracknell and Varotsos, 2007).

2. Data and analysis

The first set of column ozone data used in this study is deduced from the clear-sky observations of the Dobson spectrophotometer No. 118 installed in Athens on the

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University campus. The second data set consists of observations made by the SCanning Imaging Absorption SpectroMeter for Atmospheric CHartographY (SCIAMACHY), which is an instrument on board the European Space Agency's ENVIronmental SATellite (ENVISAT). The third data set comprises the column ozone observations obtained by the Earth Probe TOMS (Total Ozone Mapping Spectrometer), along with the Ozone Monitoring Instrument (OMI) onboard AURA.

The data used in this intercomparison were the Dobson observations obtained under clear-sky conditions at local noon at the dates when the overpasses of satellites were within 100 km from the Athens station.

3. Results and discussion

Figure 1 shows the daily column ozone observations above the area of greater Athens, as deduced from the satellite-borne (SCIAMACHY, TOMS) and ground-based instrumentation (Dobson) during October 2002 to September 2006. In an attempt to validate statistically the above comparison between ground-based and satellite total ozone data, Spearman's and Wilcoxon's tests were employed. The application of the Spearman's test to the SCIAMACHY and Dobson observations reveals that the correlation coefficient between these data sets is 0.91 (at the 95% confidence level), while between the observations of SCIAMACHY and TOMS, the correlation coefficient is 0.93 (at the 95% confidence level). To investigate the deviations between the column ozone observations obtained by the different observing instruments, Wilcoxon's test was applied. The latter revealed that SCIAMACHY underestimates the column ozone with respect to Dobson by 23.4 DU, while TOMS exhibits an overestimation with respect to SCIAMACHY by 20.3 DU. In other words, at the beginning of the *International Polar Year* 2007–2008 campaign, the percentage difference for the column ozone observations obtained by Dobson, SCIAMACHY, and TOMS over Athens is of the order of 6%.

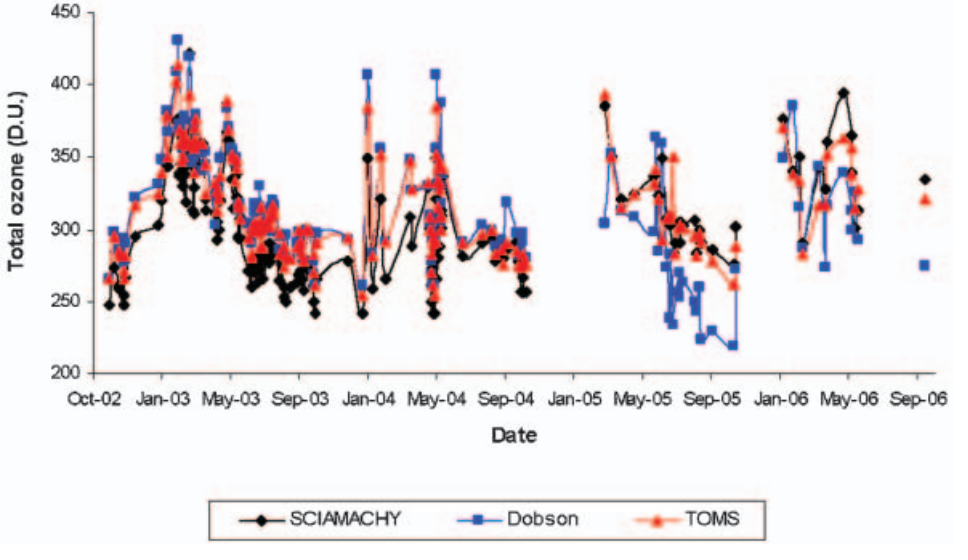

Figure 1. Intercomparison of column ozone observations performed by satellite-borne and ground-based instrumentation in Athens, Greece (2002–2006).

4. Conclusion

The aforesaid discussion reveals that the column ozone observations derived from the Dobson instrument in Athens compare well with the corresponding observations made by the satellite-borne instruments SCIAMACHY and TOMS. Therefore, in the frame of the *International Polar Year* 2007–2008, the Athens Dobson station may be used as a ground-data station for the ENVISAT column ozone observations.

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