# SYSTEMATIC COMPARISON BETWEEN THE GROUND BASED AUTOMATED DOBSON OF THE OBSERVATORY OF HAUTE-PROVENCE AND TOMS SINCE 1983

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## ABSTRACT

The total ozone quantity has been obtained since September 1983 at O.H.P. using the conventional AD wavelength technique. An average of 180 measurements per year is obtained with the Dobson n°85. Each of these daily total quantity is in fact an average of at least 5 measurements. The preliminary comparison with TOMS data show good agreement. We discuss systematic daily and monthly comparisons.

## INTRODUCTION

The Dobson instrument based at Observatory of Haute-Provence was automated in 1983. It is considered to be very accurate, as confirmed by all the intercalibrations. It is then interesting to compare its results with those of the TOMS aboard Nimbus 7 up to 1992.

## RESULTS

1. In order to have the most accurate results, we keep only AD direct sun measurements. For the same reason, only days with at least 5 measurements are compared with TOMS values.

In figure 1 the two sets of data for monthly mean total ozone are compared. A global agreement is easily observed. As an example the low observed value for february 1990 is obviously obtained by both instruments.

For further details we have undertaken a systematic daily and monthly comparison. We restrict our figures, examples and remarks to the year 1989, but all the comments are the same for other years.

In figure 2 monthly mean total ozone values for 1989 are plotted. The agreement is good for nine months, with a systematic discrepancy of -3 to -4% by TOMS due to the different cross-section values used for the two instruments. For other months differences can also be explained : for April, due to local weather conditions, only one measurements (in perfect agreement) is obtained by the Dobson between the first and 14th ; all the TOMS value during this period are lower than the monthly average. This explains the lower average for TOMS. In February the same explanation holds but in the opposite direction : values of TOMS without Dobson observations from the 16th to the 28th are higher than monthly average.

Daily values are plotted in figure 3. In figure 4 we have plotted the daily differences expressed as a percentage. The same global comments can be applied as mentionned above. If we take as an example the March values, we note a significantly larger value for the Dobson than for TOMS values on the 8th. The explanation is as follows :

TOMS has performed its measurements giving 367 Dobson units at 10H22. The Dobson instrument began 15 measurements (389 D.U. at 11H10 up to 402 D.U. at 12H53), followed by 7 measurements between 14H00 (432 D.U.) up to 11H23 (435 D.U.). Thus, it is shown that the extrapolation from Dobson values should give about the same total ozone (amount) as the TOMS at 10H22.

For a few days, for which differences are significant, we do not have specific explanations : for example, on March 13th, TOMS gave 374 D.U. at 10H50 and 25 measurements by Dobson showed no real diurnal variation : 20 measures from 10H20 (349 D.U.) up to 13H00 (355 D.U.) and 4 measures of 339 D.U. from 16H00 to 16H30. We note that on this day the sky was slightly hazy. For that reason, we are continuing this detailed comparison to look at possible problems in retrieval by TOMS when the sky is cloudy.

2. Relation with local meteorological conditions. Before comparing the results with satellite data, we note a quasi systematic correlation between large variations of total ozone and a strong local winds (Mistral). Because, this wind is tropospheric, it is interesting to consider the stratospheric dynamics, in order to explain these big variations. For example, on the February 25th 1988, the stratospheric wind trajectories obtained from french meteorology and european center for medium range weather forecasts clearly show north air masses arrivals coming from higher latitude. These air masses have a high ozone content. Figure 5 shows of the trajectories at ending pressure level 70hPa.

## CONCLUSION

Systematic comparison between TOMS measurements and ground based Dobson value at OHP shows fairly good agreement. But in order to detect small trends (less than 0.4% per year), it is absolutely necessary to have very accurate measurements.



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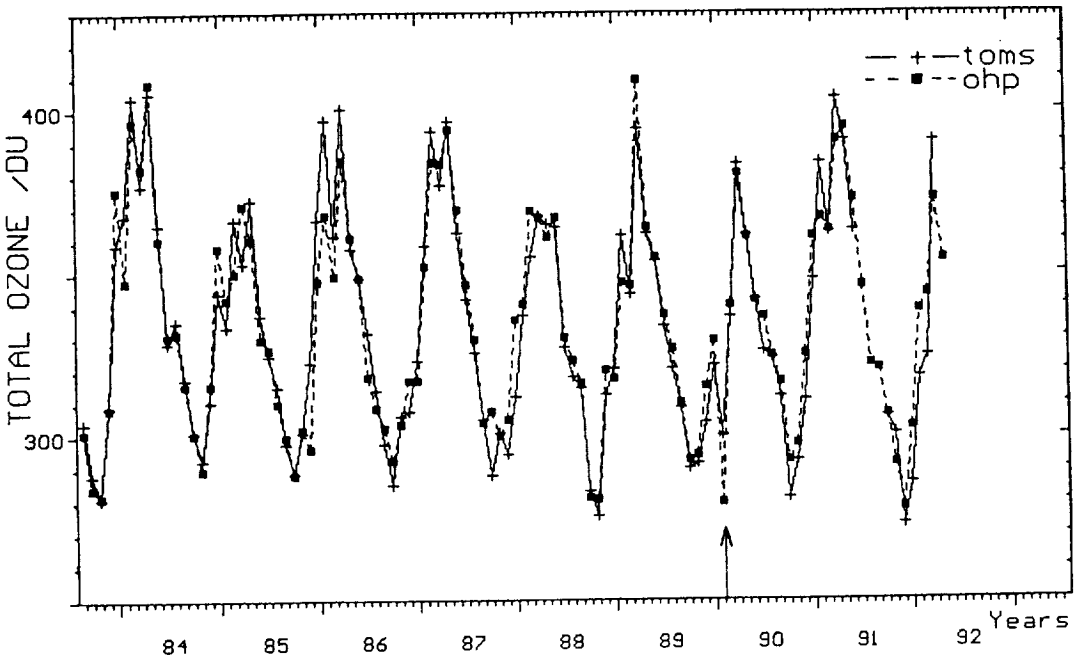


Fig 1 : Monthly mean Total Ozone : comparison between TOMS and DOBSON -OHP (September 1983 - April 1992)

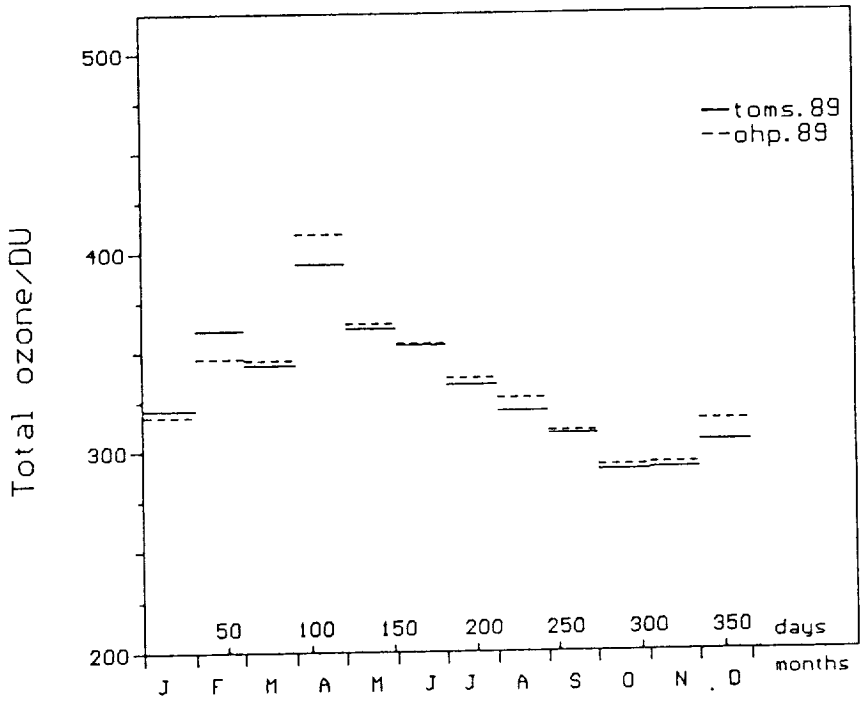


Fig 2 : Monthly mean Total Ozone: comparison between TOMS and DOBSON-OHP measurements in 1989

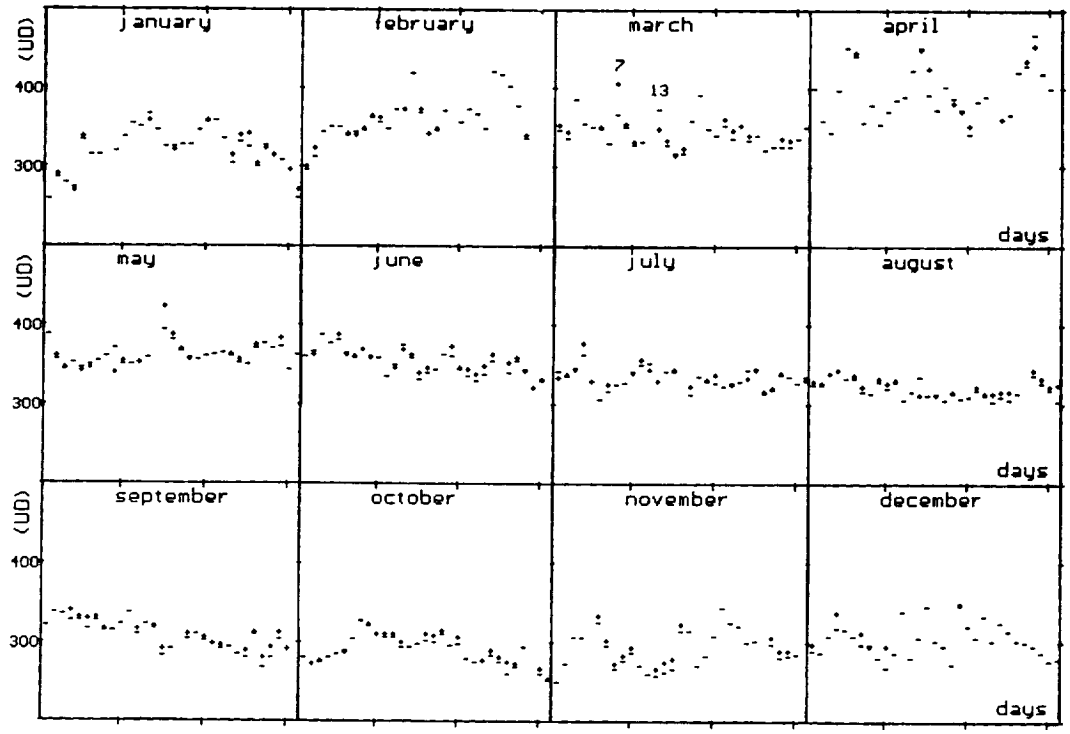


Fig 3 : Daily Total Ozone: comparison between TOMS (-) and DOBSON-OHP (+) measurements in 1989

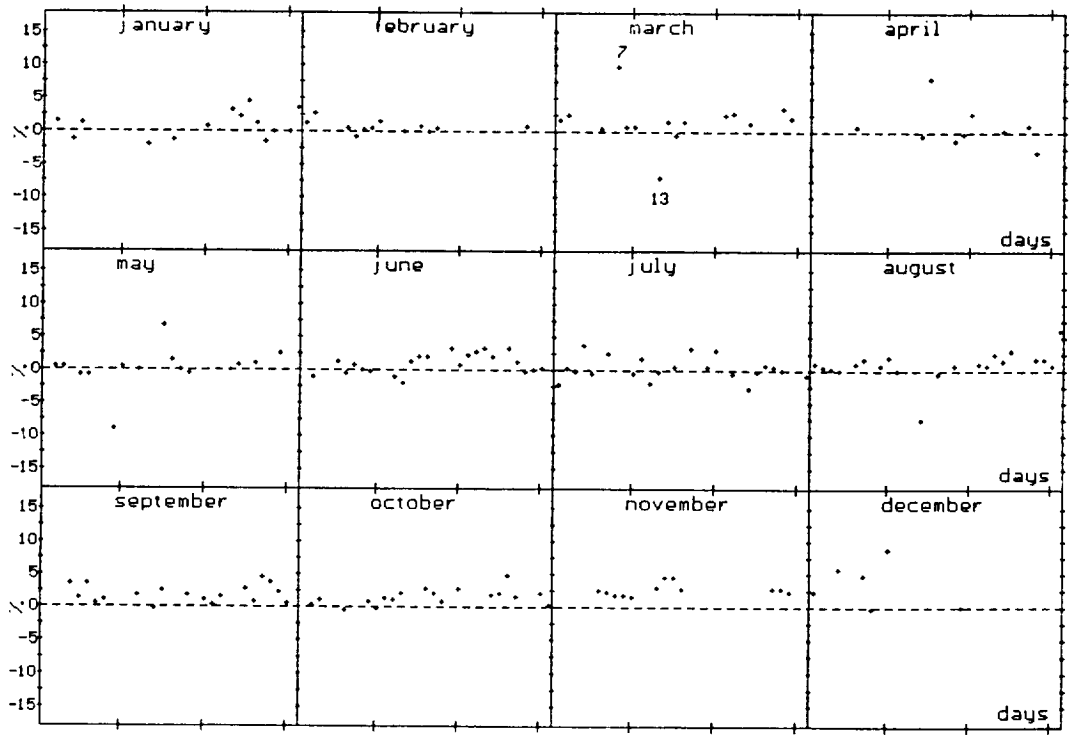


Fig 4 : Daily Total Ozone: Relative differences between TOMS and OHP in 1989. (OHP-TOMS)/OHP (%)

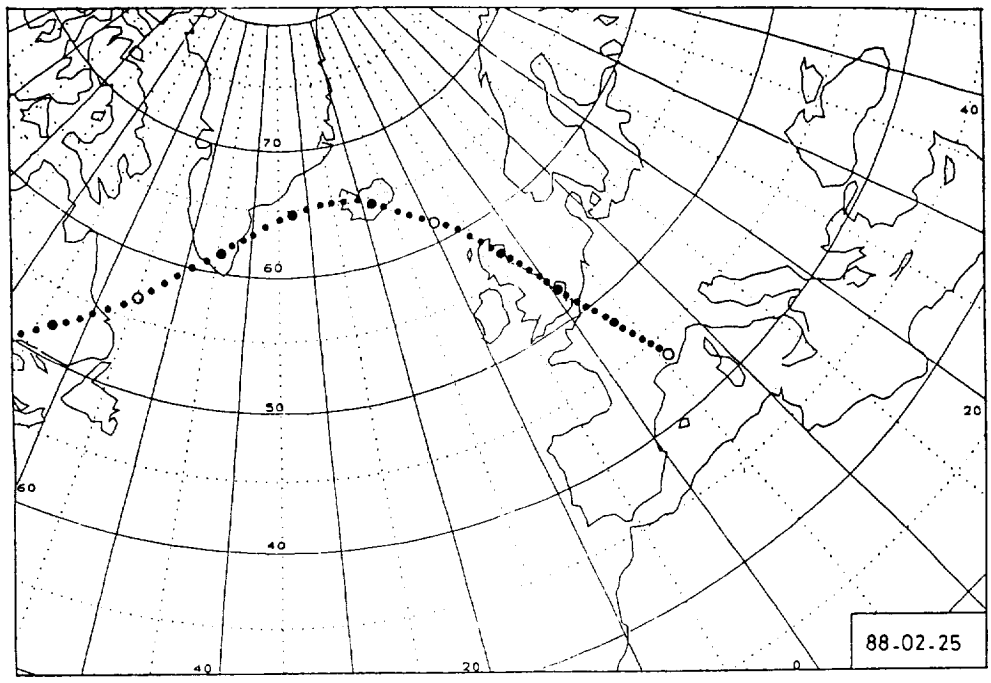


Fig 5 : Air mass backward trajectory ending at O.H.P.
1988-02-25-12UT. Ending pressure level 70hPa. o-o: 24h ●-●: 6h •-•: 1h