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Recent Stratospheric Ozone Measurements over Ankara-Turkey and Evaluation of Ozone Profiles

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Satellite, spectrophotometer and ozonesonde measurement systems are widely used to determine total column of ozone and its properties in troposphere and stratosphere. The differences between these measurement systems are the main research areas in terms of their techniques and results.

The present study deals with to compare of satellite total ozone measurements from OMI and SEVIRI instruments, Brewer MKIII spectrophotometer and ECC ozonesonde total ozone measurements and to make an assessment of the ozone in troposphere and stratosphere using ECC and Brewer ozone profiles over Ankara (39o55´N; 32o55´E) located at the centre of Anatolia.

In this study, Brewer MKIII, OMI and SEVIRI total ozone data of Ankara for the period January -December 2007 were used to make an intercomparison of monthly average total ozone measurements. The percentage differences between the data sets were calculated. It is aimed to define which remote sensing measurement techniques give the most accurate and reliable results. In order to verify the data obtained by remote sensing methods, 21 daily ECC total ozone measurements for the same period were used. Brewer, OMI and SEVIRI measurements available for the corresponding days were taken into account. Furthermore, in order to understand atmospheric ozone content, a total ozone retrieval algorithm from ECC sounding was applied to both troposphere and stratosphere to determine the ozone contents.

According to the comparisons, it was found that Brewer and OMI monthly average total ozone measurements show good agreement but SEVIRI overestimates; maximum differences between the measurements occur mostly between July and October. Maximum percentage differences between Brewer and OMI, SEVIRI and Brewer, SEVIRI and OMI were found -7.3%, 17% and 17% respectively. The mean absolute differences between Brewer and OMI were calculated as 2.4%; on the other hand SEVIRI has 10.4% mean absolute difference from Brewer and OMI. The results of the comparison of the total ozone by ECC have shown that the total ozone by Brewer and OMI are closer to ECC however SEVIRI overestimates. Mean absolute differences of the total ozone between Brewer and ECC; OMI and ECC were 5% in both. However, but it was found that 15% in between ECC and SEVIRI.

When tropospheric, lower and upper stratospheric ozone amounts were evaluated, it was examined that the variation of ozone in the atmosphere over mid-latitudes is strongly dependent on dynamic and thermal processes. The annual mean of tropospheric ozone was calculated as 35 DU. It was found that tropospheric ozone reaches up to 70 DU in summer forming 22% of total ozone and below 25 DU in winter. On the other hand, the average of total ozone is 271 DU. In spring, the total ozone was found up to 380 DU forming 94% of the total ozone, in autumn it was below 230 DU. When stratospheric ozone was analysed for lower and upper stratosphere individually, it has been evaluated that annual mean of lower stratospheric ozone was 66 DU. An increase in spring with a peak value of 150 DU and a decrease to 22 DU in summer were found. However annual mean of upper stratospheric ozone was calculated as 205 DU. It has been seen that upper stratospheric ozone has peaked in summer to 234 DU and decreased to 173 DU in winter. According to the number of laminae occurred in both troposphere, lower and upper stratosphere there is a strong relation with number of laminae and the ozone amount

in different layers.