The total ozone over Stara Zagora, Bulgaria in the period 2005-2012

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Introduction

Ozone is an important atmospheric constituent, which is formed from the photodissociation of molecular oxygen mainly in the stratosphere. It absorbs the part of solar radiation that is deleterious to biological life on the Earth. The ozone in the stratosphere acts a protective layer to prevent UV radiation reaching the Earth's surface [1]. The role of the ozone for the thermal balance and the temperature structure of the atmosphere is important because it is a heater of the stratosphere, absorbing the UV radiation, a trace species and a major participant in the photochemical processes. In the last years the dynamics of the atmospheric ozone is actively monitored both through measurements by ground-based instruments, located in a large number of stations all over the globe and by instruments onboard artificial satellites.

Instrument and methods

This paper presents the total ozone column (TOC) behaviour over Stara Zagora, (42°25' N, 25° 37' E), Bulgaria in the period 2005-2012. The ozone dynamics is investigated by using data from the Ozone Monitoring Instrument (OMI) on board the NASA EOS Aura spacecraft.

Ozone Monitoring Instrument flies on the Aura satellite since July 2004. OMI is a nadir-viewing wide-field-imaging spectrometer giving daily global coverage. It employs hyperspectral imaging in a push-broom mode to observe solar backscatter radiation in the visible (350-500 nm) and ultraviolet (270-380 nm). Two algorithms, OMI-TOMS and OMI-DOAS (Differential Optical Absorbtion Spectroscopy) are used to produce OMI daily total ozone datasets. OMI is continuing the TOMS record for total ozone and other atmospheric parameters related to ozone chemistry and climate [2].

Data analysis and results

Fig.1 shows the annual TOC variations in the period 2005-2012 by data of OMI. These variations are expressed by an abrupt maximum in the spring and a gently sloping decrease in the autumn. This ozone seasonal course doesn't correspond to the solar radiation energy distribution throughout the year. It is also different from the course of other parameters, such as temperature, humidity, air pressure, which follow the course of the solar radiation with a certain delay at all latitudes.

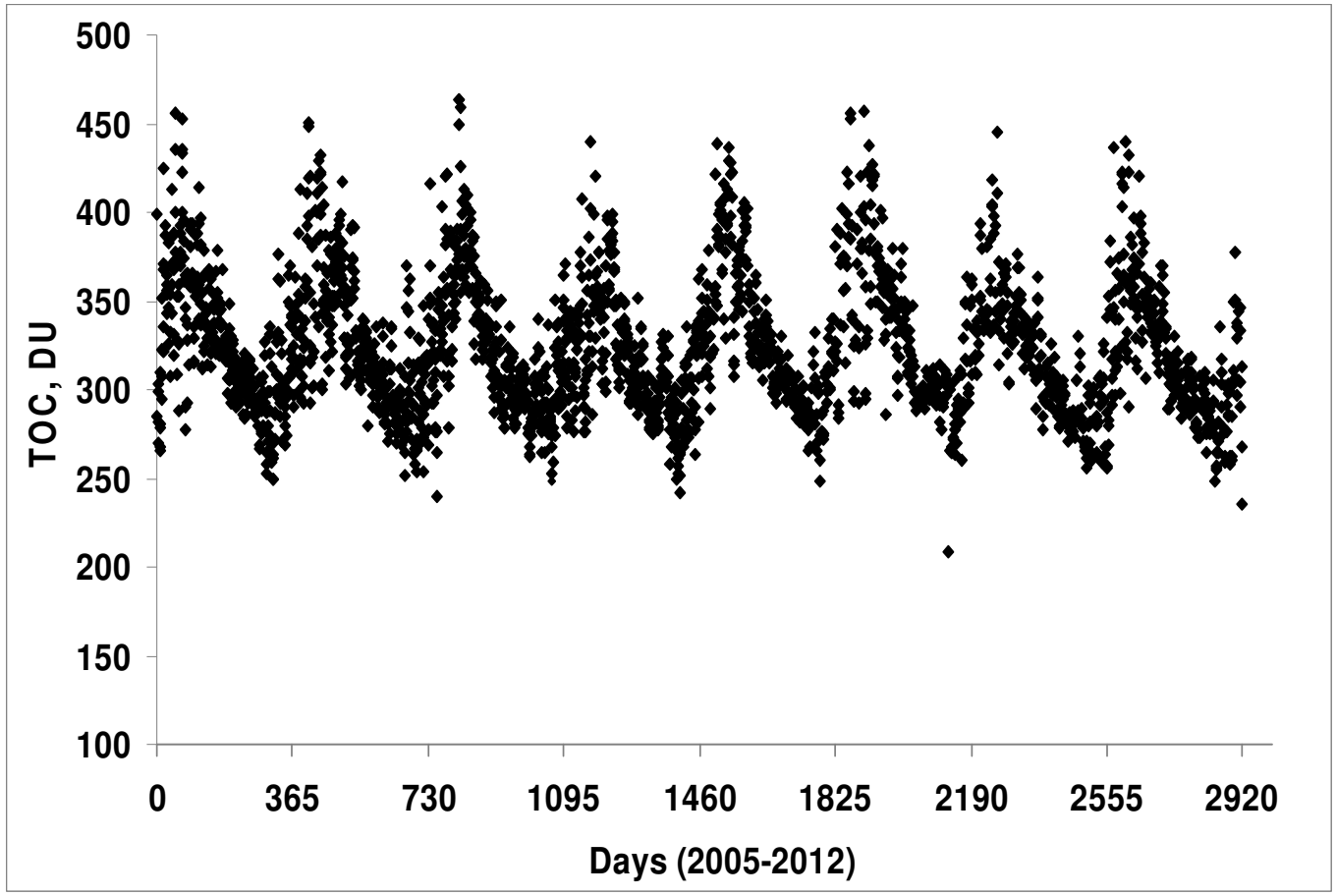

Fig.1. Day to day variation in TOC, measured by OMI during 2005-2012 period over Stara Zagora.

The total ozone behaviour by its monthly mean values is presented in Fig.2. The highest TOC maximum : 390 DU (Dobson Unit), is registered in March 2009, while the lowest one (350 DU) – in May 2008. From 2005 to 2012 a slight decrease in total ozone over Stara Zagora is observed.

Fig.3 presents the monthly TOC variations over Stara Zagora for the considered period.

- **March is the month of highest ozone concentration : 369 DU.**
- **The lowest TOC value is in November : 287 DU.**

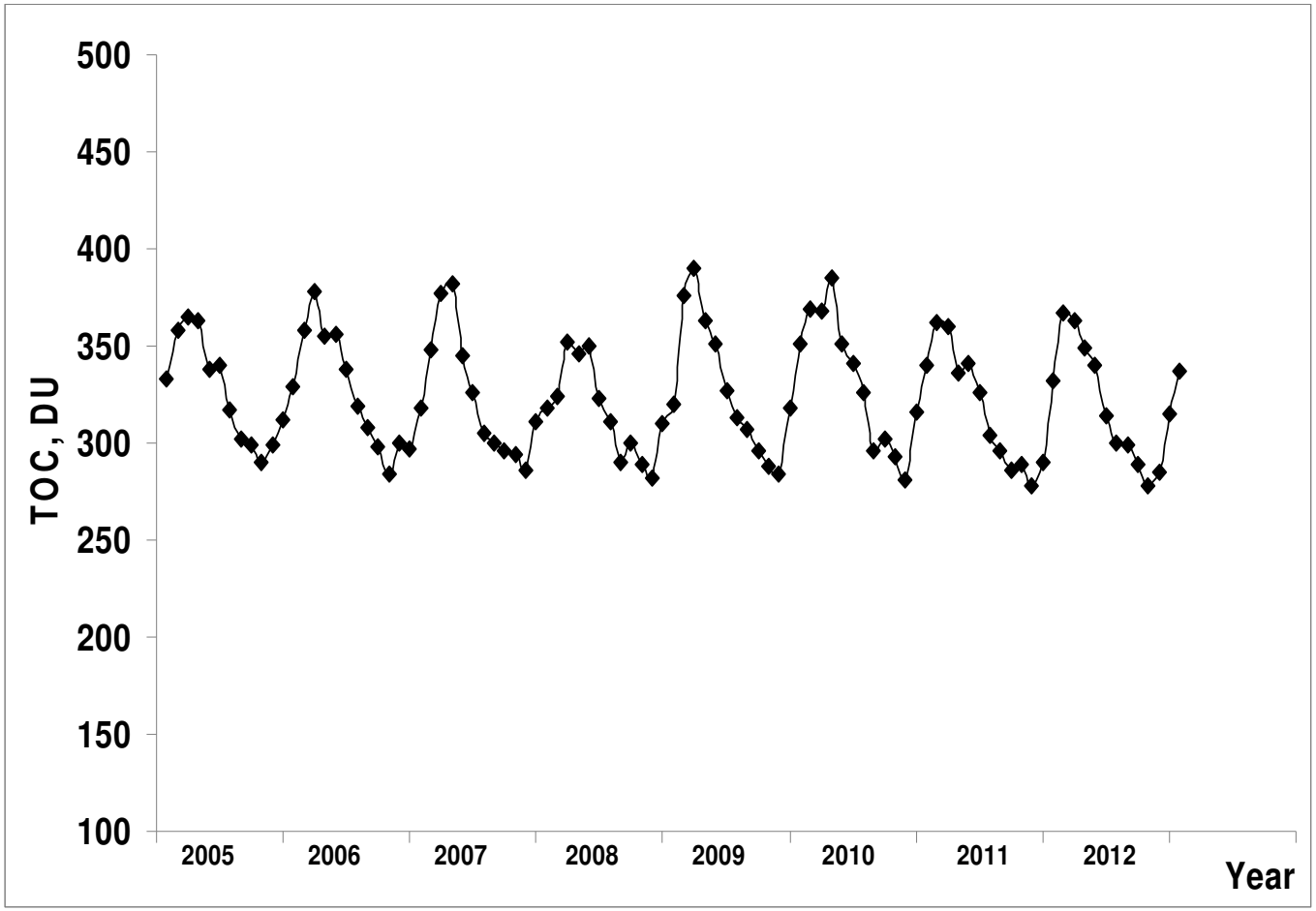

Fig.2. Total ozone behaviour (monthly mean values) in the period 2005-2012 over Stara Zagora.

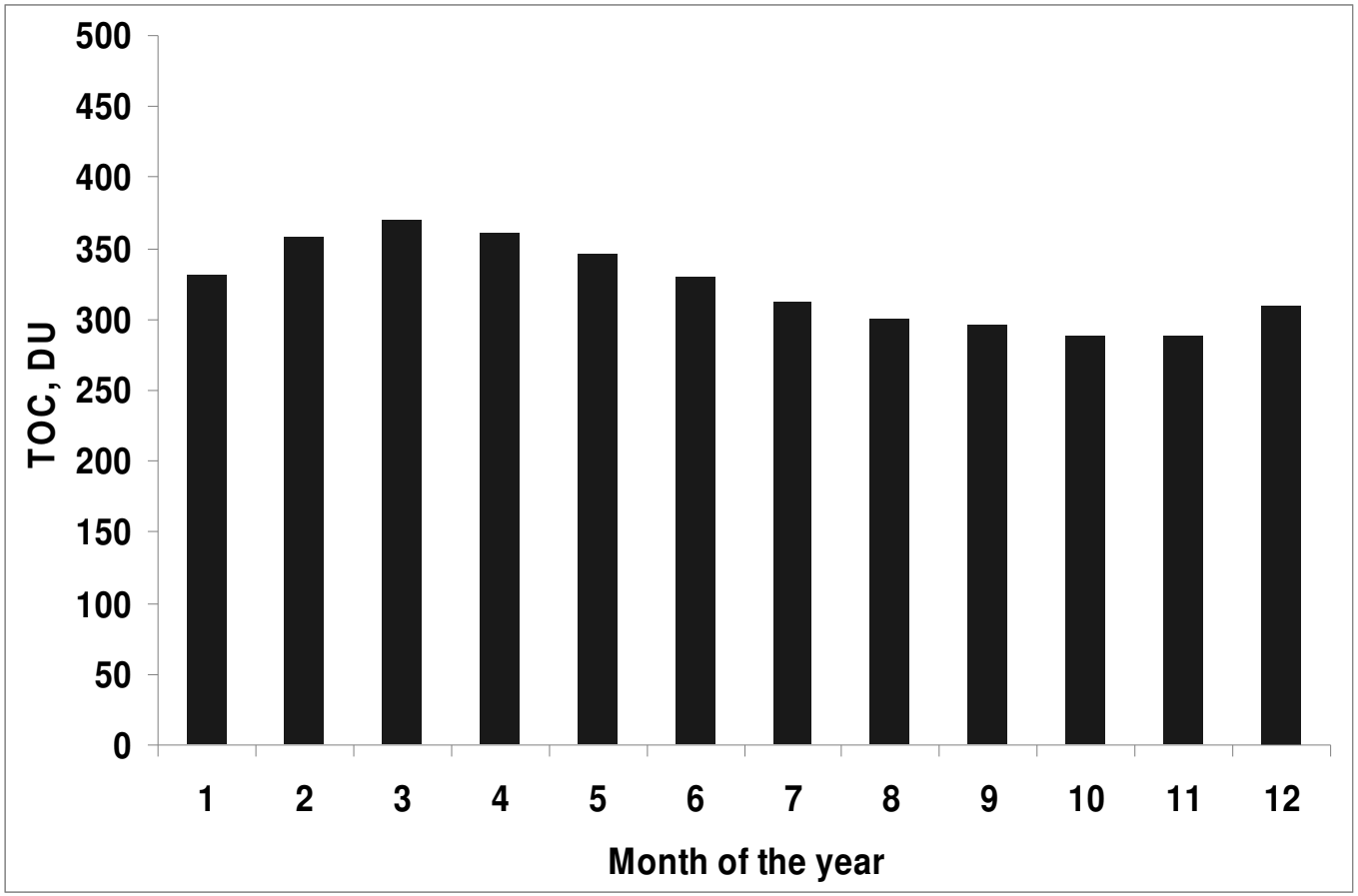

Fig.3. Monthly mean ozone values for the period 2005-2012 over Stara Zagora.

An attempt is made to find the seasonal variations of ozone concentration over Stara Zagora using the OMI data from 2005 to 2012 (Fig.4)

- It is found that the highest ozone content is in the spring (March-April-May) : 358 DU.

- The lowest ozone value is in the autumn (September-October-November) : 290 DU.

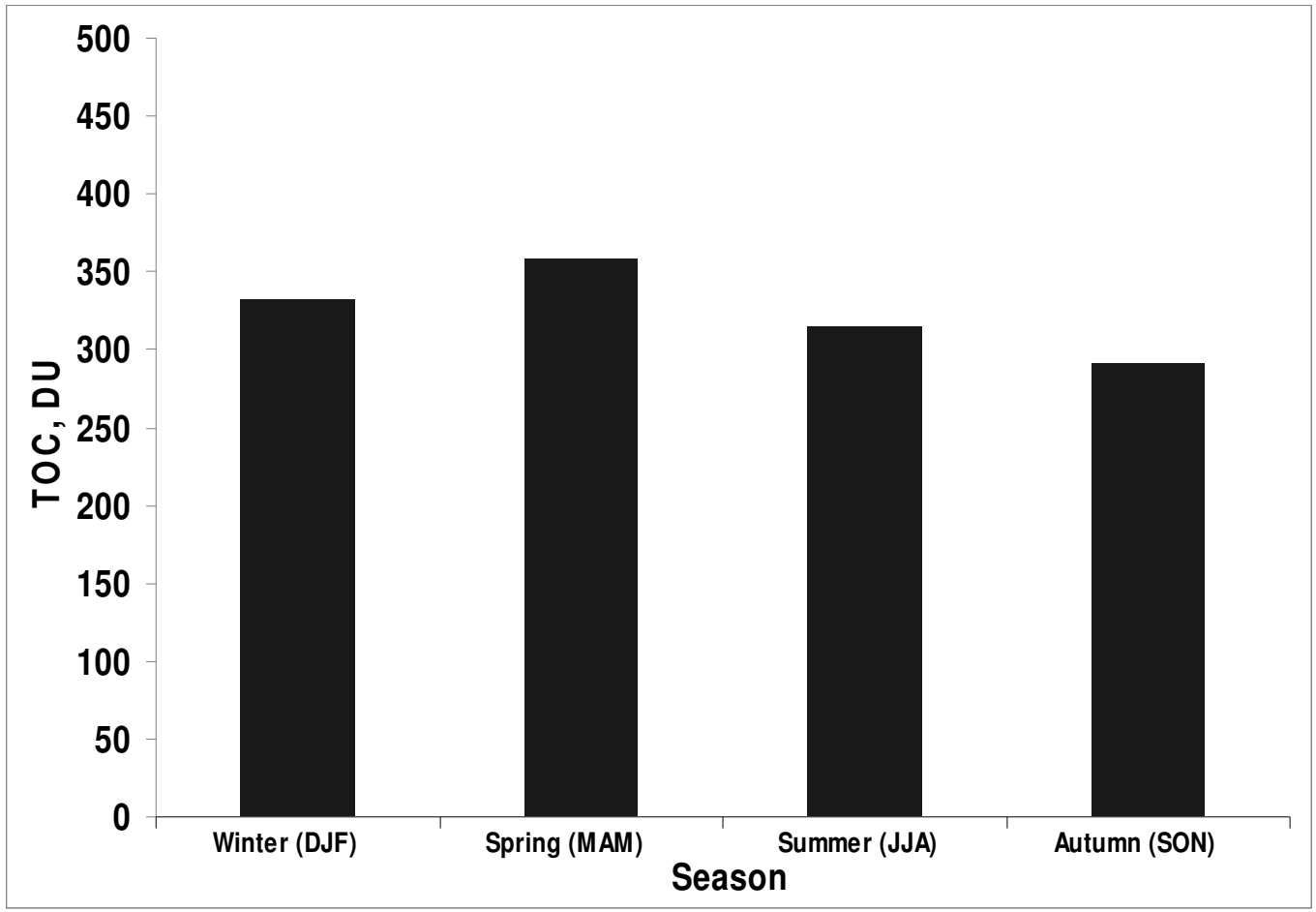

Fig.4. Seasonal ozone variations for the period 2005-2012 over Stara Zagora.

References

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