

Dear Editor,

The authors thank you for your attentive reading of the revised manuscript and your comments. Below are the responses to your comments and how they are addressed in a new revised version of the manuscript.

Sincerely,

1. Different domains are used from Fig. 1a-1b to Fig. 1c. Could the same domain be used in Fig. 1 as in Fig. 2? Since both Fig. 1b and Fig. 2c are for “2007-2012 Summertime (JJA) Mean 500 hPa Vertical Velocity (Pa.s-1)”, perhaps Fig. 2c should be skipped. There are some default values at grid cells around (-8°latitude, 32° longitude) in Fig. 2c. However, these default values cannot be found in Fig. 1b for the same grid cells.

Authors: *Figures 1 are used in the manuscript to provide climatology (1979-2012) of different meteorological parameters at the synoptic scale in order to explain the main meteorological systems driving the situation over the Mediterranean basin during summer. Figure 1c was represented on a different domain in order to better show the position of the Etesian winds. Restraining the domain of Fig. 1a-1b would not permit to show where the key meteorological systems are located. As the Etesian winds are well referred in literature and as the isobars in Fig. 1a show this circulation, we decided to remove Fig. 1c.*

Concerning Fig1b and 2c, they are not provided for the same period. Figure 1b is given for the climatology (1979-2012), whereas Fig. 2c is provided for the period of study (2007-2012). The default values you noticed were out of range values. This has been fixed.

2. There are several places in the text referring to a country for the geographical position (e.g., Greece in Line 44-46; Turkey in Line 217). This might be difficult for the readers who are not familiar with the Mediterranean geography to understand what region(s) you mean since the country's names are not labeled in the figure. It is stated “A land/sea mask has been applied to calculate the averages only over the Mediterranean sea” (Line 181). It would be suggested that such sea areas be displayed in one of the figures.

Authors: *A new figure (Fig. 2) has been included in the new version of the manuscript. This figure shows the sea mask used for the averages provided in the text as well as the name of the main countries of the basin.*

3. At the right-upper corner in Fig. 2a, there is a sharp gradient in ozone mixing ratio along the border (maybe the coast), from ~70 ppb in a green area to 80-90 ppb in the surrounding red areas. It is really difficult to understand this “phenomenon” considering that ozone is a secondary pollutant and the difference in the processes triggered from the surface may not have such a great effect.

Authors: *The discontinuities within the ozone distributions are related to the nature of the observation. The thermal infrared observations are very sensitive to the surface temperature and the thermal contrast (the difference between the surface temperature and the temperature of the air in the first atmospheric layer). The thermal contrast drives the sensitivity of the observation in the lower troposphere. A better sensitivity, which means a sensitivity lower in the atmosphere, is achieved in the case of high thermal contrast. This occurs mainly over land with maximum of sensitivity around 3 km. The thermal contrast over sea is usually close to zero and the maximum of sensitivity is more around 5 km in that case. In the region of Black*

Sea, abrupt changes in the thermal contrast from land to sea pixels induced this strong gradient in the ozone concentrations because this is not the same atmospheric layers that are preferentially sounded by the instrument.

In order to warn off the readers of this issue concerning the satellite observations operating in the thermal infrared, we added the following paragraph in the validation section: “It is worth noticed that some cautions have to be made when interpreting the ozone distributions derived from IASI observations. Due to the reduced vertical sensitivity and resolution of IASI, ozone concentrations retrieved at 3 km describe the ozone variability roughly from 2 to 8 km (lower/mid- troposphere) and ozone concentrations retrieved at 10 km the ozone variability from 5 to 14 km (upper troposphere/lower stratosphere) \citep{dufour10}. Moreover, the height of maximum sensitivity for one level (i.e. the atmospheric layer to witch the measurement is the most representative) can vary significantly from one pixel to another. This may happen mainly in the vicinity of the coasts, where the thermal contrast, driving the sensitivity of the observations, can vary dramatically from a land to a sea pixel, leading to some discontinuity in the retrieved ozone fields as the atmosphere layers sounded preferentially may be different. One example of this arises in Fig.~3a in the Black Sea area”.

4. A different domain is used in Fig. 3 than in Fig. 2, with the latitude value being extended to 70°N in the former. As a result, the gradient in ozone mixing at 10 km over the Mediterranean, if present, might be smoothed out since a larger scale has to be used to display much high ozone value at higher latitudes. It would be suggested that the same domain be used in Fig. 3 as for Fig. 2, focusing on ozone over the Mediterranean. Meanwhile, discussions on the south-to-north gradient of ozone at 10 km (Line 246-255) can be skipped as this has been a well-known character in the NH.

Authors: Fig. 3 (Fig. 4 in the revised version) has been updated. Figure 3b has been removed as well as the corresponding paragraph (former lines 247 to 255) as it is not the focus of our study. Figure 3a has been resized to the same domain as Fig. 2a to be centred over the basin.

5. Line 4: Please provide the full name of IASI. Please reconsider the title for Sect. 3 (Maybe “IASI” can be omitted. It seems not to be a right expression with “on a 2007-2012 period”).

Authors: These suggestions have been included in the new version of the manuscript and the title of Section 3 has been rephrased as follow “Summertime ozone spatio-temporal variability during the 2007-2012 period”.

6. Some words are not appropriately used in the text, for example, “higher troposphere” (L22 and later on), “has been made evident” (L55), “has been underline” (L60), “interesting datasets” (L72), “offer a maximum of sensitivity” (L79), “meteorological forcing” (L105), “between 3 and 4 pieces of information” (L117)”, “largely polluted region” (L121), “at the upper troposphere” (L166 and later on), “To be compared to” (L186), “it should also considered” (L225), and so on. Although the editorial office provides an English copy-editing service, it would be nice that you ask an English native speaker among your colleagues to polish the English first.

Authors: The manuscript has been reread carefully. Several sentences have been reformulated and we hope that the English of the manuscript is better now.

