Anonymous Referee #2 Comments (Authors Response in Italics)

The article presents specific case studies to interpret the role of subsidence on high elevation surface ozone concentrations, with the synergy of different in situ and satellite observational data. Overall, the paper merits publication after a number of comments are taken into account:

We would like to thank the reviewer for his positive comments on the manuscript. As seen below we revised the paper according to his suggestions.
The corresponding changes in the revised manuscript (in Final Response) are highlighted in green color.

In the abstract, a 10 year measurement period is mentioned, which creates a clear expectation that the results of this study are put in a long term context. This is not happening and it is a clear gap of the study. Unless the criteria used to select the cases are analysed in a previous paper (in that case direct reference to result from that paper(s) should be included), the authors should provide some statistics on the extent at which their findings for 2011 are also typical for the rest of the years as well as some means of quantification (e.g. frequency, values during events versus average values).

We would like to emphasize that the study is focused on atmospheric mechanisms, based on some selected case-studies and it is not a statistical one. In combination with a similar comment of reviewer 1 the relevant phrase (page 8, lines 3-7) was modified as follows "More than ten 7Be - ozone weekly episodes were identified in the whole time series and the three most characteristic of them, for what concerns signs of tropospheric subsidence as observed in the meteorological and air pollution measurements (high 7Be and O3 concentrations combined with positive omega and dry air masses) will be presented and examined in the following paragraphs. The selected episodes were: 3-10 May 2011, 23-29 May 2012 and 28 June – 04 July 2011. The episodes discussed here are not Foehn events".
In addition, the reader might have an idea of the frequency of occurrence of these episodes by having a look at Fig. 1 as well as in the Supplement Figs S1-S4 where the weekly averages of 7Be and O3 concentrations for 5 years (2006, 2007, 2008, 2011, 2012) plotted. As observed, during the April – September period about 2-3 major 7Be - O3 episodes are spotted. As mentioned in the manuscript, these episodes could be better detected with shorter than weekly measurements of 7Be as the usual duration of subsidence episodes is about 2-3 days (see new Fig. 13), but such measurements were not available.

The amounts of plots used is huge! The authors should definitely make a serious attempt either to merge few of them, or move to suppl. material, or exclude if really not needed. Those changes might need to be followed by changes in the text and the overall structure, which I leave upon the authors, yet few suggestions will follow immediately after in my review.

A significant merging and reduction of plots associated with the corresponding text changes have been undertaken in combination also with similar comments of reviewer 1, leading to a total number of 13 Figures in the revised text.

Finally, there are parts of the introduction or the results where references do not seem to be up to date, either in terms of time or space, the latter meaning references relevant to the area of interest. I have included few examples which I consider only indicative, but a more through review of the current state might be needed, and the selection remains at the discrete consideration of the authors.

Following the reviewer's comment an update of references has been made in the introduction and the results section, as it is described in the following paragraphs.

Specific comments:
Pg 1, Ln 30 – "It has been reported that tropospheric . . . the last couple of centuries (Volz and Kley, 1988; Forster et al., 2007)." I would suggest that this introductory statement should be supported with more recent references.

Following the reviewer's suggestion two more recent references, which are review papers on tropospheric ozone were mentioned for supporting the introductory statement (Monks et al., 2015; Gaudel et al., 2018).

Pg2, Ln 6 – "which might also be associated to deep tropospheric subsidence especially over the Mediterranean . . . Kalabokas et al., 2013; Cooper et al., 2014; Safieddine et al., 2014; Kalabokas et al., 2015) . . . especially for deep stratospheric intrusions the following references are very characteristic for the area and should be included in the already too long list of references, or later (Pg 2, lines 20-25). A deep stratospheric intrusion event down to the Earth's surface of the megacity of Athens April 2012 Meteorology and Atmospheric Physics 109(1):9-18, DOI: 10.1007/s00703-010-0096-6 by Akritidis et al. Gerasopoulos E, Zanis P, Papastefanou C, Zerefos CS, Ioannidou A,Wernli H (2006) A complex case study of down to the surface intrusions of persistent stratospheric air over the EasternMediterranean. Atmos Environ 40:4113–4125. Kentarchos AS, Davies TD, Zerefos C (1998) A low latitude stratospheric intrusion associated with a cut-off low. Geophys. Res. Lett. 25:67–70

Following the reviewer's suggestion, the mentionned references on deep tropospheric subsidence over the Mediterranean were added into the text.

Pg 2, Ln 31 – It seems that two studies conducted at Finokalia remote station in the eastern Mediterranean, dealing with the dynamics and photochemistry of ozone are missing from the introduction, especially when discussing the eastern Mediterranean controlling mechanisms of surface ozone. On the contrary, there are many selfcitations from the first author that need to be enriched with studies from other groups in the area. Kouvarakis, G., K. Tsigaridis, M. Kanakidou, and N. Mihalopoulos (2000), Temporal variations of surface regional background ozone over Crete Island in the southeast Mediterranean, J. Geophys. Res., 105(D4), 4399 – 4407. Photochemical ozone production in the Eastern Mediterranean, June 2006, Atmospheric Environment 40(17):3057-3069, DOI: 10.1016/j.atmosenv.2005.12.061 by Gerasopouolos et al. Gerasopoulos, E., G. Kouvarakis, M. Vrekoussis, M. Kanakidou, and N. Mihalopoulos (2005), Ozone variability in the marine boundary layer of the eastern Mediterranean based on 7-year observations, J. Geophys. Res., 110, D15309, doi:10.1029/2005JD005991.

The suggested studies on surface ozone conducted at the Finokalia station were added into the manuscript.

Pg 3, Ln 15-17: Be7 reference for ambient levels are quite old, some inquiry on new articles reporting on the levels should be done, especially in the area of interest. The same in lines 21-23.

Following the reviewer's suggestion ten more recent references on 7Be ambient levels were added, especially concerning the area of interest of the study (European Continent – Western Mediterranean): *Bourcier et al., 2011; Brattich et al 2017; Duenas et al, 2011; García et al, 2012; Hernández-Ceballos et al, 2016; Ioannidou et al, 2014; Jiwen et al, 2013; Leppanen et al, 2010; Lozano et al, 2012; Pham et al, 2011; Steinmann et al, 2013.*

The information in section 2.2 should be better included in a table.

A table has been added to include the information in section 2.2 (Instrumentations and measurements at JRC-Ispra site).

Figure 1a could be combined with 1b. The same stands for 2a, 2b.

The suggested combination of Figs has been done following also a similar comment from reviewer 1.

Overall, the added value of this paper results is not clear and should be better highlighted, mostly in the conclusions. It is obvious that it is an extension of previous works and for that reason it needs to be clear where does this study starts from and where it ends up (added value) at the same time being a self standing scientific publication.

In the previous study (Kalabokas et al., 2017) some troposheric mechanisms related with regional ozone episodes especially linked with large-scale subsidence were examined mainly based on surface ozone, IASI vertical columns and meteorological analysis. In this manuscript a more detailed analysis of the suggested mechanisms was performed, based on the measurements of a very large variety of meteorological and air pollution parameters collected at the JRC-Ispra station, which is considered as one of the most well-equipped measuring sites in Europe. This measurement set includes tracers of both subsidence (^{7}Be, RH), boundary layer origin (^{222}Rn, ^{210}Pb, NOx) and photochemical activity (partly PM), and this allows at least qualitatively distinguish origin of different air masses and trace back ozone origin. Relevant phrases have been inserted at the last paragraph of the introduction as well as at the beginning of the conclusions section.