Atmos. Chem. Phys. Discuss., 14, C3208–C3210, 2014
www.atmos-chem-phys-discuss.net/14/C3208/2014/
© Author(s) 2014. This work is distributed under
the Creative Commons Attribute 3.0 License.

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Summertime tropospheric ozone variability over the Mediterranean basin observed with IASI" *by* C. Doche et al.

Anonymous Referee #1

Received and published: 4 June 2014

Six years of summertime tropospheric ozone observed by the IASI instrument are analysed in this manuscript in order to document the tropospheric ozone variability over this region. I recommend publication of the manuscript after considering the following comments.

a) The authors state that "the western ridge results from the spreading of the Azores anticyclone" (page 13023 at line 15). The western Mediterranean ridge may associated with the Azores high. However in Figure 1 the high pressure ridge over the western Mediterranean (referred in page 13023 at line 13) in fact extends over Central and Central-eastern Europe (or Balkans) which according to the current understand-

ing is detached from the Azores anticyclone. Many researchers underline the differences between the anticyclonic center over Central and Central-eastern Europe (or Balkans) and the Azores high pointing to the importance of anticyclonic vorticity advection from Northwestern Africa (Prezerakos, Arch. Meteorol. Geophys. Bioclimatol. 1984; Tyrlis and Lelieveld, J. Atmos. Sciences, 2013; Anagnostopoulou et al., Clim. Dynam., 2014). Furthermore when looking Figures 6 and 10 of Geopotential Height at 850 hPa you may notice that the Azores anticyclone is detached from the anticyclone which extends from Northwestern Africa towards western Mediterranean and central to central-eastern Europe.

b) Concerning the discussion for the role of transport on the spatial ozone variability over Mediterranean (Section 3) it should be noted that the subsidence (in Figure 2c) actually takes place at the western flank of the high PV-streamer (Figure 2b) as would be theoretically expected from a dynamical point of view with anomalous subsidence upstream a positive PV anomaly (Hoskins et al., Q. J. Roy. Meteor. Soc., 111, 877–946, 1985).

c) Apart from the important role of subsidence it should also considered the high probability of tropopause folds over the area which feeds stratospheric air in the upper and middle troposphere. There is a recent article by Tyrlis et al., (JGR, 2014) indicating a global "hot spot" of summertime tropopause fold activity over a sector between the eastern Mediterranean and Afghanistan, in the vicinity of the subtropical jet. Mind also that according to a study of Sprenger et al. (J. Atmos. Sci., 2007), a maximum in stratosphere-to-troposphere transport (STT) is identified at the western flank of the stratospheric PV streamers which implies a co-location with the area of the strongest subsidence.

d) The trough of high PV extending over SE Europe (Figure 3b) (thus inducing a deviation from a zonal distribution of PV) is not clearly represented in IASI 10 km ozone data. It could be possibly the selected colored scale that masks this feature in Figure 3a. It would interesting to show the similarity in the patterns of the ERA-interim PV and

IASI O3 (e.g. by adding contour lines or modifying the colored scale). Mind that PV and O3 at the tropopuase level should show similar field structures.

e) The authors refer to a correlation of 0.99 between ozone and PV (page 13023, line 17) . Is this correlation calculated from a number of 18 data points (6 years x 3 months) shown in Figures 4 and 5? Please clarify in the text.

f) The discussion of the case of June 2008 refers to a deeper low-pressure system over Eastern Mediterranean but it misses any discussion of the link with the Asian monsoon which controls this low pressure system. This discussion maybe even more relevant in comparison to the other case of June-July 2009.

g) The analysis of the case of June 2008 uses an averaging over the whole Mediterranean Sea for IASI ozone and ERA-interim PV thus loosing the distinction of the circulation patterns between western and eastern Mediterranean. Maybe a differentiation between west and east could emphasize even more the controlling role of downward transport over the eastern part.

h) Mind please an analogous study which is under discussion in Atmospheric Chemistry and Physics (Atmos. Chem. Phys. Discuss., 14, 12377–12408, 2014).

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 13021, 2014.