

Interactive
Comment

***Interactive comment on “
A stratospheric intrusion at the subtropical jet
over the Mediterranean Sea: air-borne remote
sensing observations and model results” by
K. Weigel et al.***

Anonymous Referee #2

Received and published: 18 May 2012

GENERAL COMMENTS:

This paper by Weigel et al., describes the influence of the subtropical jet stream on tracer concentrations (O₃, H₂O, PAN, HNO₃) over central Mediterranean basin (i.e. Italian peninsula) on 29 July 2006. This event has been catch during a stratospheric flight performed during the AMMA-SCOUT-O₃ measurement campaign.

The paper presents data acquired by an advanced and improved remote sensing system (CRISTA-NF) and, for this reason, can be considered new and interesting for ACP.

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Interactive Discussion

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Nevertheless, the aim of the paper is not well defined (as also indicated by the Referee 1). In particular, I was not able to understand if the main goal of the paper is to show the capacity of CRISTA-NF in providing high quality observations or to provide new hints in the field of the UTLS and STE studies. Even if the observation results are rather “spectacular”, they are limited to a single case study. Thus, in the latter case, I don’t think that the paper provides a substantial advance in the scientific knowledge.

An other major point is that the discussion of the results should be improved. In general, the authors simply reported the observations without any kind of discussion. As an instance, the (sometimes very large) differences between CRISTA-NF observations, CLaMS and ECMWF simulations are described but without providing any explanation (see Section 3.2 and 3.3).

As the paper relies on a well defined case study a “meteorological” description of the conditions during the flight should be inserted (what kind of meteorological scenario affected the Mediterranean basin during the presente period?).

Moreover, the paper strongly focus on the stratosphere-troposphere transport process but the other concurring event (the transport from Asia, which is also interesting) is only marginally considered (even in the title!). More discussion should be deserved to this point also considering the role of this kind of transport patterns for pollution transport to the upper troposphere/lower stratosphere of Mediterranean basin (see for instance, Lelieveld et al , Global air pollution crossroads over the Mediterranean. Science 298, 794–799.2002), one of the Earth hot-spot region in terms of climate change and air-quality issues.

Finally, some figures should be improved in terms of readability.

SPECIFIC COMMENTS:

INTRODUCTION

In general ,more discussion about stratosphere –to-troposphere transport and trans-

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port to Europe related with Asian monsoon system should be added (in terms of meteorologic dynamic and influence on atmospheric composition over Mediterranean basin-Europe). As an instance, a paper on the role of the sub-tropical jet to the occurrence of high-ozone layer over Europe has been recently published on ACP (Trickl, et al. High-ozone layers in the middle and upper troposphere above Central Europe: potential import from the stratosphere along the subtropical jet stream, Atmos. Chem. Phys., 11, 9343-9366, doi:10.5194/acp-11-9343-2011, 2011).

Pag 7795, line 28: Which is the relationship between the “vertical field of view” and the “vertical resolution”? Please, better explain.

METHODS

Pag 7797, line 2: please explain the goals of the CRISTA-NF activities within the SCOUT-O3 and the AMMA campaigns.

Pag 7797, line 21: “...about 6 km altitude”. In respect to the aircraft flight level, I suppose.

Pag 7798, line 28: “To display...retrieval and refraction”. I cannot understand the general meaning of this sentence. Please, explain better and more clearly.

RESULTS AND COMPARISONS

Figure 2 is not readable at all!!! Please, separate it in two or more plates.

Pag 7801, line 27: please define X2 m-1! Please, motivate the screening between 0.8 and 1.2.

Figure 3. To make the paper easier to read, I suggest to include in the x-axis also an indication about the geographical position of the aircraft (i.e. latitude, longitude): you should refer to it also in the text.

Pag 7802, line 8: high PV values can also be generated by diabatic heating due to the condensation of water vapor. Taking into account the large number of cloudy pixel,

what the possibility that the high PV values (above 1.5 pvu) in the first part of the flight were influenced by this kind of process?

Pag 7802, line 19: but you show valid data up to 16.5 km, actually. . .

Pag 7802, line 20: I cannot see these structures. Maybe you should increase the figure resolution?

Pag 7805, line Figure 5c: also considering the following discussion, you should report the position of the thermal tropopause.

Pag 7806, line 1: again, I cannot see this minimum.

DISCUSSION

In Figure 6 you showed the back-trajectories for grid position between 350 and 360 K. Here, you must refer to Figure 8 to show the location of these isentropic surfaces.

Pag 7807, line 14: I cannot completely understand this sentence. Please, rephrase.

Pag 7808, line 22. Please, motivate the (very large) differences that you observed in respect to Pan et al. (2007).

In Figure 8a, you can delete the pink circles as the selection is already indicated by the dotted lines. Figure 8b is absolutely unreadable: too much information are presented. Please, at least, separate it in more plates. If cloudy spectra are not used, please remove the black dots (the same for Figure 2 and Figures 3-5)!

In general to support the development of a tropopause fold, more information should be provided. As an instance, you can produce a picture with vertical cross section of PV values (maybe using CLaMS data?) able to show the folding (see Sprenger et al., JGR, 108, D12, 8518, 2003).

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 7793, 2012.