Atmos. Chem. Phys. Discuss., 7, S7469–S7471, 2007
www.atmos-chem-phys-discuss.net/7/S7469/2007/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ozone-enhanced layers in the troposphere over the equatorial Pacific Ocean and the influence of transport of midlatitude UT/LS air" *by* H. Hayashi et al.

Anonymous Referee #2

Received and published: 6 December 2007

The authors present a study based on ozonesonde data obtained at three SHADOZ sites in the pacific Ocean, for 6 years between 1998 and 2003. They detect ozone enhanced layers in the profiles, and determine the origin of tropospheric ozone using trajectories. The study is a combination of climatology of ozone enhanced layers, and of case studies of biomass burning influence in the equatorial Pacific region and of transport processes and midlatitude UT/LS air masses to the equatorial Pacific region.

The back trajectory model is based on ECMWF data, with a spatial and temporal resolution of 2.5° Œ 2.5° and 12 hour. The time step for calculation was 1 hour, and the vertical displacement of air masses was calculated using the vertical wind component

of the ECMWF data.

My main reserve on this paper on the accuracy of the back trajectories.

The author should precise if they use ERA 40 reanalyse data.

If yes, in my opinion, it is impossible to do an quantitative estimation of the origin of the air masses using the vertical velocity of ECMWF with a so long time step (take 15 minutes or less), and a so large resolution (2.5 degrees is too large, but 2 fields by day is not enough).

With the parameters indicated by the authors, it is not possible to have a good representation of the diffusivity and then and then of the stratosphere-troposphere exchange influence.

In fact the stratosphere troposphere can occur at different time and space scales. With the methodology used by the authors (lagrangian approach based on trajectory and PV analyse), it could be possible to quantify the stratosphere-troposphere at the meso-scale, under the condition of the parametrization of the trajectories are well adapted, and with a PV advection using the trajectories. It is not the case here, and the authors recognise implicitly it excluding the ozone peaks whose the thickness is less than 1 km (page 17185, line 2).

Then the climatology is only quantifying the large scale sources of ozone, excluding the meso-scale.

In my opinion, the paper address relevant scientific question within the scope of ACPD. The data presented are interesting, but the tool used is not adapted to the objective of the study. Substantial conclusions could be reached, if the trajectories are improved. The title, abstract and overall presentation and OK for me.

Some minor remarks :

What is the exact significance of the term “midlatitude UT/LS air mass”

ACPD

7, S7469–S7471, 2007

for the authors? Does it mean stratospheric origin? An air mass coming for the upper troposphere of midlatitude and arriving in the tropics is not necessarily an enhanced ozone layer.

The introduction could be improved : - Page 17180, 1st sentence : the tropospheric ozone concentration in the tropics is generally low. In comparison with what? Cite a reference. - Page 1782, lines 10-14. It is exact that all is not clear concerning the ozone balance in the tropics. But I am not sure that what is not clear is the transportation of midlatitude UT/LS in the tropics. I think that what is not clear is the influence of tropical convection on tropospheric ozone, and the quantification of meso-scale and global scale processes on ozone

The presentation of the trajectories is not very clear, as example fig 5. The vertical level could be given as function of time (and not longitude), or could be given with colour on the horizontal plot latitude x longitude.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 17179, 2007.