

Interactive comment on “Is there a stratospheric fountain?” by J.-P. Pommereau and G. Held

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Thanks for your appreciation and your suggestions for revision, which have been carefully taken into account. As you will note, the paper has been deeply modified according to the many comments of the reviewers. Hope it will replies to your concerns.

Here are specific answers to your comments:

- Actual location of radar observations relative to tropopause temperature. Indeed the two measurements are not fully collocated. Those of the radar are within the 240 km range of the instrument, while the sondes are very near the station since horizontal winds are light. Moreover, as explained, most intense convection is often observed on the West of Bauru meaning that sondes observed coolings are not necessarily located immediately above most active cells. This is now explained in the revised paper. - As recommended also by Ref #1, PDFs of cloud top heights and temperature deviations

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have been included. They are indeed very informative, showing when higher turrets are observed and the altitude distribution of these. We missed this point in the original paper. - Irreversible mixing. This conclusion is mainly supported by the observation of the change of temperature within 6 h between 10 and 16 LT, which implies a short time scale process. It is also supported by the observations of ice crystals injections well above the tropopause during the same period implying fast updrafts at 50 m/s of tropospheric material implying strong cooling at around the CPT, as shown by non hydrostatic Cloud Resolving model simulations, as explained in the discussion. - Gravity waves. We fully recognised that our gravity waves analysis applies to high vertical wave numbers only but didn't find a good idea for exploring the possible influence of wave packets. - Kelvin or sub-tropical Rossby waves. There is indeed signature of downward propagating temperature anomalies in the lower stratosphere (noted now in the text + reference to Boehm and Verlinde 2000, Fujiwara et al 2003 and Randel and Wu 2005), but again these are large time scale processes, which cannot explain fast diurnal changes. - TROCCINOX. Reference to those measurements and conclusions included but not repeated here. - Hydration and not dehydration. Details on the many recent observations now available of hydration above convective cells, which never reported sign of dehydration, are now added in the discussion as well as to mesoscale models showing that they are due to injection of ice crystals at vertical velocities of up to 50-60 m/s, leading to strong cooling at the CPT altitude (Jensen et al. 2007) strongly supporting the hypothesis of lofting of adiabatic cooled air across the tropopause. - Elements suggesting extension to importance of deep convective penetration at global scale, given in the discussion section. - Abstract and conclusion modified - Difference in altitude between 340-370K (p 8937). Following explanation added: "Black lines are showing the altitude of the 340 K and 370 K potential temperature surfaces, indicative of the adiabatic lofting caused by heating in the main troposphere and of a descent at the tropopause level, whose difference varying from 4 km to 8 km appears a sensitive indicator of convective intensity" - PDF of cloud counts added (Fig. 7) with the following comments: "Figure 7 shows the PDFs of the radar echo tops height at 10, 13, 16, 17,

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21 and 24 LT on 1-21 February. The highest tops are observed around 16-17 LT where 80% of them are higher than the LRT. The high convective cloud tops altitude in the afternoon reported by the S-band radar above south-eastern Brazil is fully consistent with GLAS, CALIPSO and CLOUDSAT satellite observations showing higher clouds in the afternoon above tropical land regions (Dessler et al., 2006, Nazaryan et al., 2008, Sassen et al., 2009, Iwaski et al., 2010)”

- Grammar and English corrected.

Many thanks for helpful comments.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 8933, 2007.

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