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Atmospheric Chemistry and Physics Discussions

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

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Thanks for appreciation and helpful comments and recommendations, which have been taken carefully into account. The paper has been deeply modified according to the many comments of the several reviewers. Hope it will reply to your concerns.

1. 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. The argument for turbulent heat transport in contrast to adiabatic cooling applies to the fast afternoon cooling only shown to occur at 17-18 km that is 2-3 km above the LRT, and not at this level which is shown in contrast to warm slightly. A better description of these details is provided by the addition of an adequate PDF. The negative correlation between free tropospheric and upper tropospheric temperatures shown by Holloway and Neelin (2007), is around 100 hPa, which in the West Pacific

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is below the tropopause. If the cooling associated with convection at this level can be explained by adiabatic lofting, it is not the case for a cooling well above the tropopause only. Other arguments developed in the revised paper supporting the mixing hypothesis, are the coincidence with ice crystals injections observed during the same Hibiscus campaign as well as over other land convective regions, and the non-hydrostatic model simulations (Jensen et al., 2007, Chaboureau et al., 2007, Grosvenor et al., 2007) showing that they require fast uplift of tropospheric air at velocity of the order of 35-60 m/s, resulting in a strong cooling well above the tropopause (15K at 18 km in the case of Jensen).

2. Temperature sampling noise and diurnal cycle. As shown by the error bars, the diurnal cycle of temperature of the lower stratosphere above 20 km is not noise. As now discussed in the revised paper, its amplitude is of the order of magnitude of the daytime heating around 24 km by ozone absorption of solar radiation and the nighttime cooling by long wave emission calculated by Gettelman et al (2004). The only feature requiring something else is the nighttime warming around 21 km, tentatively attributed to a small adiabatic descent following the earlier irreversible injection of cold heavy air.

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