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Interactive Comment

Interactive comment on "Cirrus clouds in convective outflow during the HIBISCUS campaign" *by* F. Fierli et al.

F. Fierli et al.

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General comment:

The suggestions of the reviewers were extremely important. The use of new data was required. Moreover, it was necessary to re-think the modelling part. So the paper has been substantially re-written. To the author8217;s point of view this should lead to a more readable paper and to clearer conclusions. The comparison between the Lidar observations and the water vapour data provides significant elements for the analysis; this shows the presence of ice supersaturations up to 140 and lower values inside the clouds. Observed RHI helps to further interpret the lidar data and to formulate an hypothesis on the estimated age of the cloud based on the water cloud content and the backscatter ratio. The analysis shows that mesoscale the observations.

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The major revisions of the paper are:

- MODIS observations were added in Fig.2 and erroneous definition of aerosol optical thickness has been amended - The water vapour observations from SDLA are thoroughly discussed and compared to the lidar data in Figure 4. - The ECMWF trajectories are no longer included and have been replaced by trajectories derived from the Bolam simualtions to take into account convective transport. - Model microphysics is now discussed in model description section. - Bolam model is compared directly to BRAMS (Marecal et al, ACP, same issue) and to SDLA water vapour in Figure 6 where the BOLAM ice water field is also shown. - We have skipped the tracer transport analysis in the revised version since the main conclusions are now inferred from the trajectory analysis: this is done to simplify the argumentation flow and to clarify the result interpretation. - The discussion and conclusion on the results are completely rewritten.

Answers to the reviewer8217;s comments:

1./ The new analysis improves the data interpretation and convection can now fully explain the observed cloud. A wave structure is clearly seen in the BSR data and GWs can possibly modulate the BSR intensity. We agree that GWs can play a key role in cirrus formation (and maintenance). We tried to analyze the dynamical data from the SF4 flight (following for example the approach from Hertzog et al, J.G.R., 2003). Temperature profile shows a 1.5 K peak-to-peak oscillation below 10 km height. This has a low impact on the RHI that is mainly sensitive to convective hydration. Unfortunately, data between 10 and 11 km height are not available since ballon started its descent. The horizontal wind could be inferred from balloon position but we consider it is too noisy to filter a wave signal and to estimate the phase relationships. For the above reasons we consider that GWs role on cirrus formation and maintenance on that case study cannot be proven as mentioned in the conclusions. Moreover the dynamical analysis of the model results in the revised version indicates that the observed cirrus formation happens in convective outflows. The gravity waves generated by convection could be an

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explanation of the wave-like pattern on the lidar observations but are not responsible for the cirrus formation.

2./ This point is fully considered in the general comments.

3./ The point raised by the reviewer is not completely clear to us. To our opinion, the role of transport in cirrus generation is considered in the trajectory analysis and the wind zonal variability impacts mainly on the longitude distribution of the cirrus clouds (as seen in Fig. 7). In fact, SACZ induces the convergence of air masses coming from older convective outflows.

4./ The discussion on the large scale tranport during SF4 and its impact on water vapour and chemicals ditributions is not included in our revised version since it will be in the revised version of G.Durry paper to appear in the same issue.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 6737, 2007.