

## ***Interactive comment on “The time-space exchangeability of satellite retrieved relations between cloud top temperature and particle effective radius” by I. M. Lensky and D. Rosenfeld***

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The authors would like to thank the referee for his constructive criticism of this paper.

1) In the last paragraph of page 11915, it is said ‘The lower/higher percentiles represent the younger/older elements at that height.’ This statement is not obvious to me. In fact, I wonder whether this statement is compatible with the ergodicity assumption. Please provide a more-than-one-sentence argumentation here.

We use several hundreds or even thousands of pixels to build the T-re plots. Therefore these plots have some statistical nature that takes into account the natural variability in the area that is analyzed. We added the following text to clear this point and the meaning of the 15th, 50th and 85th percentiles that are usually presented on the T-re

plots. In addition to avoid confusion from the readers, we changed the re of figure 4 (figure 5 in the ACP) from 15th percentile to the median as is in the other figures. We added the text that is quoted here in response to comment 3 of referee 1.

2) In the first paragraph of page 11916, the authors discuss the stability of the T-re relationship over time. It is said that the relationship is stable, although a trend can be observed during the day. This is contradictory. I suggest to state first that a trend is observed, quantify it, and then discuss that the trend magnitude is small in regards to the signal that is observed.

We changed the text according to the reviewer's recommendations.

3) Bottom of page 11916, the behavior of cell 708 is discussed. It is said that T increases by 20 C as re drops to 27 &#956;m. I do not see the increase in T in the figure. Besides, the drop in re is only for a single time step. I wonder whether this may be due to noise in the retrieval.

There was an error in the text. We changed the algorithm that takes into account the CO<sub>2</sub> absorption in 3.9 &#61549;m, and this affected the retrieval of the re, so we had to redo all the cell tracking, and plot all the figures.

4) The main message of the paper is that the mean T-re relationship derived from a single snapshot (as shown for instance in Figure 4) is similar to the T-re relationship obtained from the analysis of a single cloud evolution (data in Figure 5). Yet, because Figure 5 uses a temporal axis, it is not easy to be convinced that the T-re relationship is the same as in Figure 4. I wonder whether it would be possible to provide the time evolution of a single cloud on the same scales as Figure 4 which would permit an easier comparison.

We changed figure 6 (now figure 7) according to the reviewers' recommendations. Figure 7 now shows a scatter plot of the T-re of the coldest pixel in some of the convective cells in areas 2, 3 and 4 that are shown in figure 6. An overlay of the median, the 15th

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and the 85th percentiles of 11:01 (red) and 14:01 (blue) are added.

5) The paper and its discussion is based on a single case study. Although I would agree with the authors that it provides a strong cases for the ergodicity hypothesis, it should be mentioned that the hypothesis may brake for other cases

We added a discussion where we expect the ergodicity to break down. It is provided here in the response to comment 2 of referee 1.

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Interactive comment on Atmos. Chem. Phys. Discuss., 5, 11911, 2005.

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