

Interactive comment on “Diurnal cycle of clouds extending above the tropical tropopause observed by spaceborne lidar” by Thibaut Dauhut et al.

Anonymous Referee #1

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The work focus on the use of the CATS lidar to look at stratospheric clouds. It provides a documentation of the diurnal cycle of these clouds over 5 regions of the tropical belt, during 3 summers (JJA) and 2 winters (DJF). Despite the interest of these clouds and the very attractive CATS dataset, I find the paper very light in terms of interpretation. This is currently only providing a documentation already available (as stated by the authors). There is no link with the diurnal cycle of convection (except a very very short mention to surface precipitation) and to the convective overshootings in general, while the regions that are sampled clearly link the observed clouds to the convective activity of the tropics. I thus propose a major revision : as it, the study do not bring something really new, except the view proposed by CATS. This study could be very valuable if the link to convection, and its diurnal cycle, was made.

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Other comments - The first section is strangely organized : I suggest to start with the current 2nd paragraph (starting with "Low-stratospheric clouds impact (...)", ending with "evolution of such clouds") and then continue with the current 1st paragraph. The idea would be first to introduce the scientific question (low stratospheric clouds & their impact on the atmosphere) and second to present the way it will be looked at (space borne lidar).

- At the end of the first section, the CATS lidar is quickly mentioned. Since the CALIOP lidar is mentioned earlier, in the same section, it is not clear why to use CATS rather than CALIOP. The reader has to go to section 2.1 to understand why CATS is used. So a paragraph stating clearly the issue (obviously related to the 1:30pm/1:30am sampling, giving very few information on the diurnal cycle) with CALIOP is missing in section 1.
- Section 3 : If I count correctly DJF2015 does not exist since the CATS data start in Feb 2015. So there are 2 DJF and 3 JJA.
- Section 3: the word "level" is used from time to time instead of "altitude" (lines 139; 171). Please use "altitude" when it is adapted. The term level is too vague.
- Section 3 / lines 147 to 175 : 3 paragraphs are dedicated to evaluate the distributions found with CATS with respect to previous works performed with other instruments (HIRDLS - by the way, please expand : the reader don't know this one; CloudSat and SAGE-II). As underlined by the authors, it is difficult to compare the values obtained with the mentioned papers since they don't look at the same period. So the year-to-year variability explains largely the differences. That is why I don't understand the structure of these 3 paragraphs. The year-to-year variability should be written at the beginning, to explicitly say that the numbers found cannot be compared, and then go to the specificities of each instruments to explain the differences (occultation, radar, etc..). Now it is too repetitive. Also, I wonder if there is no diurnal cycle studies of these clouds performed using ground-based lidar. Is that so ?
- Fig 2: please add DJF/JJA at the top of the panels as a quick reminder. Also, the



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color code for the lines should refer to the color code of Fig 1 : blue for oceanic regions / land for orange regions. This would make a more logical reading of the figures. Also, I don't see why the day starts at 8am. Is there a particular reason for that ? If there is no specific reason, then it should start at 0:00.

- line 186: it is stated that all regions present a secondary peak at 0-1LT. The Equatorial Africa doesn't have a secondary peak, while for the North Warm Pool, the 1:00LT peak is the first peak in terms of intensity. Please revise.
- Figure 3: the darker color for the very small values of % makes the reading of the figure difficult. Please put white when it is 0, so that the small values of % can still be readable. I have the same comment than for fig 2 and the start of the x-axis at 8am.

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