First of all, we would like to thank the three referees for their thoughtful and constructive comments.

Responses for referee 1

Specific comments

1. This comment was addressed by adding a phrase about the driving factors of the transition in the abstract, by modifying the 4th and the 5th paragraphs of section 3.2 ("Our results ...") and the phrase on line 6 page 23605.

2-3. We thank the referee for pointing out these unclarities concerning the analysis presented in section 5. Section 5 was rewritten to address these concerns, as well as the points raised by the other two referees.

4. Our reasoning for including the LWP in the appendix and for not showing other properties which are likely of being affected by errors (such as the cloud top height) was that we wanted to give the reader an overview of the properties of the transition that we considered as the most reliable. We did not want to burden the story line with details about measurements errors or differences between various satellites. Though we agree that they are extremely useful, the comparisons between different instruments were however beyond the scope of the present paper.

We had looked at the cloud top temperature (CTT) from MODIS. However, we decided not to include it the paper as it only reflects MODIS biases and not the real evolution of the CTT during the transition. Thus, MODIS Level-3 data are showing a gradual increase in the CTT during the transition, which is contrary to what one would expect. Indeed, due to surface contamination, MODIS is considerably overestimating the CTT for all scenes with a cloud fraction inferior to 0.9 (Zuidema et al. 2008).

We extented now Appendix B to include a discussion of other properties of the transitions which are more challenging to measure from satellite-based sensors, i.e. LWP, CTT, GPCP precipitation and aerosol optical depth.

5. The basis for considering the ERA-INTERIM wind divergence in our analysis was the founding of Stevens et al. 2007 (On the structure of the lower troposphere in the summertime stratocumulus regime of the northeast Pacific, MWR) that there is a satisfying agreement between QuickScat and the reanalysis fields of wind divergence.

We are aware about the AIRS products, and we know that they are high quality products for the upper-troposphere, but at the time the study was performed we hadn't found enough evidence that they are also better than the reanalysis for the lower troposphere.

Technical corrections

Abstract: We replaced "opens new" with "highlights interesting"

Section 2. This formulation was changed in the revised manuscript.

Section 2. At the time the study was performed we decided to focus on the most classical 4 regions where a transition is expected. In retrospect, we could have looked at the Australian region too. However, given the similarities in the dynamics across the regions we analyzed we do not expect that the inclusion of this region in our analyze would affect our conclusions. We mentioned this in the revised manuscript, in the last paragraph of the introduction to section 2. We also replaced in the manuscript expressions like "all the regions" (where the transition appears for e.g.) with "the four regions that have been examined in this study".

Section 2.1 HYSPLIT uses the reanalysis wind fields to compute three-dimensional air parcel trajectories. As far as we are aware, it is not possible to use mean wind fields to compute 2-dimensional trajectories with HYSPLIT. At the time the study was performed we had however checked that the results were not sensitive to the initial height chosen for the air parcels, as long as this is not very close to the surface. That explains our choice of the altitude of 200m as an initial level for all the trajectories performed in this study. We also checked that at the end

of the six days most of the air parcels remain in the boundary layer (for more details see our answer to the second comment of referee 3). This is now mentioned in the revised version of the paper.

Section 2.2.1 The divergence showed in figs. 3 and 5 is the average divergence in the boundary layer (up to 900 hPa). This is now stated in section 2.2.1.

Section 2.1. We chose to initiate the trajectories at 11 LT as this is approximately the time of Terra overpass, so we dispose of MODIS measurements of cloud properties at the beginning of the trajectories. We specified this in the revised manuscript (first paragraph of section 2.1).

Section 2.2.3 We agree with the referees opinion that GPCP dataset does not give useful information for the shallow boundary layer clouds. In consequence and we will only mention in Appendix B that :
Although it identifies rather well precipitation from medium and deep convection, GPCP data is not capturing as well the much weaker precipitation typical for shallow boundary layer clouds, and hence it does not supply useful information concerning the changes in precipitation rate during the bulk of the transition in cloud fraction (the first three days).
The figure 2b is moved in the appendix B (fig. B1b) and figure 4b is removed from the paper.

Section 3.1.1. As we removed the analysis concerning the AOD from the revised manuscript and we just mentioned it briefly in Appendix B (in order to address the last comment of referee 2), we removed as well the discussion concerning the backward trajectories initiated at 2000m. Moreover, a more careful analysis of this set of backward trajectories (performed to answer the second comment of referee 3), showed that these trajectories come from different levels equally situated within and above the boundary layer, which raises the question of their meaningfulness.

Section 3.1.2 Yes, the backward trajectories last also 6 days. Section 2.1 was now restructured so that this information comes out more clearly. We also added thickmarks on the backward trajectories performed within the boundary layer showed in Fig.1.

Section 3.1.2 In the other regions, i.e. SEP and NEP, the time axis is shifted only by 1 or 2 hours, as the median CF at the initial time for these regions is basically identical with the one of SEA. That is why the adjustement is practically invisible for these two regions. However, it is true that as this is not essential, we removed the mention "and other" from the text in order to not confuse the reader.

Section 3.1.2 We replaced that expression by "the cloud fraction undergoes" (line 5 page 23598)

Section 3.2 This paragraph was rewritten in the revised version.

Section 4. We would like to thank the reviewer for pointing this out. At a more careful look we realized that if we rescale the time axis such as the fast, the slow and the entire set of trajectories for NEP start with the same median LTS, the remaining spread in cloud fraction is mostly explained by the differences in term of free-tropospheric humidity (Fig. 1 and 2 here). This discussion, as well as Figs 1a and 2b and 2e were included in the revised manuscript (new Fig. 6). Section 4 was entirely rewritten in order to bring out more clearly the main ideas and to include this new information.

Section 4. This comment was included in the revised version of section 4.

Section 5. Section 5 was rewritten to address the concerns of all the referees.

Section 6. The lines 16-20 on page 23605 were rewritten as:
Indeed, our analysis emphasizes thus that in most important respects the climatological transition is representative of individual transitions in cloudiness for periods when the transition is the most likely to happen and regions where the circulation is extremely steady.

Figures 2 and following. Indeed this is true for NEP and it will be mentioned in the revised manuscript as: "y-axis labels values at the initial time, after 3 days ad respectively at the end of the median trajectory for NEP".

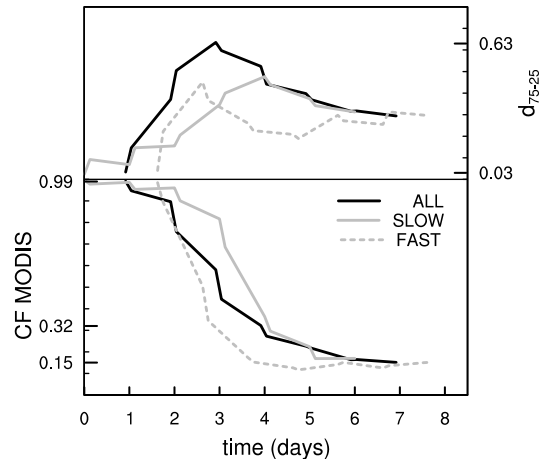Appendix B. The two typos were corrected in the revised manuscript.

Figure 1: Same as fig. 4 of the revised manuscript, but with the time axis rescaled so that the slow, the fast and the entire set of trajectories start with the same median LTS.
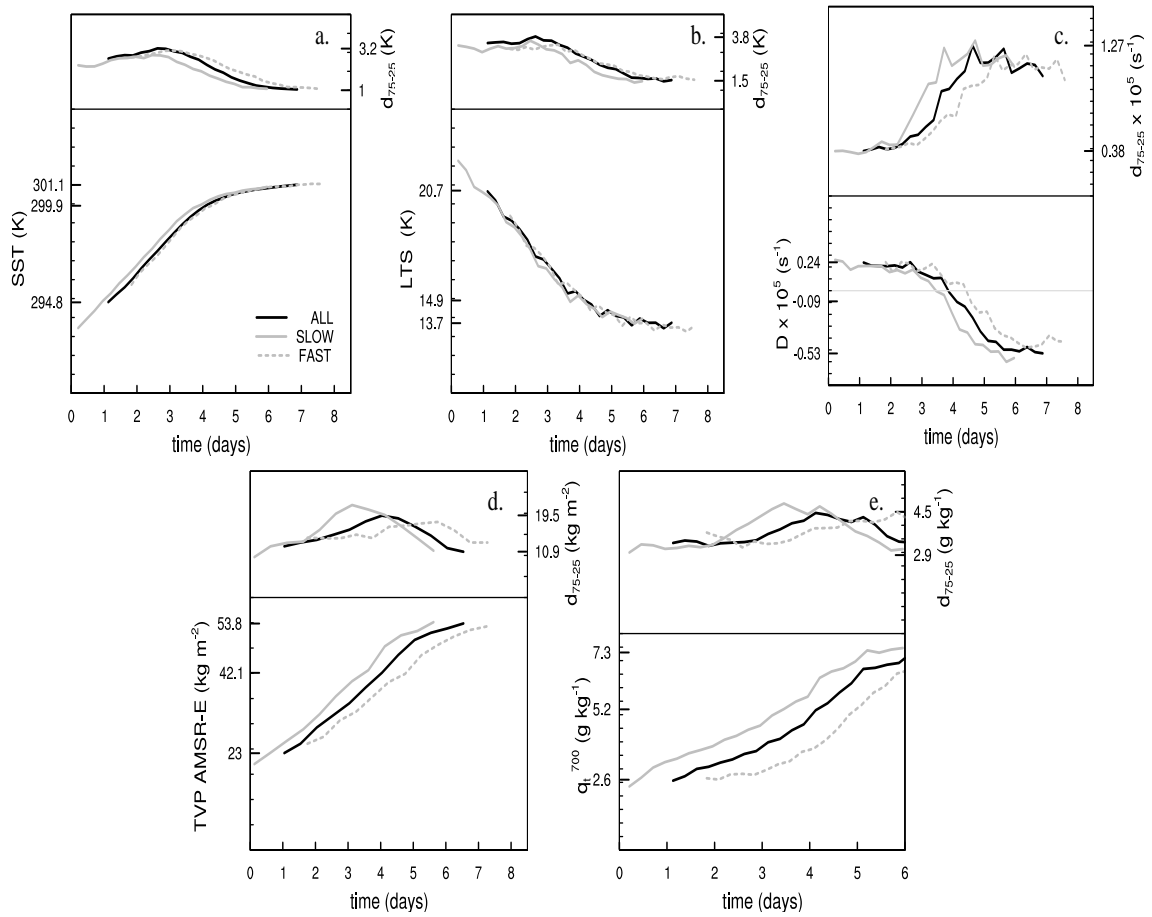
Figure 2: Same as fig. 5 of the revised manuscript, but with the time axis rescaled so that the slow, the fast and the entire set of trajectories start with the same median LTS.