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

Responses for referee 3

Issues and questions

1. This comment was accounted for in the revised manuscript (second paragraph of the introduction).

2. Section 2.1. was revised to address the unclarities pointed out by the referee. Moreover, as we decided to remove the discussion of the aerosol optical depth, we also withdrawn the discussion of the backward trajectories initialized at 2000m from the revised manuscript. The decision to remove the discussion of this set of backward trajectories was also motivated by an analysis of the time evolution of the altitude of these air parcels. This analysis showed that the air parcels do not necessarily come from the free-troposphere, but they are equally probable to come from both the boundary layer and the free-troposphere (not shown).

We also examined the distribution of the air parcels' altitude along the forward and the backward trajectories initiated at 200m. The median altitude of the air parcel is located within the boundary layer during the six days, for both the forward (left) and the backward (right) trajectories initiated at 200m (bottom panels of Fig. 1, derived for the set of trajectories analyzed for NEP). The probability distribution of the air parcels' altitude at the end of the forward trajectories (T0+6 days, top left panel) indicates that most of the air parcels are still in the boundary layer (i.e. approx. 2000m) after six days. Similarly, for the backward trajectories, most of the air parcels come from the boundary layer (T0-6days, top right panel). Similar results were found for the other regions. This findings were mentioned in the revised version of Section 2.1 (last paragraph).

The way in which spatial uncertainties related to the computation of trajectories may affect a Lagrangian analysis such as the one performed in this study are discussed by Mauger and Norris (2009). According to Stohl et al. 1998 the error in the air parcel position is of approximately 20 % of the distance traveled, but such errors are difficult to quantify precisely. Mauger and Norris (2009) estimate that the errors related to the computation of trajectories are not likely to be systematic and will thus be reduced by compositing over a large number of trajectories. Moreover, in our case, when we estimate the cloud or the environmental properties along the trajectories we always average over all grid boxes within 1 degree of the air parcel position, so that we partially account for the spatial uncertainties inherent to the computation of trajectories.

3. The criterion used in section 4 for distinguishing between the fast and the slow transitions is the average of the cloud fraction (Terra and Aqua) over days 0, 1, 2 and 3. As suggested by the referee we tried other criterions, namely the average of the cloud fraction over days 0, 1 and 2, or the average of Terra and Aqua for day 2 (due to the plotting convention day 2 on the graphs corresponds in fact to the 3rd day). In all the 3 cases the slow/fast transitions correspond to the 25 % of the trajectories having the lowest/highest values for the chosen average cloud fraction. The differences between the two subsets of trajectories do not appear to be sensitive to the criterion used to define the fast and the slow transitions (Fig.2, which a repeat of figs 4, 5a,b,c,e from the revised paper, Fig. 3 for the average cloud fraction over days 0,1,2 and Fig. 4 for the average cloud fraction over day 2).

4. We agree that the GPCP data set does not bring essential information about the changes in precipitation during the first three days when the transition takes place. In consequence, we decided to remove the discussion of the GPCP precipitation from section 3.2 and to only mention it in Appendix B.

5. This is a very helpful point, we agree that the similarity between the lagrangian and the eulerian views of the transition, if not unexpected, was at least hoped for. Section 5 was revised in order to address the concerns of the three referees.

Minor editing

These typos were corrected in the revised manuscript.

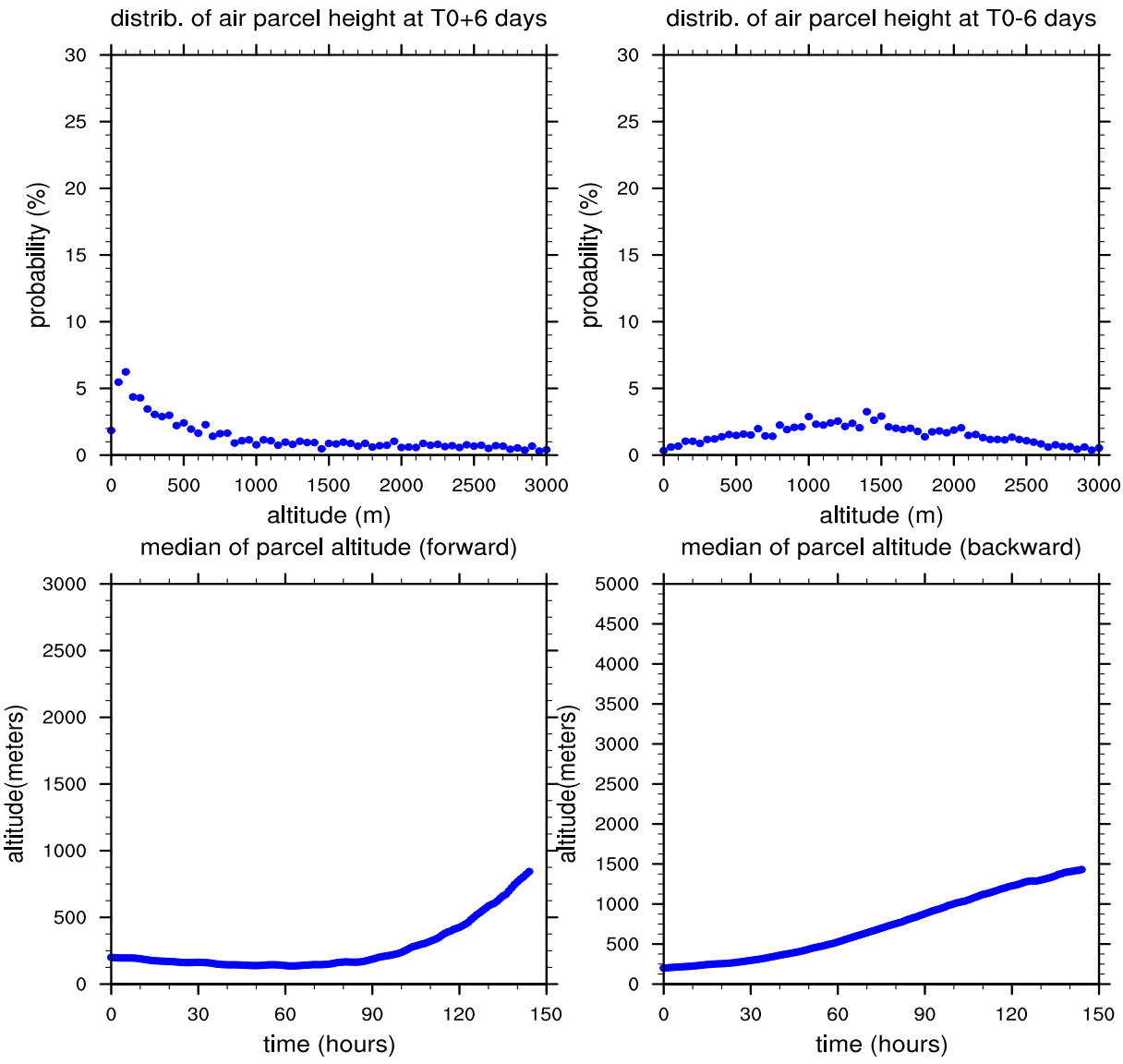

Figure 1: Probability distribution of the air parcel's altitude at the end of the forward (top left) and the backward boundary layer trajectories (top right) analyzed for NEP. Time evolution of the median altitude of the air parcels along the forward (bottom left) and backward trajectories (bottom right) analyzed fo NEP.

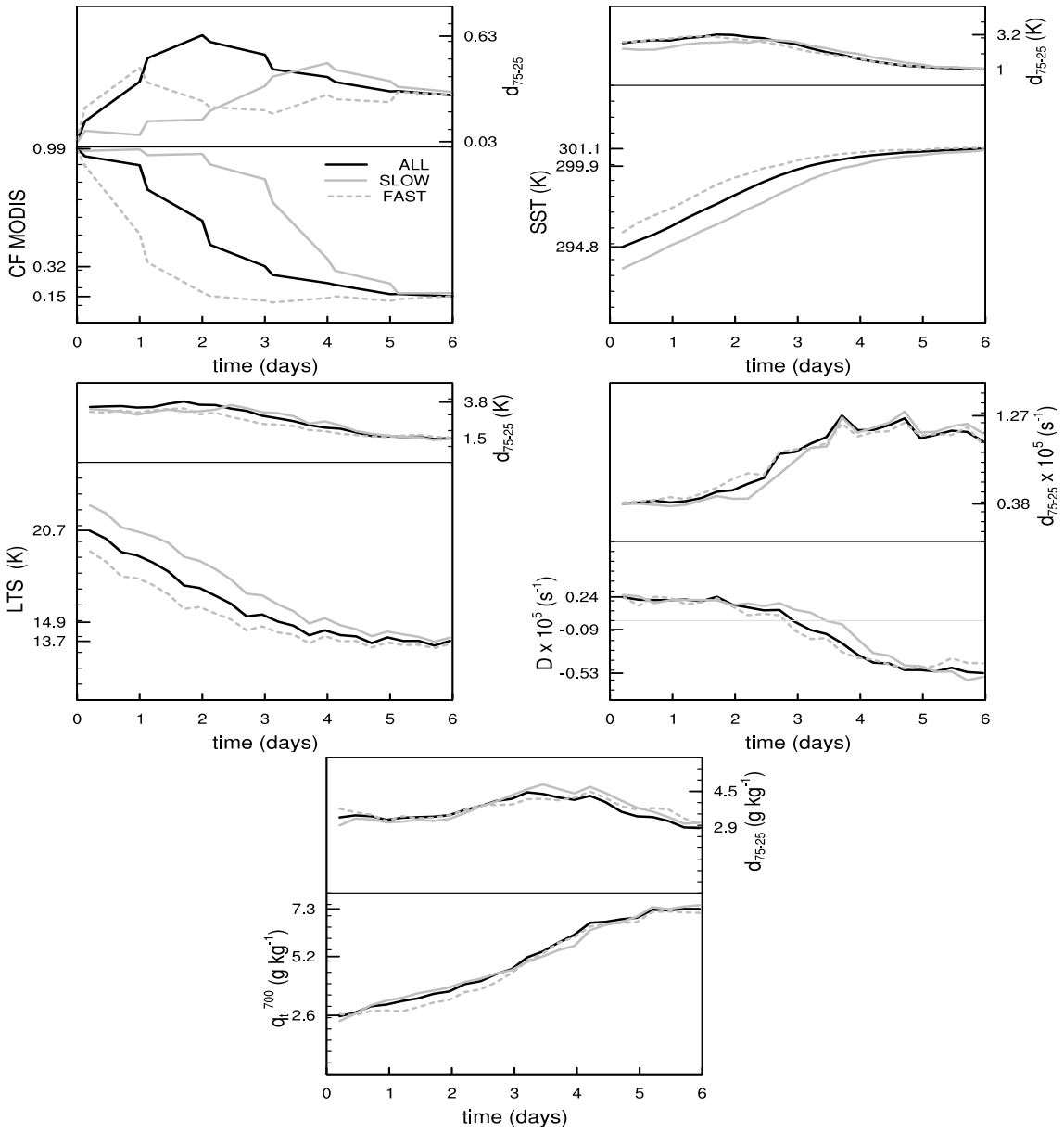

Figure 2: A repeat of figs 4, 5a,b,c,e from the revised paper, obtained when we use the average cloud fraction over days 0,1,2 and 3 to select the fast and the slow transitions.

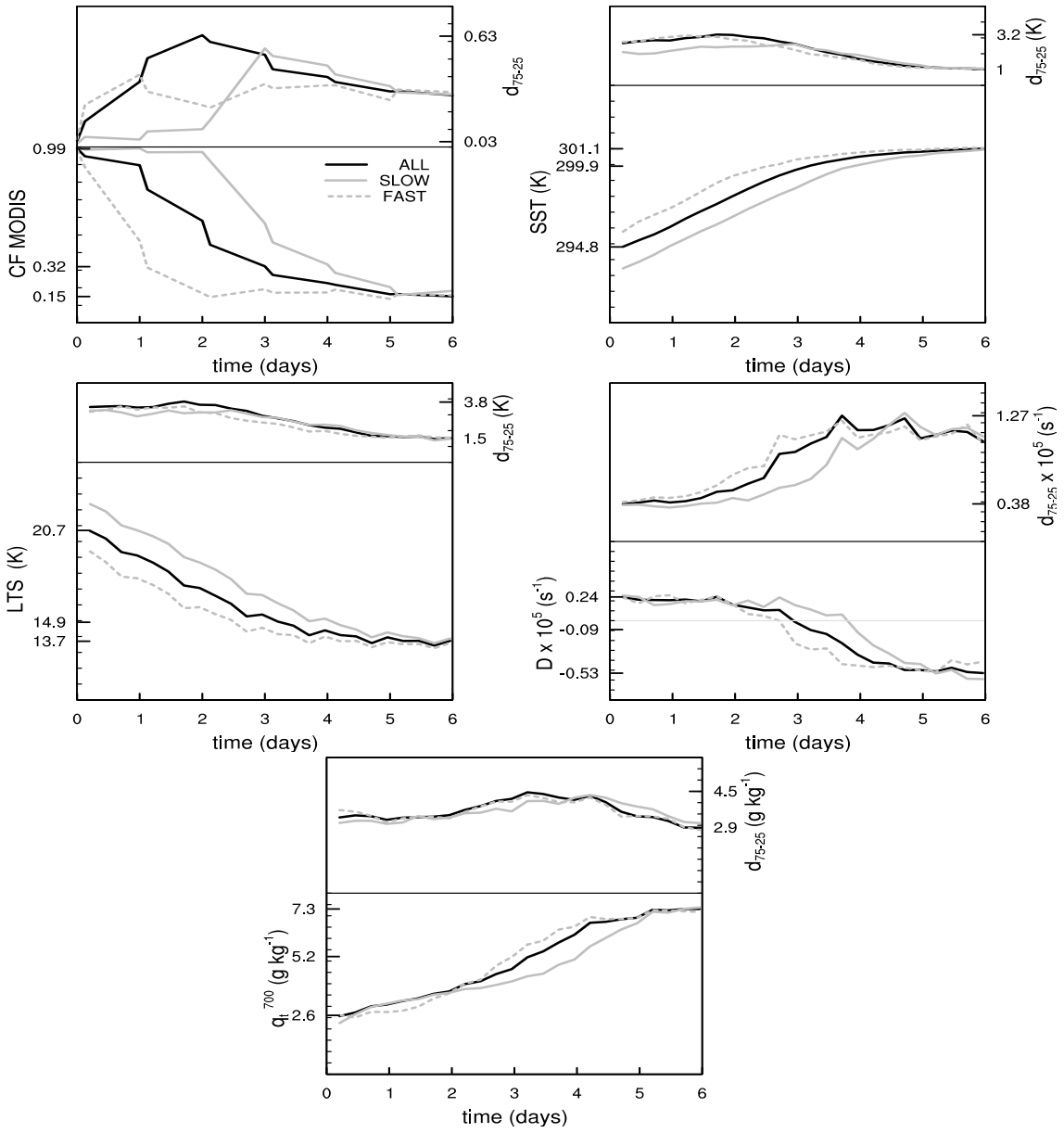

Figure 3: Same as Fig.2, when we use the average cloud fraction over days 0,1 and 2 to select the fast and the slow transitions.

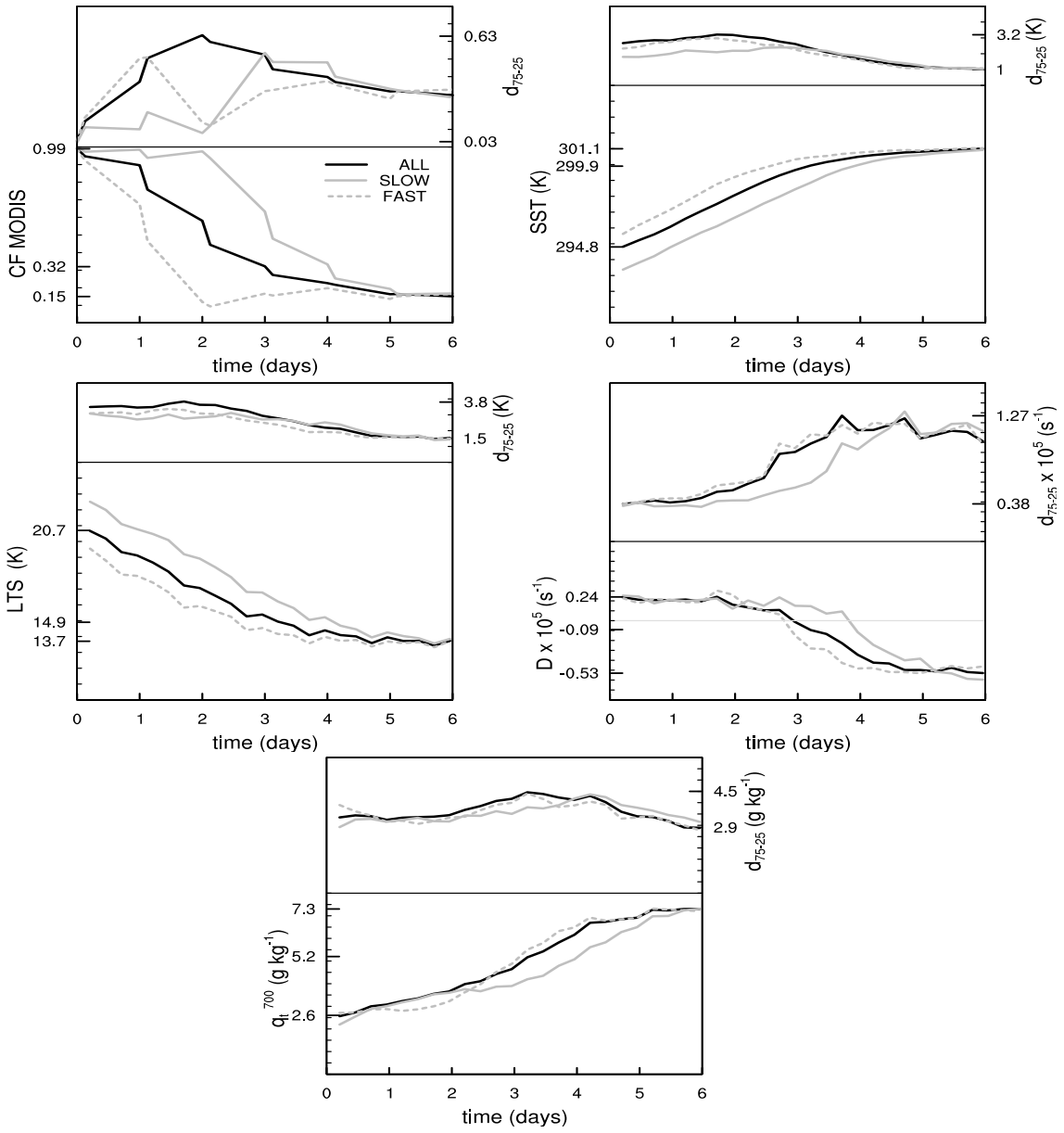

Figure 4: Same as Fig.2, when we use the average cloud fraction over day 2 to select the fast and the slow transitions.