Response to the Anonymous Referee #3.

We express our sincere gratitude to Anonymous Referee #3 for the positive review and useful remarks on the manuscript.

L291 Please provide a reference in support of this statement.

References to Moyer et al., 1996; Hanisco et al., 2007 have been added here

L303 What number of convective clouds are identified in each case? It is too hard for the reader to integrate by eye the proportion of convective hits over the wet parcels for each flight. e.g. From Fig S3, F1, F5 and F6 appear to have very few wet parcels exceeding 1 standard deviation. I am surprised they appear to have identified as many convective cloud intercepts as other flights. Also, I presume F8 isn't shown in Fig 5 for this reason (no wet parcels along the flight track) but it should be explained somewhere.

As a matter of fact, nearly all the parcels sampled in the CLS have convective encounters along the 30-day trajectories. The trajectories from each data point come from several, possibly many, sources and the results presented are a statistics over these 1000 trajectories. This way, the fraction of convective hits for each 1-second sample provides a quantitative estimate of the likelihood of a parcel to originate from a convective cloud. What is evidenced by Fig. 4, 6 and S3 is that the distribution of wet-and-heavy parcels in the theta-H2O space is qualitatively correlated with the distribution of parcels originating from deep convection (represented by high convective hits fraction).

The fraction of wet-and-heavy parcels above the CPT varies from one flight to another. We have added the following text into the first paragraph of Sect. 4.2: "The fraction of wet-and-heavy parcels to all parcels sampled above the local CPT varies from 0.5% (F6) to 11% (F2) between the different flights. No wet-and-heavy parcels have been detected in F8, which is why it is not displayed in Fig. 5"

L310and L317 Reading is made harder by occasional forward references in the early results sections, particularly L310 and L317. Please reconsider the use of forward references. I would suggest mentioning the convention of labelling hydration events when you point to Supplementary Fig. S4 near L306, rather than referencing forward, since that is where the reader is currently expected to look if they want to see individual moist features.

The hydrated feature labelling convention has been re-introduced into Sect. 4: "The results for the individual flights are provided in Fig. S3 of the Supplement. The hydrated features (layers of enhanced water vapour, exceeding 1-σ of the campaign ensemble) are denoted throughout the article as *Ax* or *Bx*, where *x* is the flight number.

L330 This sentence is hard to follow. Can the text please specify the flight paths being referred to? Does it mean the paths taken by F1-F7? Or is it referring to F1,F2,and F4 being over Nepal? Perhaps I misunderstand, but F3 seems an obvious exception to the flights F1-4 during the warm/wet period. I am not sure that the argument about intercepts in space can be separated from the impact of time differences.

The sentence refers to all the flight shown in Fig.5 and the message here is that the wet-and-heavy parcels sampled along the flight tracks are mostly restricted to the northern part of the flight domain,

i.e. north of 25 N. The only exception is F7, in which a hydration feature was detected at 22-23 N. Some clarifications have been added to the text.

L343 I found the shift of terminology from 'period' to 'regime' unclear. This is first use of the word regime even though it refers back to section 3 where 'period' is used (and section 3 heading uses 'mode'). Suggest rephrase introduction of the word regime here, or a more consistent terminology introduced in Section 3.

The term "mode" is now used throughout the manuscript.

L364 A2 must also be displaced horizontally, which is not shown in Fig 6. How extensive is that? Is it conceivable that such a body of air remained intact after 5 days? You could test this by calculating a series of back trajectories released from vertical and horizontal positions between A2 and B2. Or perhaps more precisely, forward trajectories, allowing for ice settling, from the suspected original convective event for B2. This is a point of interest, I do not expect any revision for this.

A2 is indeed displaced horizontally. Given the aircraft cruising speed of 180 m/s, the distance between the A2 midpoint and B2 peak H2O mixing ratio, as can be inferred from Fig. 6c, is about 250 km. However, since A2 and B2 are separated by 500 m in altitude (or 9 K in potential temperature), their back trajectories are substantially different: those for A2 lie closer to the AMA center.

L467 It would be of general help to the reader to provide the summary with more backward references to specific results. In particular at L467, a reference to the analysis supporting this conclusion of a drastic drop of water vapour. It might be interpreted that all of Section 1 is relevant, but Fig 1 seems to be the key result for this sentence. It's also important so that a reader does not mix up this convectively-modulated temperature effect from convective lofting processes.

The paragraph has been reworked: "The warm/wet mode sampled during the early flights revealed substantial enhancements of water vapour mixing ratio reaching above 10 ppmv (twice the background) as high as 400 K (18.2 km) level, but very little evidence for dehydration upstream. By contrast, the second (cold/dry mode) period of the campaign with organized large-scale convection inside and close to the flight domain led to synoptic-scale CPT cooling and a drastic drop of water vapour by ~30% near the tropopause. We note though that the dehydration layer did not extend above 395 K, whereas in the upper layers, the excess of water vapour was subject to a transient phase transition, resulting in an outbreak of cirrus at levels up to 415 K (18.9 km). A similar inference was made by Brunamonti et al. (2018) on the basis of balloon soundings of water vapour and ozone in Nepal as part of StratoClim campaign in 2017. They argued that overshooting convection is responsible for an isolated maximum of H2O in the CLS observed in July 2017, whereas the water vapour minimum at the CPT level is caused by synoptic-scale cold anomaly above the southern slopes that maximized around 9 August."

Technical corrections: L221 typo 'shown' L335 'at' seems unnecessary. Remove? L367 The bibliography is missing Kim and Alexander 2015. A quick glance finds Muller and Peter 1992 also missing. Please double-check your bibliography is complete. Fig1 Figs 1c and 1d are in the reverse order compared to the text in the caption and main body. Correct the text or the figure order. Fig5 F5 appears to be incorrectly labelled as F4. Please correct. FigS4 The hydrated feature for flight 5 is marked A7. I think it is meant to be A5?

All done.

Fig5 Refers to a hydrated feature C2 but is not mentioned. Please clarify. Is this associated with the ice cloud identified in Fig 6? Or is it meant to be hydrated feature A3 (as the colouring suggests)?

C2 (now referred to as C2*) is associated with the ice cloud identified in Fig. 6. The annotation marks the location of the source convection, which happens to coincide with that for A3.