

Author responses are in blue text.

The revised manuscript is much more logical and easier to follow and the figures easier to interpret. There remain just a few places where I feel the wording is somewhat inaccurate, and I have flagged these below. Otherwise, my only remaining suggestion of significance is that the paper synthesize its main findings in a way that highlights the value of the deuterium excess measurements. Why should we as a community make d-excess measurements in addition to more traditional meteorological ones? What value is gained in having not just the individual isotope ratios but d-excess as well? The conclusions might, for example, touch upon the following points:

- D-excess appears to do a better job distinguishing mixing from Rayleigh processes in the FT of the CLR day.
- Only d-excess identifies the potential role of cloud in moistening the inversion layer during the STC day.
- In comparison, both d-excess and the individual isotope ratios are able to distinguish which air masses are mixing (interacting) on the DBL day.

We appreciate the reviewer pushing us to further clarify the value of these measurements to the atmospheric science community. This is an excellent opportunity and we've expanded the conclusions to highlight this value.

P1, L27: It is not obvious to me what “moist processing” and “transport mixing” imply. Should this read “water phase changes, transport, and mixing?”

We have made the suggested substitution.

P2, L4: I suggest removing “dynamic, mesoscale” as climate feedbacks are usually regional/global.

We have removed “dynamic, mesoscale”.

P2, L29: Possible typo? “Variability in...co-vary?”

Great catch, we have modified this sentence.

P3, L7: Satellite retrievals do provide HDO/H<sub>2</sub>O profiles outside the middle troposphere. The challenge with using them is the low spatial resolution in the vertical and lack of signal when clouds are present. Also, without H<sub>2</sub>18O/H<sub>2</sub>O, there is no way to estimate d-excess.

Thank you, we have modified this sentence to make some of these distinctions.

P4, L33: Should LGR be the low-pass filtered timeseries if it has longer residence time (thus lower bandwidth) than Picarro?

This sentence was misinterpreted. We did not apply a low-pass filter to the data. Rather, the longer residence time (slower flow and larger optical cavity) smooth the temporal signal in the LGR compared to the Picarro. We have rewritten it to improve clarity.

Eqn 1: Should H<sub>2</sub>O<sub>v</sub> in numerator also have a “Ray” subscript?

We have added “Ray” as a subscript for clarification to H<sub>2</sub>O<sub>v</sub>.

P 7, L18-19: Consider removing the last sentence. I’m not sure this is sufficiently substantiated.

We have removed the indicated sentence.

P9, L32: It’s not clear to me why mixing plots don’t provide insight into the Z<sub>FT</sub> minimum. It seems they indicate mixing of FT and BL each with a distinct third end member (cloud influenced air?). Consider rephrasing/removing.

We have clarified this sentence so that it reads that the mixing lines do not identify the source responsible for the d-excess minimum at  $z_{FT}$ .

P10, L40: It is not clear to me that turbulent conditions are expected during formation of shallow stratocumulus. Some of the discussion in this section seems rather speculative.

We have reworded this section so that it is clear that a key characteristic of stratocumulus clouds is the cloud-top longwave cooling that maintains and enhances in-cloud turbulence (pg 10, ln 33-34).

P12, L25: Perhaps clarify that the mixing line connects with “lower altitude” delta values also observed during VP3.

Thank you for identifying this; we have clarified this sentence.

Figs 3-4: Captions should note that isotope values from profiles are shown as a function of water vapor concentration.

We have added that the delta and d-excess signatures are plotted versus  $H_2O_v$  mole fraction.

Fig 6: Measurements in BL, INV, and FT are not indicated for reference but are the main point of the figure. This line can be deleted.

It should read the altitudes of BL, INV, and FT are indicated for reference. This is edited.