Note: The comments are in black, and our replies in blue.

Major issue:

The reworking of the manuscript has been carefully done, however there is still a major issue with the findings presented. As correctly mentioned by Reviewer 3, the moisture source conditions were not diagnosed in an event-based manner, meaning considering the exact location and timing of the uptake, which has been shown to be important in the state-of-the-art of the literature (e.g. Sodemann et al. 2008, Pfahl et al. 2008, Aemisegger et al. 2014, Aemisegger, 2018, Weng et al. 2021). To diagnose the RHsst at the moisture source, the conditions at the time and place of the uptake need to be diagnosed, not the climatological conditions or the conditions in the last few days before arrival. The RHsst has been shown to be highly variable over tropical regions due to dry intrusions, trailing cold fronts, cold pool activity and convective cells (Villiger and Aemisegger, 2024). In this respect the text in the methods in Section 2.4 as well as Fig. 5 and the analysis around it are confusing. The RHsst or the needed variables to compute it have to be traced along the trajectories to take into account the "time lapse" between moisture source conditions and arrival at the location of the measurements, where the observations are done. Since the authors have implemented the moisture source diagnostics, the step for diagnosing moisture source conditions is not a big one and should really be taken to be able to draw robust conclusions. Details on how to implement the moisture source conditions diagnostics are documented in Sodemann, 2025 as well as the papers cited above.

Re: We sincerely thank you for your further guidance on our manuscript. We agree with you that explicitly diagnosing the RH_{SST} at moisture sources would strengthen the robustness of our conclusions. During the previous revision, we conducted a preliminary analysis of the weighted-mean upstream RH and found no meaningful correlations with *d*-excess, which is why these results were not included at that time. Following your suggestions, we have now explicitly diagnosed a set of RH-related variables corresponding to each *d*-excess observation. The description and method for diagnosing these RH-related variables are detailed at L169-L174 in the revised section 2.4:

"To investigate the relationship between vapor d-excess and relative humidity (RH) at moisture sources, we diagnosed a set of RH-related variables. The RH^{source} is the weighted-mean RH at locations where within-boundary-layer moisture uptakes occur by weighting the individual within-boundary-layer moisture contributions. The RH^{source_land} and RH^{source_ocean} are similar to the RH^{source} but only apply to within-boundary-layer moisture uptakes over land and ocean, respectively. The $RH_{SST}^{source\_ocean}$ is the weighted-mean RH_{SST} at locations where within-boundary-layer moisture uptakes occur over ocean by weighting the individual within-boundary-layer moisture contributions"

The corresponding results are now presented in Table 1 and in the revised section 3.3 at L301-L305:

Table 1: Correlation coefficients between *d-excess* and the RH-related variables for different seasons from 2015–2017. Values with significance levels exceeding 99%, between 99% and 95%, 95% and 90%, are in bold italics, bold, and italics, respectively.

	2015-2017 All	Nov-Apr	JJAS	May	Oct
RH^{source}	***−0.48***	***−0.24***	0.08	*0.27*	*0.23*
RH^{source_land}	***−0.17***	0.01	0.02	0.13	0.16
RH^{source_ocean}	***−0.23***	***−0.30***	0.02	0.04	0.01
$RH_{SST}^{source\_ocean}$	***−0.37***	**−0.17**	***−0.30***	**−0.35**	−0.16

"To further explore the relationships between d-excess and RH over moisture source regions, we analyzed the correlations between d-excess and the RH-related variables for all observations from 2015–2017 and during the four seasons (Table 1). Overall, d-excess is significantly negatively correlated with these RH-related variables at

moisture sources at the annual scale, whereas correlations during specific seasons weaken to very low levels. The strongest correlation is between d-excess and RH^{source} from 2015–2017 (r = –0.48, p < 0.01). Notably, correlations with $RH_{SST}^{source\_ocean}$ are weak overall (Table 1).”

If by implementing the moisture source diagnostics carefully, the authors still find no existing correlation between dexcess and RHsst, then they should discuss their findings in terms of other processes that have been shown in previous studies to interfere with this relation, in addition to the processes already mentioned an important factor is the influence of plant transpiration discussed in Aemisegger et al. 2014 to strongly affect the dexcessRHsst relationship. Furthermore, the resolution of the data used for trajectory calculation has to be discussed as an important factor in potentially masking an existing dexcess-RHsst at the source relationship.

Re: Our analysis reveals that even after conducting careful moisture source diagnostics of RH_{SST} at moisture sources, we find limited correlation between *d*-excess and RH_{SST} at moisture sources. In addition to the existing discussion in the manuscript, we have strengthened our discussion on plant transpiration and data resolution which may affect this relationship (at L445-L452 in the revised section 4):
“For example, Aemisegger et al. (2014) suggested that high transpiration contributions could lead to a lack of correlations between d-excess and RH_{SST}, as transpiration is non-fractionating under the steady-state assumption (Yakir and Sternberg, 2000). In addition, uncertainties associated with trajectory calculations and moisture source diagnostics, especially the resolution of the driven data, could also have an impact on the relationship between d-excess and RH_{SST}. While our study employs nested ERA5 and GDAS data with a resolution of 0.25°×0.25° from ERA5 in key moisture source regions, using coarser GDAS data does not alter our conclusions (not shown). However, higher-resolution data or regional high-resolution models could enhance the accuracy of trajectory calculations and reduce uncertainties.”

This major revision of the analysis is indispensable given how central the relationship between the dexcess and the source RHsst is in this paper. Furthermore, when rereading this manuscript, I realised that the English Language still needs significant improvement, please go through the text again carefully and use a copy-editing service.

Re: We sincerely thank you for your time and valuable suggestions again. Following your instructions, we have now explicitly diagnosed the RH_{SST} at the moisture sources associated with each *d*-excess observation. The manuscript has been professionally edited by highly qualified English-speaking editors at a commercial English language editing service to ensure proper grammar, punctuation, spelling, and overall style. An editing certificate is available upon request. After utilizing the copy-editing service, we have carefully reviewed the text to further refine and correct the English Language.

References:

Aemisegger, F., Pfahl, S., Sodemann, H., Lehner, I., Seneviratne, S. I., and Wernli, H.: Deuterium excess as a proxy for continental moisture recycling and plant transpiration, Atmos. Chem. Phys., 14, 4029–4054, https://doi.org/10.5194/acp-14-4029-2014, 2014.

Aemisegger F. On the link between the North Atlantic storm track and precipitation deuterium excess in Reykjavik. Atmos Sci Lett. 2018; 19:e865. https://doi.org/10.1002/asl.865

Pfahl, S., and H. Wernli (2008), Air parcel trajectory analysis of stable isotopes in water vapor in the eastern Mediterranean, J. Geophys. Res., 113, D20104, doi:10.1029/2008JD009839.

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Sodemann, H.: The Lagrangian moisture source and transport diagnostic WaterSip V3.2, EGUsphere [preprint], https://doi.org/10.5194/egusphere-2025-574, 2025.
Villiger, L. and Aemisegger, F.: Water isotopic characterisation of the cloud–circulation coupling in the North Atlantic trades – Part 2: The imprint of the atmospheric circulation at different scales, Atmos. Chem. Phys., 24, 957–976, https://doi.org/10.5194/acp-24-957-2024, 2024.
Weng, Y., Johannessen, A., and Sodemann, H.: High-resolution stable isotope signature of a land-falling atmospheric river in southern Norway, Weather Clim. Dynam., 2, 713–737, https://doi.org/10.5194/wcd-2-713-2021, 2021.

Re: We have studied these references and cited them when appropriate.

Small changes for clarity of the science:

1. L. 15: precipitation (instead of rain) – vapour interactions

Re: modified.

2. L. 17: due to anticorrelated seasonal cycles (instead of similar seasonal patterns)

Re: modified.

3. L. 23: replace dynamics by circulation changes

Re: modified.

4. L. 24: of shifts in moisture sources (instead of different moisture sources)

Re: modified.

5. L. 35 a shift in moisture source regions

Re: modified.

6. L. 42: that monsoon convection at upstream locations along moisture transport pathways

Re: modified.

7. Fig. 8 panel b upstream.

Re: corrected.