We thank Referee #2 for the review, which helps us to make the manuscript clearer, including a better description of the main objective of our study. The previous studies that the referee refer to are very useful as well. We thank also the referee to highlighting uncertainties in the ERA5 data. We have improved the investigation of the Bowen ratio (see our reply after the referee's comments below and related updated Figure 9 at the end of this document). Our answers below are marked with blue colours. In some of the answers, we refer to text belonging to line numbering related to the original version of the manuscript.

Referee #2

The humidity paradox: how drier conditions and fewer clouds amplify terrestrial warming due to global climate change, by Glantz et al

As the title suggests, this study aims to argue for an important role for drier conditions (in a relative humidity sense) and associated reductions in clouds to contribute to the relatively greater increase in warming over land compared to ocean. It does this by showing long term trend in a wide variety of surface energy and water balance related variables from ERA5 reanalysis and other datasets. Unfortunately, I think this study falls considerably short of providing a coherent, quantitative story to prove this point and instead reads more like a laundry list of trend analyses from these datasets, many of which have already been presented in prior work. I, therefore, do not think this paper meets the required standards for publication.

(1) My primary criticism is the lack of quantitative analysis to prove the connections that the authors are arguing for.

In addition, a detailed quantitative modelling analyses would be desirable, but is beyond the scope of the current study. Even so, ERA5 surface net solar radiation has increased with as much as ~7 W m^{-2} in both South America and over the areas in the Northern Hemisphere since 1979 (Section 4), caused by decreases in the cloud cover. This regional brightening exceeds the globally averaged human-caused greenhouse gas forcing of 3.8 W m^{-2}, accumulated since 1750 (AR6). Although the forcing of 3.8 W m^{-2} is a global average, much of the extra heat at present has ended up as increased ocean heat content (line 37 in the manuscript). Furthermore, *at* lines 501 – 508 in Section 3.5 we present results of the responses in cooling in infrared for South America and the areas in the Northern hemisphere. The corresponding quantitative impact on the surface energy balance is presented and discussed as well by referring to results presented in Figures 7c, 7d, 8c and 8d. In the middle of the third paragraph in Section 4 we discuss impacts from the perturbed surface energy balance on warming for the two investigation areas.

By comparing ERA5 reanalysis data against multiple independent, high-quality observational datasets, our methodology addresses possible reanalysis biases and establishes confidence in the trend analysis. We believe this is a robust, state-of-the-art approach for studying global land surface climate trends from 1979 onward. While individual trends of variables like humidity or precipitation have been studied in isolation, the aim with our study is to simultaneously evaluate ERA5 across three distinct earth system components (humidity, radiation, precipitation) using independent observations (HadISDH, CERES/CLARA-A3, GPCP/GPCC) to investigate a possible feedback loop driven by the accelerated ocean-land warming contrast. Investigating water vapor response to temperature directly addresses the Clausius-Clapeyron relationship, which gives an indication of possible moisture deficit over land. By analysing the Bowen ratio links moisture availability with temperature trends and a shift in the heat fluxes, which expose underlying mechanisms of land-atmosphere coupling, thus, whether available energy is used to evaporate water or heat the air (see our answer to the major concern, point 3, below).

To describe the objective of this study more clearly, we have included the following text at the end of Section 1: *The objective is to investigate a possible feedback loop between humidity, clouds, and solar radiation in the ERA5 dataset. Given the highly coupled nature of these variables, we employ a multi-dataset observational constraint framework to evaluate their co-dependent equilibrium trends. While individual trends of the current variables have been studied in isolation, the aim with our study is to simultaneously evaluate ERA5 across three distinct earth system components (humidity, radiation, precipitation) using independent observations (HadISDH, CERES/CLARA-A3, GPCP/GPCC) to investigate a possible feedback loop driven by the accelerated ocean-land warming contrast. Finally, we incorporate recent studies on rapid global land-warming to corroborate our findings."*

In the paragraph before the clarification of the objective, we have included the following change: *"Investigating the water vapor's response to temperature directly addresses the Clausius-Clapeyron relationship, which gives an indication of possible moisture deficit over land. By analysing the Bowen ratio between sensible and latent heat flux we link moisture availability with temperature trends and a shift in the heat fluxes, which exposes underlying mechanisms of land-atmosphere coupling, thus, whether available energy is used to evaporate water or heat the air."*

We have also included the following sentence in the beginning of Section 3: "*The comprehensive outcomes with a weak analysis are presented in this section, while the primary findings relevant to the present objective are discussed and contextualized in Section 4*."

We have as well changed the end of the manuscript (in Section 5) with this text: "*Given the highly coupled nature of these variables, we employ a multi-dataset observational constraint framework to evaluate their co-dependent equilibrium trends. By confirming that the ERA5 thermodynamic trends on the whole map cleanly onto independent satellite (CERES, CLARA-A3) and observational (HadISDH, GPCP, GPCC) products, our analysis method provides a physically consistent real-world footprint supporting the apparent humidity paradox.* Based on 36 climate model simulations, Qu et al. (2014) found that the response of low clouds due to climate change is the largest source of uncertainty driving differences in climate sensitivity between the models; *our observationally-verified trend analysis provides an essential empirical baseline to help constrain these model uncertainties. Overall, the topic requires more investigation. Even completely opposite trends in precipitation appear between ERA5 and GPCP/GPCC across various regions on Earth, particularly in Asia, North America and Africa (Section 3.6). In addition, this study does not isolate the initial trigger of the proposed feedback loop—specifically, whether surface humidity drops or cloud clearance acts as the primary driver*."

See also our answers to the comment below " The paper is extremely descriptive…", by the referee.

Trends are shown in many quantities, but many of these trends are already well established in the literature e.g.,

See also our answers above.

Humidity trends: Dunn et al. (2017) cited in the paper, Douville and Plazotta(2017) cited in the paper,

The Dunn et al study is based on ERA-Interim and HadISDH version 2.0.1.2015p data of the investigation period 1976-2005. In the Douville and Plazotta study, ERA-Interim data were investigated of the period 1979–2014. We are using the latest versions, ERA5 from ECMWF and HadISDH 4.6.0.2023f, which should be motivated to be used in our study. Based on the investigation period, 1979-2023, the present study capturing as well recent accelerated warming/drying anomalies that older studies missed.

Simpson et al. (2024) PNAS https://doi.org/10.1073/pnas.2302480120 not cited in the paper

Simpson et al. (2024) found a discrepancy between observed and model-based historical hydroclimate trends and conclude the availability of moisture to satisfy the increased atmospheric demand is lower in reality than in models in arid/semi-arid regions. The discrepancy is most clear in locations that are arid/semi-arid throughout the year, but it is also apparent in more humid regions during the most arid months of the year. The results in the present study are in line with increases in moisture demand. In our answers to the comment "The paper is extremely descriptive…" below by the referee we describe an obvious climate driver and positive feedbacks causing the increase in moisture/water demand at present. We have included the findings above by Simpson et al. after these sentences in the fifth paragraph of Section 1: "*CMIP5 (Coupled Model Intercomparison Project Phase 5) simulations, however, underestimate this decline in relative humidity observed over land globally (Douville & Plazzotta, 2017; Dunn et al., 2017*)."

Top of atmosphere radiation trends: The Loeb et al studies cited in the paper

The main result from Loeb et al. that we refer to in the manuscript is about a positive trend in the CERES TOA radiation imbalance since 2000 (see beginning of Section 4 and at the end of fifth paragraph in Section 1). In our study, we investigate, however, ERA5 TOA net solar radiation. See our answer to the next coming comment by the referee, concerning the related strong solar radiative forcing that has occurred over the land surface, which is consequently a large impact on the surface energy balance. This is in line with the changes in solar radiation at the TOA, identified by ERA5, CERES and CLARA-A3 (Section 4). In our answer in the first paragraph related to major scientific comments, denoted with point 6, by Referee #3 we motivate the comparisons of ERA5 radiation variables against CERES and CLARA-A3.

Downward shortwave trends at the surface: Wild et al. (2026) https://doi.org/10.1007/s00376-025-4534-2, McKinnon and Simpson (2025) https://doi.org/10.1029/2025GL119493

The comprehensive study by Wild et al. (2026) is about "dimming" and "brightening", with a concrete outcome of the situation in Chine: where opposite trends in aerosol loading have occurred during the current period that likely are the dominant effects on warming rates in China. We have included this study in the third paragraph of Section 1: *"In addition to internal variability, regional changes are forced by more heterogeneous perturbations, such as anthropogenic aerosols that temporarily mask greenhouse warming (Glantz et al., 2022; IPCC, 2021; Quaas et al., 2022; Wild et al., 2026)."* If there is another aim with this study, we would like the referee to be more precise about it.

Since the second study above is relevant for the present study, we have included the following sentence at the end of the sixth paragraph in Section 1: "*Substantial continental brightening from 1980 to 2024 with co-located reductions in total cloud cover were found over central United States, Brazil and central Asia, although no large trends in aerosol concentrations have occurred over the same period (McKinnon and Simpson, 2025)."*

Furthermore, we have included the following sentence in the third paragraph of Section 4: "*McKinnon and Simpson (2025) demonstrate that both the variability and trends in ERA5 surface* *solar radiation downward over land are in good agreement with high quality estimates from satellite and in-situ observations. Even so, the authors pointing out concerns in the data quality for ERA5 surface solar radiation in central Africa.".* The latter sentences have been included after this sentence in the original version of the manuscript: "*This may be explained by decline in snow cover (Sect. 3.5).".* See also our reply to the referee's comment below related to issues with Africa.

The paper is extremely descriptive with a lack of novel analysis or discussion to bring together the trends that are shown into a coherent story with a quantitative demonstration of the claim made in the title that reduced clouds associated with drier conditions are an important contributor to the amplified warming over land compared to ocean.

Since 1979, ERA5 surface net solar radiation has thus increased by about 7 W m^{-2} in both South America and over the areas in the Northern Hemisphere (Section 4), caused by decreases in the cloud cover. The strong solar forcing over land in addition to the enhanced absorption of IR-radiation are to a large degree available for sensible heat flux (Figures 5d and 7e) that warms the lower atmosphere directly. See our answer to comment l130 below by the referee, considering how a shift in the heat fluxes occurs due to perturbed water balance. In addition to reduced low cloud clover and total cloud cover, relative humidity has decreased over land globally (Section 3.4). Extreme negative responses in total column water vapour to temperature are found as well over land regions (Figure 9a, see updated figure below), which indeed are associated with drier conditions over land. For South America and southwestern North America, the decrease in precipitation is a strong likelihood indication of drier conditions and increase in water demand and consequently increase in the ocean-land warming contrast.

For the areas in the northern hemisphere, we also discuss and present results that show decreases in surface albedo (Figure 10), which are relevant for solar radiative forcing and the warming trends. The following sentence in Section 3.5 has been modified in regards to warming in Europe: "*A shorter period with snow covers likely explains decreases in the albedo over land and this is obvious for large part of Europe, particularly in winter*."

For the perturbed surface energy balance, part of the radiation absorbed by the ground is thus released back into space as upward infrared cooling (lines 84, 368, 492 and more). This negative feedback contributes to restore the altered surface energy balance. At the end of Section 5, we have included text, based on comments by Referee #3 (see major scientific comment, denoted with point 4), that describes a possible explanation, at least in part, for decreases in the clouds over land at present, thus, relevant for the negative feedback.

(2) ERA5 trends in precipitation, sensible and latent heat and radiative fluxes are presented without any acknowledgement that they are heavily influenced by the representation of processes in the underlying model.

We agree and the following sentence has been included at the end of Section 2.1. "*Variables like humidity, radiative fluxes and precipitation are not directly constrained by the assimilation of observations, they act as products of the underlying model physics. To asses them against independent observations is therefore essential to ensure their reliability*."

(3) Some statements are made about the reductions in atmospheric humidity being related to the lack of water vapor being transported in from the oceans because they haven't warmed as much. I don't think any evidence has really been presented to prove that this is the dominant factor as opposed to e.g., reduced evapotranspiration from the land surface.

In Section 1 (lines 127 – 124) we refer to Manabe (2019), who explain why shift in the heat fluxes occurs, an increase in sensible heat flux at the expense of late heat flux, for a perturbed surface energy balance caused by increase in absorbed IR-radiation in arid and semi-arid regions. This means reduced evapotranspiration at the land surface. In Section 4 (line 639) we mention the additional supply of absorbed solar radiation at present, thus, the forcing of 7 W m^{-2} in our reply above. This has caused an even stronger stress on the terrestrial water cycle than just absorbed IR-radiation. This is illustrated by the water vapour response to higher temperatures over land in Figure 9a (updated figure at the end of this document), where negative values regionally are extreme cases. Results of the water vapour response are also presented at many places in the manuscript and discussed in the context to findings in previous studies. This is reinforced by reduction in precipitation that appears regionally in the present study. Reduced evapotranspiration is discussed on lines 656 – 657 in Section 4 and in combination with findings of deforestation in Amazon (lines 661 – 674 in the same section). In Section 5 (lines 731 – 733) we also mention that the present study did not investigate the initial cause of the proposed feedback loop between humidity, clouds and solar radiation. We agree that no evidence is presented in the study regarding the main cause of the positive feedback associated with reduced humidity, nor whether it is initiated locally or remotely. Although it is not the dominant effect, an apparent humidity paradox still applies here, driven by the changing ocean-land warming contrast and limits on ocean moisture transport. We once again refer to the updated end of Section 5 (see our reply above to the comment "The paper is extremely…" by the referee), relevant for a possible link between the warming over ocean and land. Concerning referee's comment about the humidity paradox, see our next reply below.

Comments by line number:

The title, l19, and elsewhere: It's not clear what is paradoxical about this. I wouldn't call it a paradox. It is simply that there is something that is limiting the water availability, whether it be evapotranspiration from the land surface or transport from elsewhere and as a result, atmospheric humidity is not rising at the rate required to maintain constant relative humidity in a warming atmosphere.

We agree with the referee. We think the correct descriptive phrase needs to be used. With "apparent" it meets the definition of a false paradox, while the statement sounds impossible at first glance. To explain the apparent paradox and improve the first paragraph of Section 5 we have changed to: "*The increase in absorbed solar radiation by the land surface in addition to the enhanced greenhouse effect at present implies thus even more stress on the terrestrial water cycle. The slower warming of the oceans at present means a limitation in evaporated moisture to keep pace with the rapid increase in the temperature over land. The apparent humidity paradox describes a superficial contradiction in the changing climate system: while global warming drives increased oceanic evaporation and a higher absolute atmospheric water vapor capacity, relative humidity and cloud cover over land are simultaneously decreasing. By denoting this phenomenon as 'apparent,' we explicitly frame it as a false paradox—an intuitive contradiction that can be entirely resolved by evaluating the distinct thermodynamic constraints of land-atmosphere coupling. In the regions we studied, the increase in evaporative demand, caused by enhanced absorption of radiation at the surface, is most obvious where precipitation decreases. We assume that the ocean-land warming contrast doesn't exist during more gradual natural climate change since it proceeds slowly enough in the ocean and over land so crossing of the vapour-liquid phase is not perturbed. The exception to a slow change in the climate is extreme volcano eruptions.*"

We have changed to "apparent humidity paradox" at other places in the text, including the title. In addition to the apparent humidity paradox, a positive feedback between drying and shortwave radiation is indeed mentioned both in the abstract and conclusion section, while implicit also in the title.

l64: I think there are some other relevant references for this point e.g., Vautard et al. (2023) https://doi.org/10.1038/s41467-023-42143-3 and Singh et al. (2023) https://doi.org/10.1038/s43247-023-01096-7

We have changed the corresponding sentence to "*Considering regional changes and other time frames, previous studies have nevertheless found changes in atmospheric circulation relevant for warming trends (Blanc et al., 2022; Rudeva et al., 2023; Sfică et al., 2020; Simmons, 2022; Singh et al., 2023; Vautard et al., 2023), while also for a cooling trend in Midwest United States (Singh et al., 2023)*."

l130: I don't think there is any rule that says that the water balance of the land surface needs to be maintained in a transient climate

The referee is right. As the downward flux of longwave radiation increases, the atmospheric demand for water rises. In regions where precipitation changes are negligible, this demand drives a transient net loss in soil moisture. This progressive drying reduces the ratio of actual to potential evaporation. Ultimately, this reduction in soil moisture acts as negative feedback that limits actual evaporation, guiding the land surface toward a new, altered water balance under enhanced radiative forcing. We have changed the corresponding sentence to "*In order to maintain the altered water balance of the land surface, the actual evaporation has to be reduced in relation to potential evaporation*."

l141: "The latter" doesn't sound right in this context. I'm not sure what it's referring to.

We agree and have changed to "The aim is to investigate…".

l295: There are also fairly substantial differences around Antarctica.

We have included the following sentence "*Differences in skin temperature between the ERA5 and CERES datasets also appear in other land regions, including Antarctica.*"

Figure 3: Why use 1000 hPa relative humidity? This is going to involve some extrapolation below the surface. 2m surface air temperature and dew point temperature can be used which would be more comparable to HadISDH.

We agree with the referee and have changed to ERA5 relative humidity at 2m height in comparison with HadISDH, which means that changes have been made in Figures 3a and 3c. The negative decreases in the time series are now closer to each other, shown in Figure 3c. The update gives, however, somewhat higher values of the evaluation statistics shown in the right low of Figure 3, while better agreement occurs of the ERA5 and HadISDH mean values. We have kept the result of changes in ERA5 relative humidity, representing as an averaged of the boundary layer (Figure 3c), since this is relevant considering changes in the low cloud cover. See the updated Figure 3 at the end of this document.

l478: The decline in specific humidity in the southwestern USA has already been extensively discussed in the literature (see studies mentioned above)

See our answer to the major concern, denoted with point 1, by the referee and the comment related to the Simpson et al. (2024) study above, in which southwestern US is included in the investigation.

Figure 2: There are really big differences in terrestrial upward radiation between the products over Africa, as well as relative humidity in Figure 3 and then Figure 11 makes it clear that ERA5 has spurious precipitation trends in this region compared to GPCP, so likely can't be trusted. No attempt has been made to link these different features together and it raises the question of where and when ERA5 can be trusted for certain fields.

In Section 3.2 (with start on line 355), we mention deviations in upward terrestrial and solar radiation at the TOA over Africa between ERA5 and CLARA-A3. The McKinnon and Simpson (2025) study has now been included in the manuscript, where the authors pointing out concerns in the data quality for ERA5 surface solar radiation in central Africa. However, the relatively low coverage of HadISDH data for relative humidity in Africa makes it difficult to draw a robust conclusion of the comparison with ERA5.

We mention in Section 3.6 (line 531) that an opposite trend appears in the precipitation between ERA5 and GPCP over areas in Africa. Africa is especially critical also for ERA6, since it represents a massive, highly vulnerable landmass plagued by extreme data scarcity. The ground weather stations with precipitation data are very sparse for much of Africa (Liu et al., 2024). This implies that ERA5 has to relies heavily on the reanalysis models, generating precipitation by simulating physical atmospheric processes. Related to this issue, we have included this sentence at the end of Section 3.6: “*ERA5 precipitation is also significantly influenced by sparse station density, and Liu et al. (2024) highlight that this is a particular problem for Africa, where much of the continent lacks meteorological ground-based stations.”* We have also included “*Greenland*” in the following original sentence in the same paragraph: “*Even so, in the view of the latest version of GPCP satellite/gauge space (0.5°) and time homogeneity since 1983, Fig. 12b shows that the GPCC gauges don’t exist at high latitudes in the Northern Hemisphere, in Greenland, and for large parts of Africa and Australia.”*

We have also included “North America” and “Africa” in the sentence at the end of Section 5: “*Opposite trends in precipitation between ERA5 and GPCP/GPCC appear in Asia, North America and Africa (Sect. 3.6)*.”.

l710/711: This sentence makes it sound like natural variability goes away with time. Of course it doesn't, but its incontribution to long term trends reduces.

We agree with the referee, this sentence is not clear. Note that internal variability implies short-term variability, but not long-term variability associated for example with the Atlantic Multidecadal variability. We have changed to “Natural internal variability not investigated in the present study may also play a role for record-low planetary albedo associated with reduced low-level clouds, although the contribution is expected to subside and leave the observed longer-term warming unaffected (Goessling et al., 2024).”. This implies that the phrase “long-term warming” has been changed to “longer-term warming”.

l722: Not sure the word "intimate" is appropriate here, but I'm not sure what is meant.

We have changed the sentence to “*The exception to a slow change in the climate is extreme volcano eruptions*.”

Bowen ratio

We have improved the investigation of the Bowen ratio and Figure 9 (see below) has been modified with results of Bowen ratio and evaporative fraction. The name of Section 2.7 has been changed to "*2.7 Statistical analysis, Bowen ratio and evaporative fraction*". The following text has been included in this section:

"*Trends in Bowen ratio (BR) and evaporative fraction (EF) between sensible and latent heat flux (SHF and LHF, respectively) have been investigated:*

$$BR = \frac{SHF}{LHF} = \frac{1-EF}{EF}, \tag{7}$$

$$EF = \frac{1}{1+BR} = \frac{LHF}{SHF+LHF} \tag{8}$$

with a screening mask for BR, EF > 0, to avoid division with zero and BR <= 50 as a crucial boundary cap, since small values of EF yield disproportionately massive Bowen ratios. The screening mask for EF: total heat flux (SHF + LHF) is larger than 5, which eliminates low-energy cases where the Bowen ratio breaks down, and the range 0 – 1 is also applied for EF, which limit the data to a realistic physical window and removing all unphysical spikes."

The fourth paragraph in Section 3.5 has been modified with the following sentence: "*Statistically significant increases in the Bowen ratio between sensible and latent heat flux with 19 and 26% from 1979 to 2023 for annual and summer averaging, respectively, are shown in Figure 9b*." and text:

"*Depletion of water supply has affected latent heat flux that is associated with a statistically significant negative trend of -0.37 W m^{-2} decade^{-1} for South America, although minor increases appear regionally in Fig. 5e. In addition to a strong increase in mean sensible heat flux, with 1.1 W m^{-2} decade^{-1} (Fig. 7e), substantially reduced evaporative cooling has consequently occurred in South America during the latest four decades. Statistically significant increases in the Bowen ratio between sensible and latent heat flux with 19 and 26% from 1979 to 2023 for annual and summer averaging, respectively, are shown in Figure 9b Specific humidity has however increased over the current Northern Hemisphere region, while relative humidity and low cloud cover have decreased (Figure 8). This is probably driven by the differentiation of warming in the oceans and in the air over land, which causes the air to be further away from saturation at present. Figure 8e shows a strong increase in mean total heat flux over the areas in the Northern Hemisphere, where the positive trend in sensible heat flux, 0.54 W m^{-2} decade^{-1}, is higher than 0.43 W m^{-2} decade^{-1} for latent heat flux. In addition to large part of South America, Fig. 9c and 9e show that significant increases in Bowen ratio appear in southwestern North America, central and northern Africa, central Australia and large parts of Europe. The shift in heat fluxes is found in the results of the evaporative fraction as well (Fig. 9d and 9f), while also here South Asia deviates from these changes. The very low annual values in northern Russia (Fig. 9c) indicate, however, that the Bowen ratio breaks down due to air-to-land sensible heat flux in winter that rendering the standard mathematical definition. The screening mask introduced for the evaporative fraction (Section 2.7) removes these extreme unphysical mathematical spikes (Fig. 9d), while also in part of Europe for the winter season*."

Finally, at the end of the fifth paragraph in Section 4 the following text has been included: "*The weak or negative trends in the ERA5 total column water vapour to surface temperature ratio over land from 1979 to 2023 shown in Fig. 9a indicate that atmospheric moisture is not keeping pace with temperature increases, invalidating Clausius-Clapeyron scaling. These findings point to severe land-based moisture limitations and declining relative humidity, where drier surfaces likely enhance local warming via increased and reduced sensible and latent heat fluxes, respectively. The Bowen ratio* *between sensible and latent heat flux has significantly increased from 1979 to 2023 over large parts of global land (Fig. 9c and 9e).*

Figures

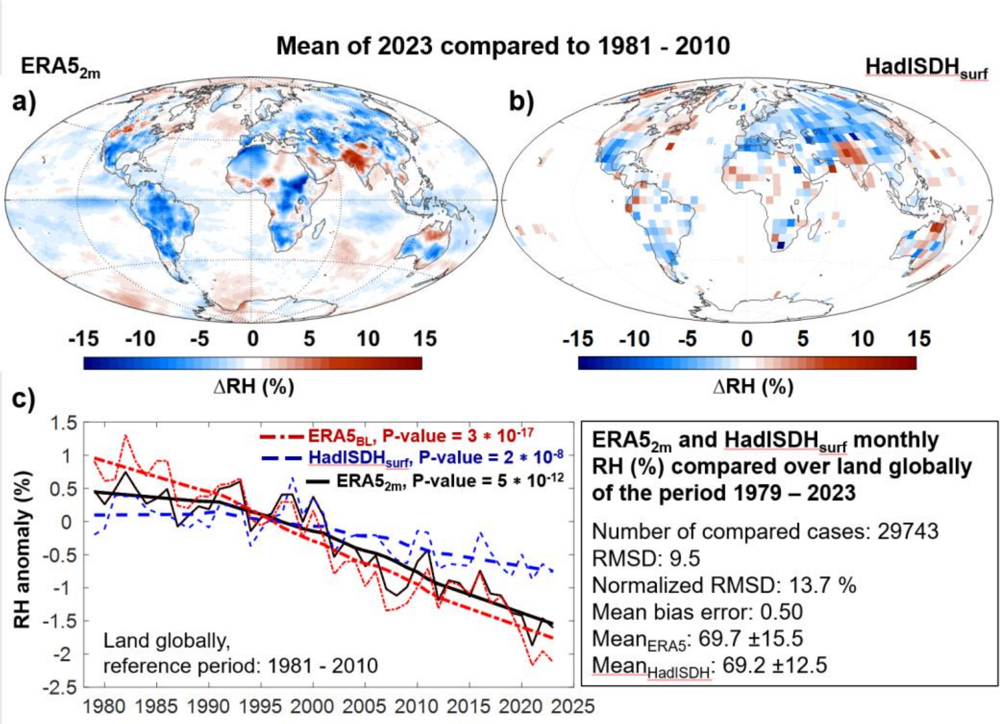

Figure 3. Comparison of relative humidity (RH) in the lower troposphere between a) ERA5 and b) HadISDH for 2023 relative to the period 1981–2010. Heavy black solid and blue dashed lines for ERA5 and HadISDH, respectively, in c) denote trend lines where the Savitzky-Golay finite impulse response smoothing filter of polynomial order has been applied on annual and global land time series represented by the light black solid and blue dashed lines. P-values of the trends are obtained by the Mann-Kendall test at the 95% confidence interval applied to the annual values. The evaluation statistics in the lower right were obtained by comparing the monthly mean values of the ERA5 and HadISDH time series.

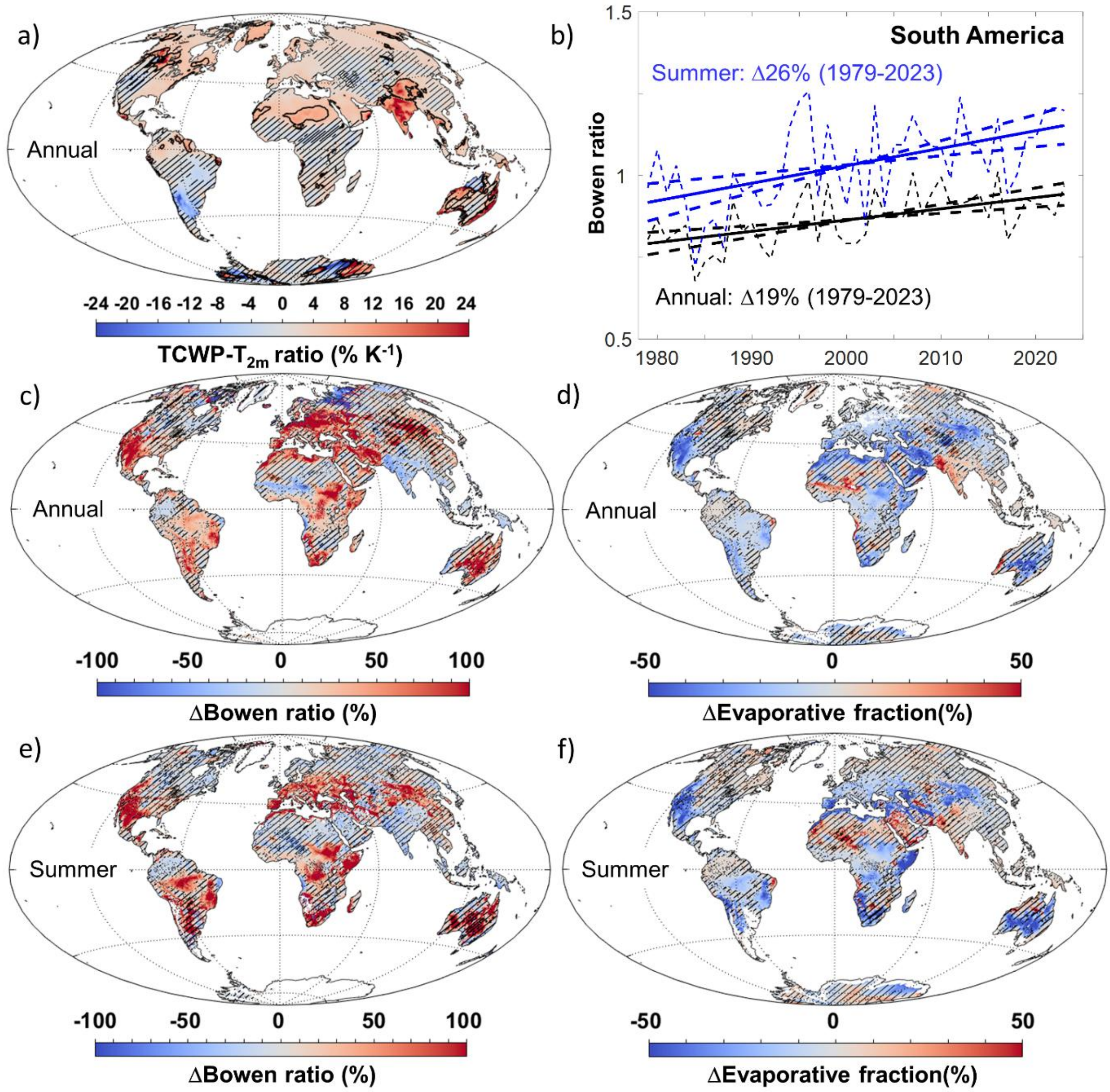

Figure 9. a) Trends in the ratio between ERA5 annual total column water vapour (TCWP in %) and temperature at 2 m height (T_{2m} in kelvin (K)) from 1979 to 2023, where the black solid line denotes 7 % per K according to Clausius-Clapeyron equation between uptake of moisture in the air due to warming. b) Heavy solid and dashed lines denote linear regressions and corresponding 95% confidence intervals, respectively, for annual and summer averaging (June – August) of ERA5 Bowen ratio (light dashed lines) obtained over area-weighted South America of the period 1979 – 2023. c) and e) Trends in Bowen ratio (in percent) by linear regression for annual and summer averaging, respectively. d) and f) Trends Evaporative fraction (in percent) by linear regression for annual and summer averaging, respectively. The hatched areas over land represent trends that are not statistically significant at the 95% confidence level.