REVIEWER #1 COMMENTS

This manuscript focuses on addressing the temperature-sensitivity issues inherent in dielectric-based soil moisture (SM) sensors, which often lead to spurious daytime peaks in diurnal cycles. The authors propose an empirical correction method based on Fast Fourier Transform (FFT) by leveraging the physically consistent diurnal patterns from land surface model (LSM) reanalysis datasets. The performance of the adjusted SM data was validated against reference sensors and further evaluated through land-atmosphere coupling analysis. Overall, the study provides a practical and innovative solution to a long-standing problem in the hydrological community. The topic fits well within the scope of the journal. However, considering there are some critical methodological issues and data inconsistencies that need to be clarified, I recommend a major revision.

➔ *We thank the reviewer for your thorough and constructive comments, which have helped us to clarify the scope and strengthen the manuscript. Below we respond point-by-point and describe the corresponding revisions.*

Major comments

1. The proposed method introduces a potential risk of circular reasoning. By aligning the diurnal power of in-situ observations with LSM reanalysis (ERA5-Land/MERRA-2), the independence of the observation data is significantly compromised. This raises a critical question: Can the adjusted ISMNadjdata still be used as an independent reference to evaluate the same or similar land surface models? The authors should explicitly discuss the limitations of using model-informed observations for model validation or data assimilation.

The proposed approach does not introduce circular reasoning in the evaluation framework. The diurnal time adjustment was applied exclusively to temperature-sensitive, low-frequency sensors that exhibit artificial diurnal variability. For validation, we used nearby temperature-insensitive reference sensors (e.g., TDR, TDT, and cosmic-ray) that were not subjected to any adjustment. Although these reference sensors are located in close proximity (thus experiencing similar climatic conditions), local land-surface heterogeneity still exists. To account for this, the evaluation was conducted using variance-normalized temporal correlation coefficients rather than other non-normalized comparisons (e.g., RMSE). Because the reference sensors were not time adjusted and are independent from the reanalysis-based correction procedure, the evaluation does not constitute model-informed self-validation. The description has been edited in Lines 225-228.

"Diurnal adjustment is applied exclusively to temperature-sensitive, low-frequency dielectric-based sensors (e.g., capacitance, impedance, and FDR), which are known to exhibit spurious temperature-induced diurnal variability. Temperature–insensitive sensors, including non–dielectric cosmic–ray sensors and high–frequency dielectric sensors (e.g., TDR and TDT), were excluded from adjustment process and retained as independent reference for validation."

2. A critical physical inconsistency arises in cold regions (e.g., the Tibetan Plateau mentioned in L309). Dielectric-based in-situ sensors primarily measure the liquid soil water content because the dielectric constant of ice (~3.2) is much lower than that of liquid water (~80). However, the ERA5-Land soil moisture variable (swvl) represents the total water content (liquid + ice). During freeze-thaw cycles, the liquid water content exhibited a strong diurnal signal driven by phase changes, while the total water content remained relatively stable. Using the diurnal power of the model's total water to adjust the liquid water observations would be physically erroneous. Could the authors clarify: (1) whether they used only the liquid water component from the LSMs (if available), or (2) whether they excluded periods when the soil temperature was below 0°C to avoid this mismatch?

- ➔ *We appreciate the reviewer's insightful comment regarding the physical inconsistency between liquid soil moisture observations. This study utilizes total soil water content (liquid and ice) from LSMs due to data availability. To take this issue into account, when the soil is frozen with soil temperature below 0℃, the diurnal phase filtering approach for in-situ measurements is not applied. We have revised the corresponding text (Lines 163-168) to clarify this point.*

  "This study utilizes modelled SM and temperature in the surface layer (0–7 cm for ERA5-Land and 0–5 cm for MERRA-2) for diurnal adjustment (Seo and Dirmeyer, 2022a). These variables are selected for their physically constrained and realistic behavior. Although the LSM SM variable represents total soil water content (liquid and ice) due to data availability, potential physical inconsistencies with dielectric-based sensors, which primarily measure liquid water, are addressed by filtering the dataset. Specifically, days with soil temperatures below 0°C are excluded from both in-situ observations and reanalysis datasets to ensure consistency.

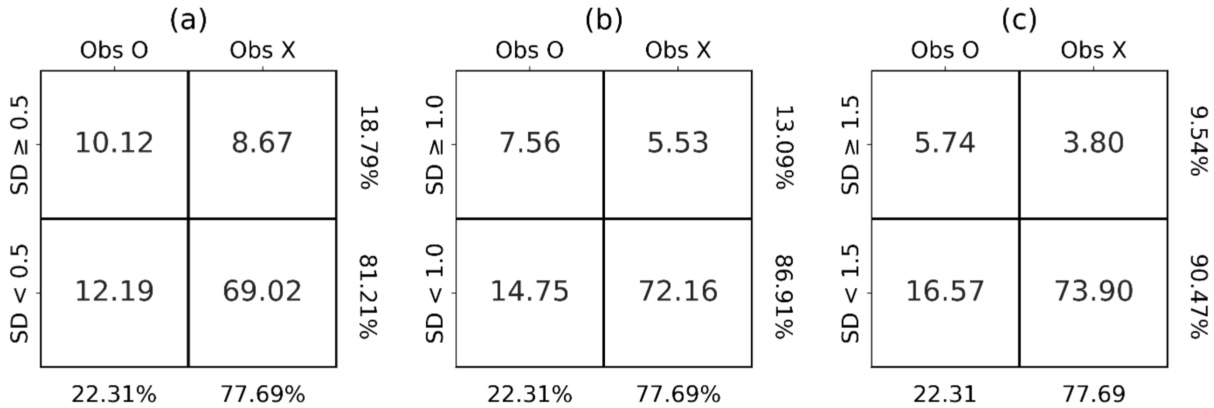
3. Regarding the precipitation filtering (Section 3.1), I have concerns about the consistency and physical basis of the thresholds used. The authors used a +1.5 standard deviation (SD) threshold for in-situ data but a 0.1 mm/day threshold for LSMs. (1) Since SM response to rain is highly dependent on soil texture and antecedent moisture, can a universal +1.5 SD threshold reliably identify rainy days across all global ISMN sites? (2) Why was the 'previous day' (L206) excluded along with the rainy day, rather than the following day, which is typically affected by post-rainfall drainage? (3) The use of different filtering methods for models and observations may lead to mismatched samples in the FFT adjustment. The authors should justify these choices.

- ➔ *Regarding the precipitation masking based on a soil moisture tendency threshold, as noted by the reviewer, soil moisture responses to precipitation vary with observation sites; thus, employing a single global threshold necessitates certain simplifications. To evaluate the practical efficacy of this approach, we conducted a sensitivity analysis using all collocated ISMN SM-precipitation station pairs (n=240). This analysis compared SM-based masking criteria against collocated precipitation observations across different thresholds (1.5, 1.0, and 0.5 SD).*

  The masking performance was evaluated based on two key metrics: (1) the number of overlapping days identified as rainfall-affected by both precipitation observations and the SM SD-based criterion, and (2) the proportion of observed rainfall days not detected by the SD-based threshold (the omission rate). The results (below contingency tables) indicate that the initial 1.5 SD threshold primarily captures only intense and abrupt SM spikes, thereby missing a substantial number of moderate precipitation events. In contrast, a lower threshold of 0.5 SD yields a more balanced identification, enhancing the agreement with observed rainfall days while significantly reducing the fraction of missed events. Based on these results, we revised the threshold from 1.5 SD to 0.5 SD in the updated manuscript (Lines 208-214 and Fig. S2).

  "To exclude rainy days at observation sites, hourly SM measurements are aggregated into a daily resolution to calculate the day-to-day SM tendency. When this tendency exceeds a threshold of +0.5 standard deviations (SD), determined over the entire analysis period, both

the current and previous days are identified as precipitation-affected and excluded from the adjustment (Step 1 in Fig. 3a). The exclusion of the preceding day is specifically implemented to mitigate the influence of post-precipitation dry drifting, which typically introduces the most significant distortion to the SM diurnal cycle. The SM-based threshold is optimized through comparison with collocated precipitation data (Fig. S2); notably, these threshold values vary according to local climatology, with higher thresholds assigned to wetter regions (Fig. S3).”



➔ *(2) We excluded the following day because the post-precipitation dry drifting introduces the strongest distortion to the diurnal signal. The masking of the previous day resulted from the way daily SM tendency was calculated. Because the tendency was derived from daily differences, the rainfall signal could appear shifted to the preceding day. However, this was a methodological artifact rather than an indication of drying occurring before rainfall. In reality, the distortion associated with rainfall occurs on the rainy day itself and can persist into the following day. Therefore, to properly remove the drying drift effect, we masked the current and following days rather than the previous day. This clarification has been added to the revised manuscript (Lines 210-212).*

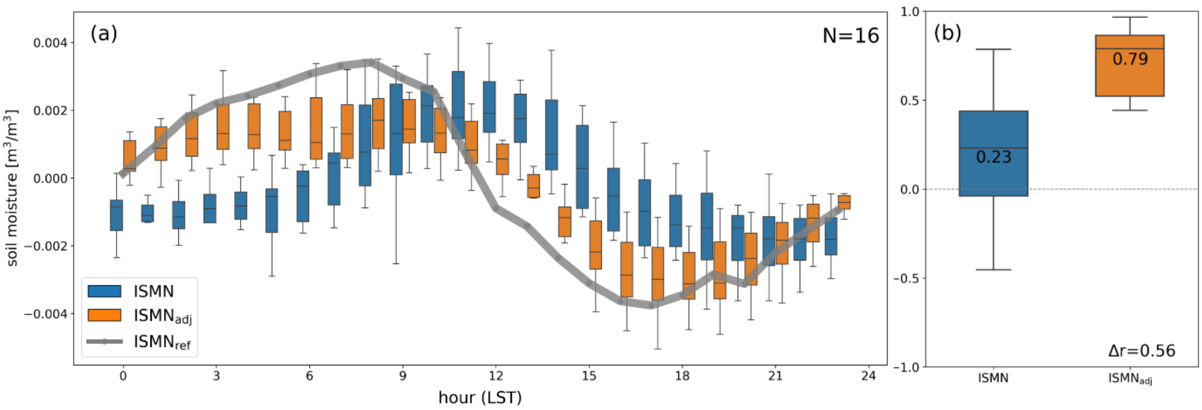
“…, both the current and following days are identified as precipitation-affected and excluded from the adjustment (Step 1 in Fig. 3a). The exclusion of the following day is specifically implemented to mitigate the influence of post-precipitation dry drifting, which typically introduces the most significant distortion to the SM diurnal cycle.”

➔ *(3) We acknowledge the concern regarding potential inconsistencies arising from the use of different precipitation filtering methods for observations and models. As noted, rainfall-affected days were identified using an SD-based criterion for the observations, whereas model datasets used their own precipitation records. Consequently, the sets of non-rainy days differ across datasets. To ensure consistency in the FFT adjustment, the analysis was performed only on overlapping non-rainy days after precipitation removal had been applied separately to each dataset (ISMN, ERA5-Land, and MERRA-2). In addition, only days with complete 24-hour records were retained to guarantee consistent diurnal sampling. Therefore, despite differences in the initial filtering criteria, the FFT was ultimately applied to matched samples across datasets. This clarification has been added to the revised manuscript (Lines 214-217).*

“For the LSMs, rainy days are filtered using their respective precipitation outputs, with a threshold of daily total precipitation exceeding 0.1 mm. Although the filtering criteria differ between the observational and model datasets, consistency in the diurnal adjustment is maintained by restricting the analysis to overlapping non-rainy days common to all datasets.”

4. The authors used sensor pairs within a 200 km radius for validation. Given that soil moisture is known for its extreme spatial heterogeneity, 200 km is a very large distance. How can the authors ensure that the SM diurnal cycle at a site 200 km away is representative enough to validate the local sensor's correction? I suggest the authors provide a sensitivity analysis or at least discuss how the correlation changes as the distance threshold decreases.

➔ *We agree with the reviewer that a 200km radius is relatively large given the strong spatial heterogeneity of soil moisture. This threshold was initially chosen to ensure a sufficient number of comparable in-situ sensor pairs for statistical evaluation, particularly in data-sparse regions. Our validation focuses on the temporal correlation of diurnal cycles with standardizing the diurnal variance in both reference and validated datasets, rather than comparing absolute soil moisture (e.g., RMSE), under the assumption that sites within similar climatic regimes exhibit comparable diurnal timing and phase. In response to the reviewer's suggestion, we conducted a sensitivity analysis by reducing the distance threshold to 50km. While the number of available station pairs decreased from 20 to 16, the sample size remained reliable for robust comparison. Based on this result, we revised the analysis and updated the manuscript to adopt the 50km distance criterion related to Figure 5, which better balances spatial representativeness and data availability.*



5. There is a clear discrepancy between the measurement depths of the LSMs (0–7 cm for ERA5-Land, 0–5 cm for MERRA-2) and the in-situ sensors (top 10 cm). Soil moisture and temperature in the top few centimeters are often Using the diurnal power of a 0–5 cm layer to correct a 10 cm layer might introduce vertical representativeness errors. This point needs more rigorous justification.

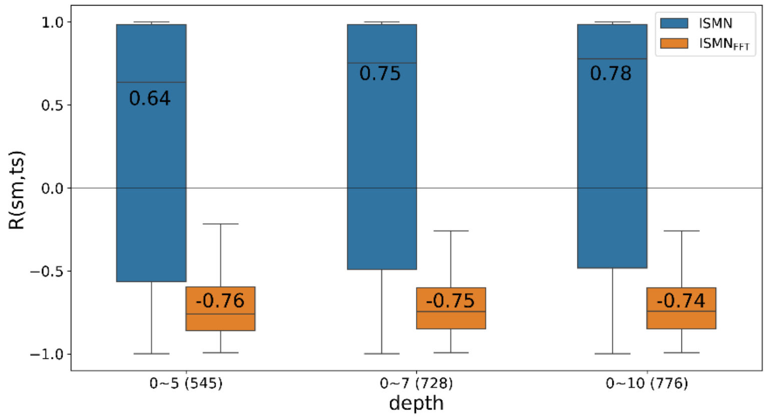
➔ *We acknowledge the reviewer's concern regarding the vertical representativeness mismatch between the LSM soil moisture layers (0–7 cm for ERA5-Land and 0–5 cm for MERRA-2) and the in-situ measurements representing the top 10 cm. The use of the 0–10 cm in-situ layer was initially motivated by consistency with widely adopted near-surface soil moisture definitions in reanalysis and land surface models (e.g., a top layer on the order of 0–10 cm).*

To assess the potential impact of this depth mismatch, we conducted additional sensitivity tests by restricting the analysis to in-situ sensors whose measurement depths most closely match the corresponding model layers. The resulting diurnal power and correlation characteristics showed no apparent differences compared to those obtained using the full 0–10 cm in-situ dataset.

These results indicate that, despite small differences in nominal layer thickness among datasets, the diurnal signal targeted in this study is sufficiently robust within the near-surface soil layer.

Therefore, we consider the use of the 0–10 cm in-situ observations to be appropriate for the purposes of diurnal-cycle-based adjustment. Additional explanation has been added to the manuscript, and the corresponding figure has been included in the Supplementary Material (Lines 311-317).

"Although the nominal layer depths vary between ERA5-Land (0–7 cm), MERRA-2 (0–5 cm), and in-situ measurements (top 10 cm), all datasets characterize near-surface soil moisture, where diurnal variability is most pronounced. To evaluate the potential impact of this vertical discrepancy, additional sensitivity analyses were conducted by grouping stations according to their specific measurement depths (0–5, 0–7, and 0–10 cm). The resulting correlation characteristics remained highly consistent across all depth groups (Fig. S5), suggesting that the vertical representativeness mismatch has a negligible influence on the diurnal signals analyzed in this study."



6. The correction relies on the assumption that sensors are insensitive to temperature during 20:00–06:00 LST. However, in many regions, soil temperature can remain high or continue to fluctuate significantly during the early night. Does this "baseline" assumption hold across all climate zones?

We appreciate the reviewer's concern regarding potential soil temperature fluctuations during the early nighttime hours. To minimize the potential influence of such fluctuations, we revised the definition of the nighttime baseline period from 20:00–06:00 LST to a more conservative window of 22:00–04:00 LST. This narrower interval more closely represents the period when surface temperature variability is relatively stable and temperature-driven sensor artifacts are minimized. The manuscript has been revised accordingly in Lines 247-248 and 387-389.

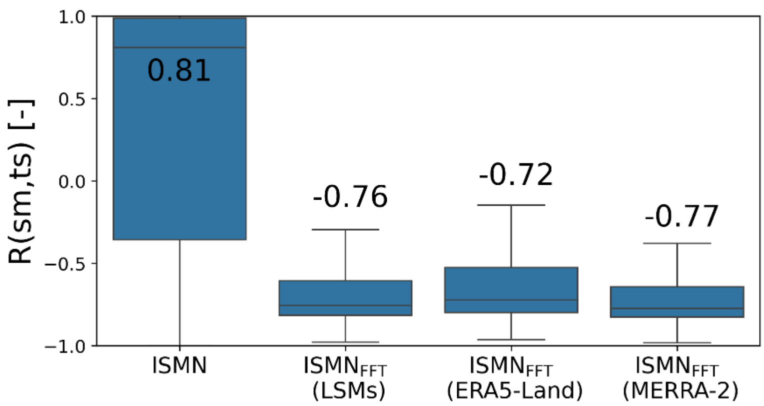
"Assuming SM measurements to be relatively insensitive to temperature during the nighttime hours (22:00–04:00 LST) due to the absence of solar radiation, we further correct the mean of diurnal anomaly for each day."

"Additionally, a diurnal mean correction (22:00–04:00 LST) is incorporated, assuming that the sensor temperature sensitivity is limited during nighttime periods when temperature-induced errors are minimal, thereby serving as a baseline for the correction."

7. The study shows that ERA5-Land and MERRA-2 exhibit different SM-temperature coupling behaviors due to inconsistencies in latent heat (LH) flux. Since these models serve as the"ground truth" for the diurnal pattern, how does the discrepancy between the two models affect the reliability of the adjusted ISMNadj product?

➔ *As reviewer mentioned, ERA5-Land and MERRA-2 exhibit different soil moisture–temperature (or SM–LH) coupling behaviors. So, we carried out two additional sensitivity tests to adjust diurnal time series using ERA5-Land and MERRA-2, respectively, which demonstrates that the proposed adjustment is not highly sensitive to model-specified SM–LH coupling characteristics. As a result, while the two models differ in their internal land–atmosphere coupling, the extracted nighttime baseline and the resulting correction remain robust across models. The corresponding explanation related to Fig. S9 has been added in Lines 350–355.*

"To evaluate whether inter-model discrepancies impact the reliability of the adjusted ISMN results, additional sensitivity tests are performed by applying the diurnal adjustment using ERA5-Land and MERRA-2 individually. Although these two reanalysis datasets exhibit distinct soil moisture–temperature coupling strengths, the resulting adjusted time series show negligible differences across the various adjustment configurations (Fig. S9). This demonstrates that the proposed method does not impose a model-specific diurnal phase onto the observations and remains robust regardless of model-specific coupling characteristics."



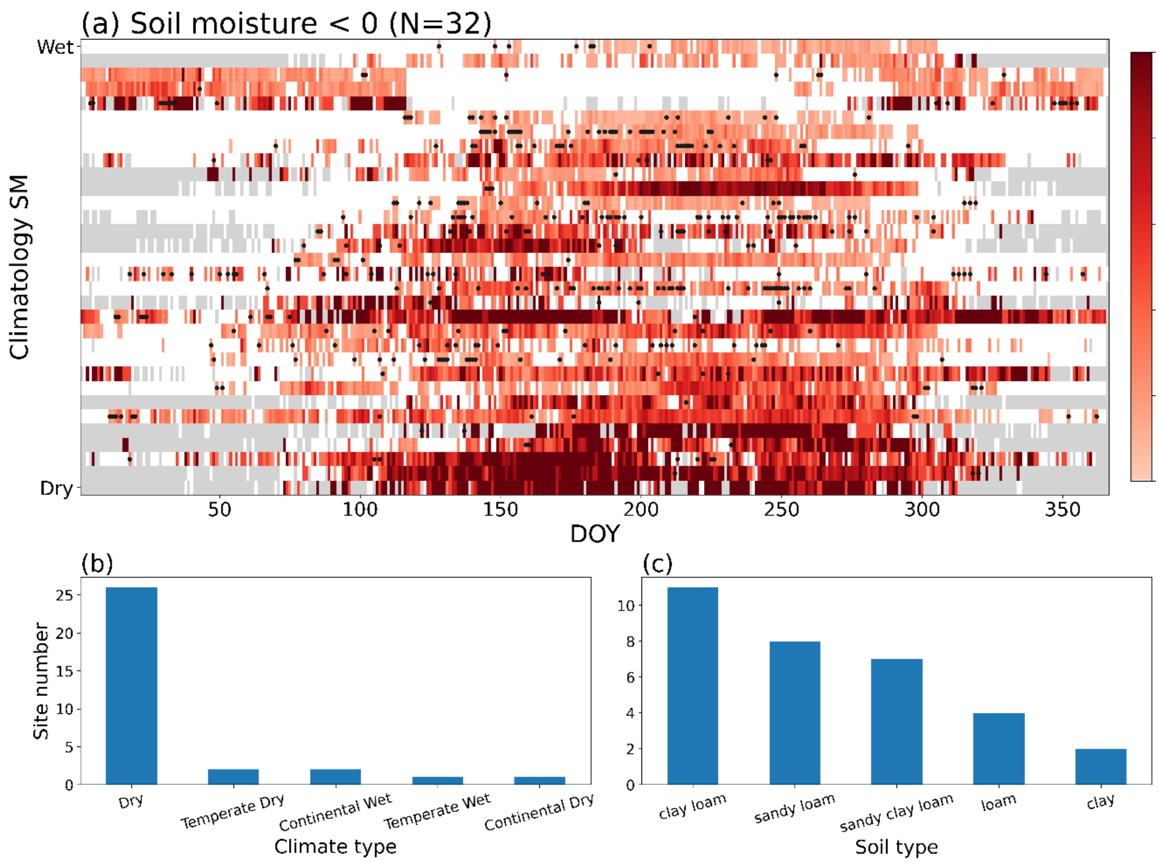
8. The application of standard normal deviate scaling (SNDS) to avoid negative values is an additional empirical step. I wonder if this scaling process significantly alters the original variance or the physical meaning of the diurnal amplitude.

➔ *We appreciate the reviewer's comment regarding the use of SNDS. The occurrence of negative soil moisture values after phase adjustment was examined in detail. Among 745 stations, only 32 exhibited more than 100 hours of negative values, indicating such cases are relatively rare. These stations are predominantly located in dry regions with loam-type soil, where strong daytime heating can induce large diurnal amplitudes in soil moisture. During the phase-adjustment (1st) step, inversion of the diurnal cycle under these conditions can occasionally produce unrealistically low reconstructed values.*

Importantly, soil moisture values below zero are physically implausible and therefore require correction. The SNDS procedure is applied only to these limited cases to prevent non-physical values while preserving the daily mean soil moisture. Because the adjustment affects only a small subset of stations and observations, and dose not modify the daily mean, its impact on the overall variance and the physical interpretation of the diurnal amplitude is expected to be minimal. The corresponding details are explained in Lines 255-260 and Fig. S4.

"To evaluate the extent of this supplementary SNDS adjustment, we quantified the frequency of negative values across all stations. Only 32 stations exhibited more than 100 cumulative

hours of negative SM following the phase-adjustment step. These stations are primarily located in arid regions with loamy soils (Fig. S4), where strong daytime heating induces disproportionately large diurnal amplitudes. Since SNDS is restricted to these infrequent occurrences, its impact on the overall variance structure and the physical interpretation of the diurnal signal remains negligible.”

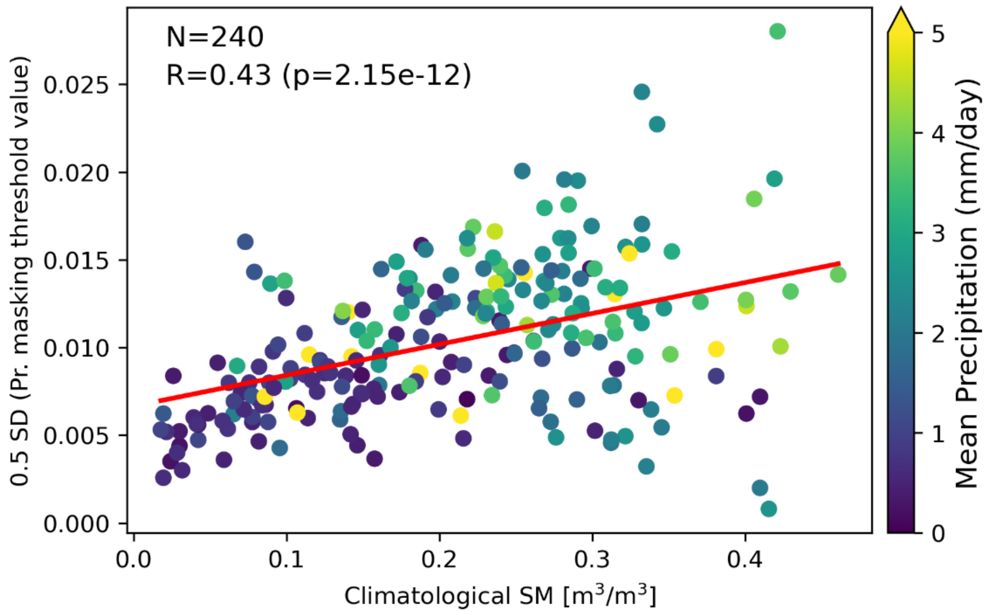


Minor comments

1) L205-207: The +1.5 standard deviation threshold for excluding rainy days seems somewhat arbitrary. Is this value robust for both humid and arid regions?

➔ *We evaluated the potential climate dependence of the +0.5 SD threshold by examining its relationship with climatological mean SM across stations with precipitation observation data. The regression pattern shows that climatological SM generally increases from approximately 0 to 0.3 and exhibits a slight decrease in the 0.3–0.5 range, with the overall SM variability bounded within approximately 0.5. In comparison, the absolute magnitude of the +0.5 SD threshold is very small (approximately 0–0.02), which is much smaller than the typical range of climatological SM variation. Therefore, the threshold is applied at a scale that is negligible relative to long-term SM climatology, supporting the conclusion that the criterion is not sensitive to arid–humid climate separation. This explanation has been added in Lines 213-214 and Fig. S3.*

“notably, these threshold values vary according to local climatology, with higher thresholds assigned to wetter regions (Fig. S3).”



2) L222-223: Please ensure that all cited works in the text are properly listed in the Reference section.

➔ *Thank you for pointing this out. We have carefully checked all in-text citations and ensured that all cited works are now properly listed in the Reference section.*

3) I suggest adding a brief comment on whether this Fourier-based method could be adapted for real-time data streams or if it is strictly a post-processing tool for historical datasets.

➔ *While the proposed Fourier-based correction is primarily designed as a post-processing tool for historical datasets, it can be adapted for real-time diurnal correction. Despite the latency in reanalysis product availability, the requisite diurnal amplitude and phase can be pre-calculated from long-term historical archives. Consequently, this method can be implemented for real-time soil moisture observations by leveraging these established diurnal parameters to adjust incoming data. This is added in the last paragraph of "summary and conclusion" section (Lines 410-413).*

"Although primarily developed as a post-processing tool for historical datasets, this method can be extended to real-time applications by utilizing pre-calculated climatological diurnal amplitude and phase. By leveraging these parameters derived from long-term records, the correction can be applied to near-real-time observations even in the absence of concurrent reanalysis data."

REVIEWER #2 COMMENTS

The manuscript presents a Fourier transform–based approach to correct temperature induced diurnal artifacts in in-situ soil moisture (SM) measurements from dielectric sensors. Constrained by the physically consistent land surface model (LSM) reanalysis products (ERA5-Land and MERRA-2), the authors aim to restore physically realistic diurnal behavior of dielectric-based SM and improve the interpretation of land–atmosphere interactions at sub-daily timescale.

The topic is highly relevant to the hydrology and land–atmosphere coupling communities. The manuscript is generally well written, methodologically innovative, and supported by extensive datasets. The proposed correction has the potential to substantially improve the usability of high-frequency in-situ SM observations. However, several issues need to be addressed before the manuscript can be considered for publication.

- ➔ *We thank the reviewer for your thorough and constructive comments, which have helped us to clarify the scope and strengthen the manuscript. Below we respond point-by-point and describe the corresponding revisions.*

Major comments

1. Introduction: Literature review on correction of SM is too limited, only the second last paragraph of the introduction section. At least correction methods of the same type as those used in this study should be reviewed in detail.

- ➔ *We thank the reviewer for this valuable suggestion. In response, we have substantially expanded the literature review on temperature correction methods for soil moisture measurements. Specifically, we added a more detailed discussion of empirical regression-based approaches, including studies that utilize diurnal amplitude-temperature relationships and data-driven correction schemes (e.g., Lu et al., 2015; Kapilaratne and Lu, 2017). The revised discussion can be found in Lines 91-100.*

  "Regarding empirical correction approaches, Chanzy et al. (2012) proposed a daily correction coefficient derived from diurnal variations in permittivity and temperature, which are potentially influenced by SM and conductivity. This coefficient was applied to adjust measured permittivity, utilizing periods of minimal moisture change (i.e., early morning or late afternoon) to ensure stable estimation. More recently, regression-based schemes have been developed to link SM diurnal amplitude with soil temperature (TS) variability. For instance, Lu et al. (2015) developed a regression framework to quantify the artificial positive coupling between SM and TS on the diurnal scale. By modeling SM variations as a function of concurrent TS fluctuations, they isolated and removed the temperature-induced component embedded in dielectric sensor measurements, thereby mitigating thermally induced diurnal artifacts. Building upon this approach, Kapilaratne and Lu (2017) introduced a refined calibration strategy to enhance the robustness of regression-based corrections across diverse hydroclimatic conditions."

2. Data: Three land reanalysis datasets (ERA5-Land, MERRA-2, GLDAS) are discussed, but only two are used in the adjustment. The rationale for this choice is not sufficiently clear.

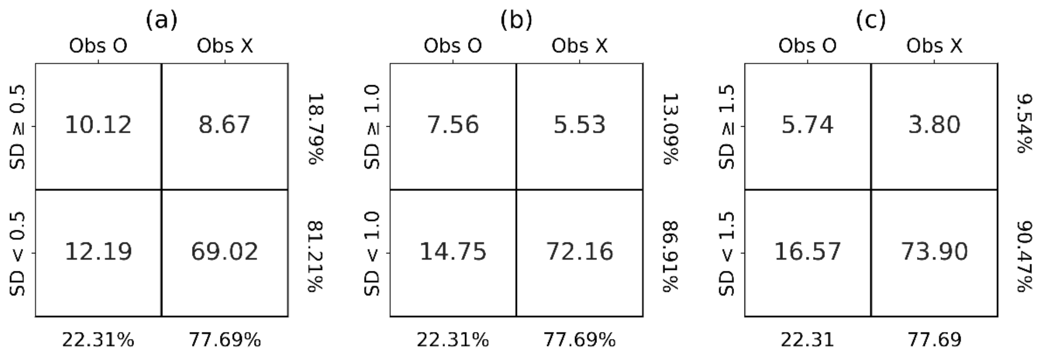
- ➔ *We thank the reviewer for pointing out this ambiguity. Although three land reanalysis datasets (ERA5-Land, MERRA-2, and GLDAS) are introduced in the Data section, only ERA5-Land and MERRA-2 were used in the adjustment due to temporal resolution constraints. The proposed method relies on resolving and comparing sub-daily (diurnal) phase and power characteristics* *using FFT-based analysis. ERA5-Land and MERRA-2 provide hourly soil moisture outputs, which are essential for accurately capturing diurnal variability and phase information. In contrast, GLDAS is available at a 3-hourly temporal resolution, which limits the reliable estimation of diurnal phase and power and prevents a consistent comparison with hourly in-situ observations. Therefore, GLDAS was excluded from the adjustment procedure, although it is introduced for completeness as a widely used land reanalysis product.*

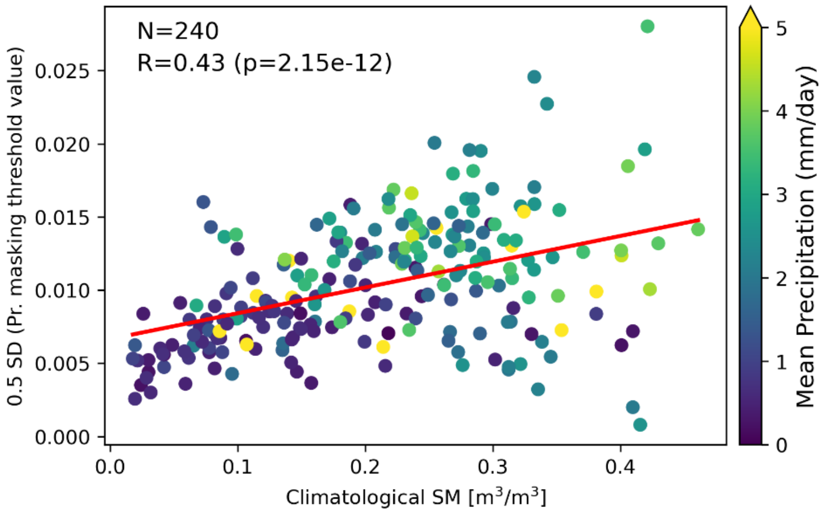
We have revised the manuscript to explicitly clarify this rationale in the Data section (Lines 163).

3. Methodology: The manuscript excludes all days identified as "rainy" based on SM tendency thresholds or precipitation totals. This approach is questionable, particularly in arid and semi-arid regions. Light precipitation events often evaporate rapidly and may have negligible impacts on daily soil moisture, especially near the surface.

➔ *Regarding the precipitation masking, we acknowledge that SM response to precipitation may vary across climate regions. To determine an appropriate masking threshold, sensitivity tests were conducted using multiple SD thresholds (0.5, 1.0, and 1.5 SD). The results indicate that the 1.5 SD threshold primarily detects only strong and abrupt SM spikes, whereas the 0.5 SD threshold achieves a better balance by increasing the overlap between precipitation observations and SD-based rainy-day identification while reducing the fraction of missed rainfall-affected days. Therefore, the +0.5 SD criterion was adopted for precipitation removal. Furthermore, the magnitude of the threshold relative to climatological SM variability is very small (approximately 0–0.02), which is negligible compared to the typical range of SM variations (up to approximately 0.5). This suggests that the masking criterion is not strongly dependent on climate regime and is applicable across both humid and arid regions. This clarification has been added in the revised manuscript (Lines 208-214 and Figs. S2 and S3).*

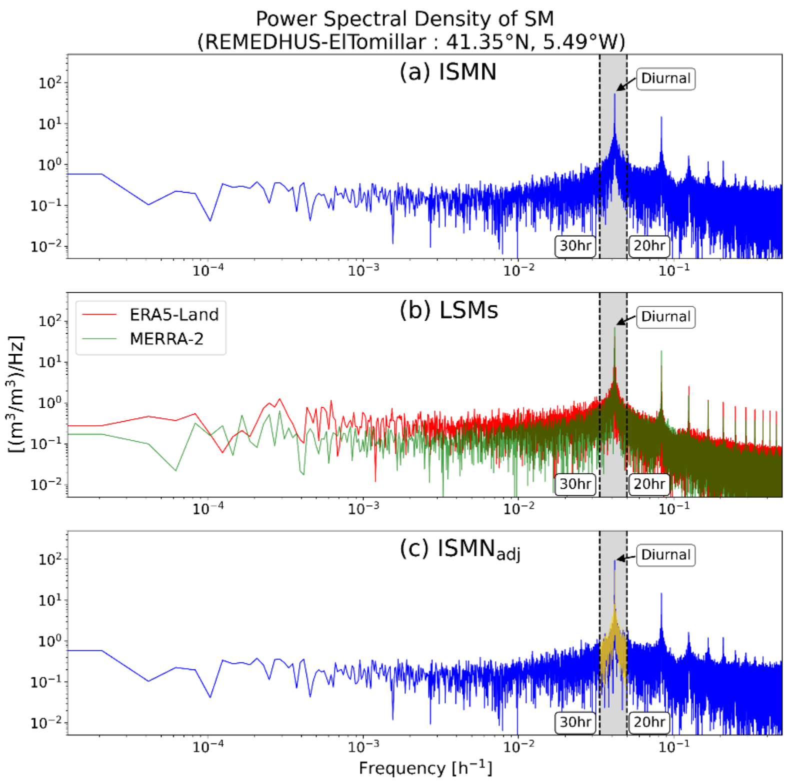
"To exclude rainy days at observation sites, hourly SM measurements are aggregated into a daily resolution to calculate the day-to-day SM tendency. When this tendency exceeds a threshold of +0.5 standard deviations (SD), determined over the entire analysis period, both the current and following days are identified as precipitation-affected and excluded from the adjustment (Step 1 in Fig. 3a). The exclusion of the following day is specifically implemented to mitigate the influence of post-precipitation dry drifting, which typically introduces the most significant distortion to the SM diurnal cycle. The SM-based threshold is optimized through comparison with collocated precipitation data (Fig. S2); notably, these threshold values vary according to local climatology, with higher thresholds assigned to wetter regions (Fig. S3)."





4. Methodology: The power spectral densities shown in the manuscript are unevenly distributed in frequency space, with sparse low-frequency bins and dense high frequency bins. This makes interpretation of the diurnal peak less robust. Recommend applying frequency or logarithmic smoothing to the power spectra.

- ➔ *Indeed, the diurnal frequency was not explicitly labeled in the original figure, which may have made its identification less clear to the reader. Although the peak corresponds exactly to 1/24 h^{-1} and was confirmed to represent the maximum power within the diurnal band, this was not sufficiently highlighted in the visualization. To improve clarity, we have revised the figure to explicitly indicate the diurnal frequency in Figure 4.*

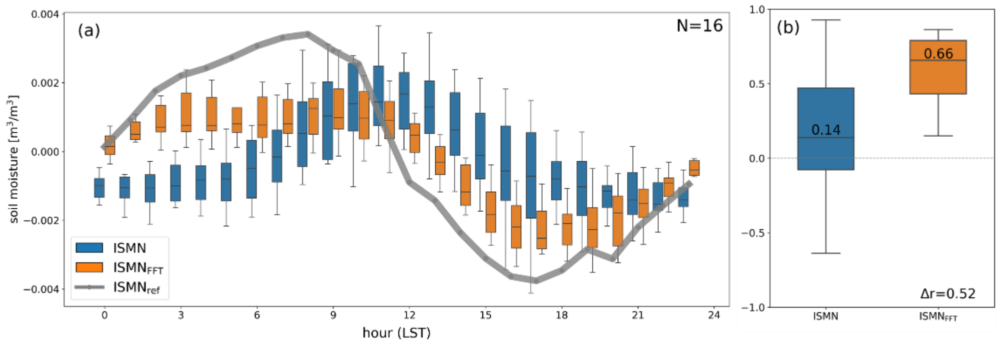


5. Results: The evaluation strategy compares adjusted SM time series with reference sensors located up to 200 km away. Given the extreme spatial heterogeneity of soil moisture, such comparisons raise concerns about physical meaning. Even at distances of a few meters or hundred meters, SM can differ substantially due to soil texture, vegetation, topography, and land management.

➔ *We agree with the reviewer that soil moisture exhibits strong spatial heterogeneity due to variations in soil texture, vegetation, topography, and land management, and that this can limit the physical interpretability of comparisons across large distances. The initial 200 km radius was chosen to ensure a sufficient number of reference sensor pairs for statistical evaluation, particularly in regions with sparse stations.*

Importantly, the evaluation targets the temporal correlation and phase consistency of the diurnal cycle, rather than absolute soil moisture magnitude. Even when mean soil moisture differs between sites, stations located within similar climatic regimes can exhibit comparable diurnal timing characteristics.

In response to the reviewer's suggestion, we conducted a sensitivity analysis by reducing the distance threshold to 50 km. Although the number of available station pairs decreased from 20 to 16, the sample size remained sufficient for a statistically robust evaluation. Therefore, we adopted the 50 km distance criterion in the revised manuscript, which improves physical representativeness while maintaining adequate statistical reliability.



Minor comments

1) The correction is only for dielectric-based SM, this should be pointed out in the Title.

➔ *Thank you for this comment. We have revised the title to explicitly indicate that the proposed correction is applicable to dielectric-based in-situ soil moisture measurements.*

Revised title: "Adjusting Diurnal Error in Dielectric-Based In-Situ Soil Moisture Measurements via Fourier Time-Filtering Using Land Surface Model Datasets"

2) L124-125: This has been reported in the introduction and do not need to repeat here.

➔ *Thank you for pointing this out. The repeated statement has been removed from Lines 124–125 to avoid redundancy with the Introduction.*

3) L168: References introducing eddy-covariance method are needed here, there are multiple classical papers and books. Pastorello et al., 2020 is not a perfect one.

➔ *We thank the reviewer for this comment. The originally cited reference was removed because it was considered not sufficiently appropriate for introducing the eddy-covariance method.*

4) L172: Reference for FLUXNET2015 is missing here. Pastorello et al., 2020 is the right citation.

➔ *We appreciate this comment. The reference for FLUXNET2015 has been added, using Pastorello et al. (2020) as the appropriate citation in Line 176.*

"FLUXNET2015, the latest major release of globally harmonized flux tower observations (Pastorello et al., 2020), provides Tier 1 data accompanied by quality flags for each variable, along with the flag of uncertainty and gap-filled data."

5) L205: Fig4a -> Fig 3a? And similar issues below.

➔ *Thank you for pointing this out. The figure reference has been corrected (Fig. 4a → Fig. 3a), and similar inconsistencies below have also been fixed.*

6) L239: What adjustment?

➔ *We have clarified this sentence to explicitly specify the nature of the additional adjustment. The revised text now reads (Lines 252-254):*

➔ ***"Since this approach yields negative values in reconstructed SM time series during extremely dry periods, the diurnal amplitude is further constrained for such instances to ensure physical plausibility. This adjustment, detailed below, prevents the artifact of negative soil moisture while maintaining the integrity of the diurnal signal."***