

Third Reviewer:

The authors have appropriately addressed my previous comments, and I suggest to accept this paper after addressing my following two concerns.

1. For the results presented in Figures 3-6, how the authors match the Noah-MP results with SMAP results given the fact that the sampling frequency of SMAP data is one per three days. I think relevant description should be provided in the manuscript. The authors should also note that the sampling frequency will largely affect the computation of τ_L as given by Shellito et al. 2016.

R: We thank the reviewer for the thoughtful comment. To address the concern about how Noah-MP results were matched with SMAP observations, we clarify in the manuscript (Section 2.2.2) that the Noah-MP soil moisture data were selected to correspond to SMAP observation times. Additionally, the SMAP L3 soil moisture data were resampled to achieve a consistent sampling frequency of one observation every three days at each pixel, as previously stated:

We also note that the sampling frequency can significantly influence the computation of τ_L , as highlighted by Shellito et al. (2016). To mitigate this potential impact, we ensured temporal alignment between Noah-MP outputs and SMAP observations, maintaining a consistent 3-day sampling interval.

We also added the following into paper:

“To ensure comparability, Noah-MP soil moisture data were selected to correspond to the SMAP observation times. This alignment minimizes potential biases introduced by temporal differences and facilitates a consistent analysis of soil moisture memory. It is important to note that the sampling frequency, as highlighted by Shellito et al. (2016), can significantly influence the computation of τ_L . This potential impact was mitigated in this study by aligning Noah-MP data with SMAP observation times and maintaining a consistent sampling frequency of one observation every three days, ensuring a reliable basis for analyzing soil moisture memory.”

2. Considering the impact of sampling frequency, it's also interesting to know how the authors derive these results for rootzone for matching those analyses made for surface layer?

R: We thank the reviewer for this insightful comment. To address the concern regarding how root-zone results were derived to match analyses made for the surface layer, we clarify in the manuscript that both Noah-MP outputs and ISMN data were resampled to ensure temporal consistency with SMAP surface-layer observation times. Specifically, Noah-MP outputs for the root zone were sampled at the same temporal intervals as SMAP, and the ISMN data, which served as the benchmark for root-zone analyses, were also resampled to match SMAP observation times. This approach ensures alignment in sampling frequency across datasets, minimizing biases introduced by differing temporal resolutions and allowing for a consistent comparison between surface-layer and root-zone soil moisture memory analyses.

We also add the following into 2.2.3 section of the paper:

“For root-zone analyses, Noah-MP outputs were sampled to ensure temporal consistency with SMAP surface-layer observation times. Similarly, ISMN data were resampled to match the SMAP observation times, ensuring alignment in sampling frequency across all datasets used as benchmarks for root-zone soil moisture memory.”