Reviewer 2:

This manuscript presents an excellent dataset: two years of continuous isotope measurements in precipitation, soils, trees, and stream water in a boreal mixed forest. The contrasts between spruce and pine, and between a normal (2017) and extreme drought year (2018), are highly valuable. The results go beyond the traditional "two water worlds" framing by showing that transpiration is species-specific and dynamic, shifting with drought and rewetting.

General comments

This is a strong and timely paper. The continuous isotope record across two contrasting years is a major contribution. The paper would be significantly strengthened if the authors (i) reframe the introduction toward dynamics, (ii) add quantitative analyses (event lags, rainfall thresholds, precipitation totals, unmixing), (iii) clarify methods (ideally with a schematic of the sampling design and photos of the site), and (iv) improve figure compilation.

We will further emphasize dynamics. The photo is a good idea. We will add a Gantt chart to the supplement showing when each set of measurements were made.

I also wonder whether the Seasonal Origin Index (SOI) is the most informative metric. The precipitation isotopic data do not follow a clear sine-shaped seasonal pattern, which may limit interpretability. A summer–winter endmember unmixing approach applied per time step could better capture event-driven dynamics, highlight species contrasts, and allow uncertainty estimates (e.g., via Bayesian or bootstrapped mixing models). The SOI metric could still be retained for comparability.

Summer/winter unmixing is certainly possible, but it would not add so much to the SOI analysis, which essentially does the same thing. We will provide clearer references of the unmixing approach as an alternative in the discussion. We agree that it will help to present the sine curve fit to show where the "non-sine" behavior occurs and how it influences the results. In addition, we have added a description of the dynamics during the drought-breaking event in 2018.

The continuous monitoring through drought and recovery is the most exciting aspect of the study. While the "two water worlds" hypothesis provides a useful background, it may have reached its heuristic limit. The dataset is better framed in terms of temporal dynamics and species contrasts, as already suggested by Reviewer 1.

We will place a heavier emphasis on the dynamic responses.

I encourage the authors to be cautious with terms such as “water pools,” which can imply complete separation of sources. Water in soils and catchments mixes continuously across depths and time. It is not black and white (not purely winter vs. summer or deep vs. shallow) but a gradient of interactions and mixtures (e.g., Dubbert et al., 2019). Acknowledging this explicitly and noting that such behavior can be simulated with mechanistic models would provide a more nuanced interpretation. For instance, Meusburger et al. (2022) showed with modeled root water uptake that both shallow- and deep-rooted species switched to deep soil water during drought but returned to recent shallow water after rewetting. An extension of this model with isotope transport (LWFBrook90.jl) can reproduce the distinct signatures between species and residual (blue) water. This suggests that physically based models can capture these dynamics without invoking a rigid “two water worlds” separation, reinforcing a process-based interpretation of water sourcing.

The Meusburger ms. provides a good example of a non-isotopic, soil-focused analysis of water consumption by forests from a broad range of soils. It would be interesting to try analyzing these data in this way. But it seems beyond the scope of the current manuscript, especially considering that we wish to emphasize the xylem data. We will provide the documented data and contact potential collaborators to see if they would be interested in working on such an analysis for another paper.

The manuscript is largely descriptive. While not a weakness, adding straightforward analyses would strengthen mechanistic insight. I also second the comments of Reviewer 2 regarding more quantitative evaluation. Because the soil isotope equilibration devices were only installed at 5 and 15 cm depth, please discuss how you can be confident that a meaningful isotopic gradient existed along the full profile, particularly given that spruce and pine likely access water from different depths. Providing basic information on total soil depth would also be helpful.

We have added a brief description of the pulse after the 2018 drought was broken, which leads into a more mechanistic set of interpretations. The soil data were so limited that we could not support much mechanistic interpretation of them. We have clarified this limitation in the text. Soil depth data will be taken from earlier hydrologic studies at this site, which show exponentially declining hydraulic conductivity with depth (Bishop et al. 2004), which results in isotopic mixing primarily in the upper layers (Laudon et al. 2004).

The observed vertical profile in soil $\delta^{18}O$ is consistent with piston flow (line 208), but a simple quantitative check could make this conclusion more robust. For example, compare pre- and post-event soil $\delta^{18}O$ values and volumetric water contents to estimate the fraction of soil water replaced during major rainfall events, providing quantitative support for Figure 3.

We will add a brief description of this phenomenon to the new text focusing on the breakthrough after the rains in 2018. We will need to use forest floor data from studies at adjacent sites and the time to breakthrough at the 5-cm soil depth. Particularly interesting in this new analysis is the $\delta^{18}O$ of the 5-cm soil probes, which did not rise as high as the heavy rains, suggesting that only half (53%) of the water was replaced after the rains. This point will be added.

At line 215, the manuscript states that the SOI value (~0.16) in deep soil layers indicates a nearly even mixture of winter and summer precipitation and interprets this as evidence for macropore flow. This pattern may not exclusively indicate macropore flow; it could also reflect seasonal removal of isotopically heavier summer water by transpiration, leaving lighter winter-like water behind. Please discuss both processes as potential contributors.

Agreed. Will do.

Regarding Fig. 4, the strong distinction between SOI of streamflow and transpiration is interesting but should not be overinterpreted as evidence for fully distinct water worlds. A continuum shaped by root distribution, water availability in soil layers, and temporal dynamics of inputs and outputs is a more realistic interpretation.

This is the point we were trying to make, apparently not clearly enough. Will strengthen it

Additional small comments:

- Consider combining 2017 and 2018 into single panels.
  - As in R1 response, it became too busy.
- Consider adding all compartments (precipitation, soils, trees, streams) into one composite figure (Reviewer 1 suggestion). Do the mixtures lie within the sources?
  - Will do.
- Line 225: correct to Gessler et al., 2022.
  - Yes, will fix
- Clarify in Methods how precipitation isotope sampling was done (collector type, frequency, storage) to ensure reproducibility.
  - Will do.

- Report isotope analyzer precision (e.g., ±0.1 ‰) and sample handling details (sealed vials, storage conditions) so readers can judge data quality.
    - Will do.
- In Figure 3, if soil data are discrete, mark sampling points; this will make profiles easier to interpret.
    - Yes, these are daily means. Will present the points.
- Add seasonal shading or vertical bars to Figure 1 for summer months to highlight the drought period visually.
    - Agreed.
- Provide average temporal resolution of stream water sampling (e.g., weekly/biweekly).
    - OK, and will note that the stream ran dry during the 2018 drought.

Bishop, K., Seibert, J., Koher, S., and Laudon, H.: Resolving the Double Paradox of rapidly mobilized old water with highly variable responses in runoff chemistry, Hydrol Process, 18, 185-189, 10.1002/hyp.5209, 2004.

Laudon, H., Seibert, J., Kohler, S., and Bishop, K.: Hydrological flow paths during snowmelt: Congruence between hydrometric measurements and oxygen 18 in meltwater, soil water, and runoff, Water Resour Res, 40, 10.1029/2003wr002455, 2004.