The manuscript is generally well organized, with a relatively clear logical structure and a comprehensive presentation of the modeling results. The development of the coupled FORMIND-mHM framework is an interesting effort to better represent the interactions between forest growth and hydrological processes. However, I believe several aspects of the manuscript could be further improved, particularly regarding the description of model setup and parameterization, the clarity and consistency of scientific terminology, and the validation of the key scientific findings. Addressing these issues would help strengthen the scientific rigor, reproducibility, and overall contribution of the study. My specific comments are provided below.

Thank you very much for your time and effort in reviewing our manuscript and the many helpful comments and suggestions! In the following, we address all comments point by point and describe the changes we plan to make in the revised version of the manuscript.

1. **Clarification of minimum soil water content**: The term "minimum soil water content" (Theta_msw) may be misleading, as it could be interpreted as the permanent wilting point in soil science. Based on Eq. (1), this parameter appears to represent the critical soil water content below which plants begin to experience water stress, rather than the minimum soil water content itself. The authors should consider using a more precise term, such as "critical soil water content for plant water uptake," and clarify its physical meaning. Additionally, please explain how the soil hydraulic parameters, particularly Theta_pwp and Theta_msw, were determined or parameterized.

   Thank you, we will rename the parameter to “critical soil water content for plant water uptake” in Eq. (1) and throughout the manuscript, and clarify its meaning: it is the soil water threshold above which there is no soil moisture limitation for plants’ transpiration.

   In stand-alone FORMIND, soil hydraulic parameters are determined from soil data and from literature values. In the coupled framework applied to the Selke catchment, FORMIND’s soil module is replaced by the soil module of mHM, so these FORMIND parameters are not used. There, Theta_pwp and Theta_fc are derived from soil data by multiscale parameter regionalisation (Samaniego et al., 2010), and Theta_crit is calculated as Theta_ pwp + 0.4 (Theta_ fc - Theta_ pwp) (Granier et al., 1999).

   We will add this information in Sect. 2.3.

   For the evaluation at the Hohes Holz site, no regional mHM parametrisation is available, and stand-alone mHM was not run there. We therefore set four soil parameter values manually according to the local soil type using a texture-class lookup table (Maidment, 1995) and layer depth. Root distribution was estimated from literature data (Leuschner et al., 2004).

   We will clarify this in Sect. 2.4.2.

2. **Representation of soil evaporation**: Equation (3) describes the calculation of plant transpiration, but it is initially unclear how soil evaporation is represented in the model. I noticed that the authors explain later in the manuscript how soil evaporation is calculated by mHM. However, I suggest briefly mentioning this earlier, when introducing the soil water balance, to avoid potential misunderstanding and improve clarity.

   Thank you. We understand this comment as referring to the soil water balance of FORMIND (Eqs. 2–3), which does not state how soil evaporation is treated. FORMIND does not explicitly consider soil evaporation, as plant water uptake usually is the dominant process in forests.

   We will add a sentence for clarification in section 2.1.

3. **Assumption of a fixed root zone depth**: In the proposed framework, the key two-way coupling occurs between forest growth and soil water processes, with the soil component restricted to the upper soil layer, defined as the root zone depth (Line 121). However, assuming a fixed root zone depth may not adequately represent actual forest growth dynamics, as the rooting depth of some temperate deciduous trees can exceed 2 m. Could the authors clarify the rationale for this assumption and discuss its potential limitations? In particular, how might extending the root zone to deeper soil layers affect simulated soil moisture, plant water uptake, and forest growth?

   Thank you very much; that is a very interesting question, and we will elaborate on this assumption in greater detail in the revision. We have opted for a fixed root zone depth, as both models, in their standalone versions, also require a fixed root zone depth. Although the depth can be configured before the simulation begins, it then remains unchanged throughout the entire simulation period. As one of the objectives in coupling these two models was to leave both models in their original state as far as possible, we have retained this model feature to ensure comparability between the standalone and coupled model versions.

   Extending the root zone depth or having it develop dynamically with vegetation growth could be very interesting, especially in a drought scenario, where deep rooting is an important coping mechanism for trees. Here, as implemented in the standalone-mHM version, we assume the following: 1) Soil moisture uptake by plants in each soil layer is proportional to the layers' relative root fractions 2) Deeper soil layers cannot compensate for soil moisture deficits in upper layers. As most of the fine root biomass is located within soil depths already represented in our model (Pietig et al., 2026), an increase in the root zone depth is likely to have only limited effects on soil moisture, plant water uptake and forest growth.

   We will add this discussion to Sect. 4.1.

4. **Section organization and input data description**: I suggest revising the title of Section 2.4, as this section also covers the model setup and configuration. Additionally, it would be helpful to include a summary table in Section 2.4.1 listing all input datasets, their sources, and their spatial and temporal resolutions. This would provide readers with a clearer overview of the data used in the study and make the methodology easier to follow.

   We will revise the title to include all things covered in Sect. 2.4 and include a tabular summary of input datasets in Sect 2.4.1.

5. **Evaluation of evapotranspiration performance**: Evapotranspiration (ET) is an important variable for evaluating the coupled model's performance, particularly given the interactions between forest growth and soil water processes. I suggest including additional evaluation metrics, such as KGE and PBIAS, rather than relying solely on R2. The corresponding regression equation could also be provided in the figure. Additionally, I am curious whether the coupled FORMIND-mHM model performs better under conditions of high evapotranspiration demand. It would be interesting to investigate whether the benefits of two-way coupling become more pronounced during periods of intensive evapotranspiration.

Thank you for these suggestions. We will extend the evaluation of ET at Hohes Holz as follows: (1) We will add a table that reports further statistical metrics in addition to $R^2$. (2) We will add the regression equation to each panel in Fig. 3. (3) To examine whether the coupled soil module performs better under high evaporative demand, we will calculate the metrics separately for low, medium and high potential evapotranspiration within the vegetation period.

6. **Validation of the analytical pathway in Figure 6**: Figure 6 attempts to reveal an analytical pathway linking the different processes in the coupled framework, which is also highlighted as a key finding in the abstract. However, I wonder whether this pathway can be supported by local observational data. To some extent, such relationships may naturally emerge when all relevant components are incorporated into a coupled modeling framework. Therefore, it is important to distinguish whether the identified pathway reflects an actual ecological mechanism or is primarily a consequence of the model formulation. To strengthen this claim, I suggest that the authors consider using observational GPP data, if available, to examine whether similar relationships can be identified. Otherwise, one could argue that the reported pathway is largely driven by changes in the model equations rather than providing independent evidence of the underlying ecological processes.

   Thank you for this important comment. We will repeat the analysis with observation-based data: remotely sensed GPP (MODIS) and observed discharge.

   We will add a figure to the Supplements and report the outcome irrespective of whether the simulated relationship is reproduced in Sect. 3.5.

7. **Figure 3 labeling and units**: In Figure 3(c, d), the x-axis label "Observed xxx" is unclear and should be revised to "Observed GPP at xxx" with the corresponding units. Additionally, please clarify the temporal units of GPP, as the figure appears to present daily observations while the y-axis indicates annual units (Mg C ha-1 yr-1).

   We will change the label to "Observed GPP at Hohes Holz" and add a separate x-axis label for (a) and (b). The data for GPP are daily values that have been converted to annual values. We will add a conversion formula to the figure description.

8. **Clarification of the simulation, calibration, and validation periods**: The definition of the simulation period is unclear. Line 278 mentions the period 2005-2015, while a different period, 2015-2020, is introduced in Line 299 without sufficient explanation. I suggest clearly defining the overall simulation period, as well as the calibration and validation periods, in the model setup section. The authors should also clarify how these different periods relate to each other and whether the same periods were used for both FORMIND-mHM and the standalone models to ensure a consistent and transparent model evaluation.

   Thank you for pointing this out. We used three simulation periods:
   (1) 2001–2020 for the catchment-scale evaluation of discharge, AET and soil saturation and for the GPP–discharge analysis (mHM and FORMIND-mHM); (2) 2005–2015 for parameter optimisation and the sensitivity tests (mHM and FORMIND-mHM), a period without major drought events; (3) 2015–2020 for the evaluation of ET and GPP at Hohes Holz, determined by the availability of eddy covariance data (FORMIND and FORMIND-mHM). Models compared in one analysis were run over identical periods. mHM was calibrated over period 2, FORMIND-mHM used its soil parameters, and FORMIND was not calibrated.

We will define in a new table and paragraph in Sect. 2.4.4 and remove all inconsistencies with the presentation of results regarding the simulation periods.

**References**

The references can be found in the reviewed main text. The only new reference used in our response is the following:

Leuschner, C., Hertel, D., Schmid, I., Koch, O., Muhs, A. & Hölscher, D. (2004). Stand fine root biomass and fine root morphology in old-growth beech forests as a function of precipitation and soil fertility. Plant and Soil, 258. https://doi.org/10.1023/B:PLSO.0000016508.20173.80

Pietig, K., Kotowska, M., Coners, H., Mundry, R. & Leuschner, C. (2026). Deep rooting revisited: Comparing the rooting patterns of European beech, Sessile oak, Scots pine, and Douglas fir in sandy soil to 3.8 m depth. Forest Ecology and Management, 600. https://doi.org/10.1016/j.foreco.2025.123288.