Responses to HESS reviews on "**More trees, more rain? The unexpected role of forest and aquifers on the global water cycle**" by J. Chéry, M. Peyret, C. Champollion, and B. Mohammadi

We thank D. Sheil who provides a review of our paper, bringing comments that will be useful to improve its value. Our responses and propositions are written in red italic.

The manuscript presents a model linking forests, aquifers, and rainfall distribution. The core ideas seem new and potentially useful: presenting complex climate–vegetation feedbacks in this simple framework has possible value, especially as a conceptual tool. The positive framing of forests as sustaining inland rainfall is also constructive and welcome. However, the current paper is hard to follow (I am not sure I grasp all the details) and unsuitable for publication without revision.

Major:
Framing and focus – The paper claims to "test the biotic pump" but does not engage with its defining mechanism. Instead, the model explores a conceptual model of forest–aquifer–rainfall interactions. For example, the sentence "We test the biotic pump" could be replaced with "We propose a simplified model of how forests and aquifers may jointly sustain inland rainfall."
Response:
*We acknowledge that the current framing is misleading. We will revise the introduction and abstract to clarify that our model explores **forest–aquifer–rainfall interactions**, not the condensation-driven "biotic pump." We will explicitly state that our goal is to propose a **simplified conceptual framework** for understanding how forests and aquifers may jointly sustain inland rainfall, distinguishing it from previous work.*

Structure, coherence and clarity – The argument is dense and difficult to follow. Assumptions, derivations, and conclusions are jumbled together. Methods and results should be separated, with explanatory text alongside equations. For instance, when presenting the conservation equations, explain each term before moving to outcomes.
Response:
*We will restructure the **Methods** and **Results** sections to improve clarity:*

- ***Methods:** We will separate the presentation of conservation equations and constitutive laws, explaining each term and assumption before deriving outcomes.*
- ***Results:** We will guide the reader step-by-step through the logic linking assumptions to outcomes, ensuring that statements like "forests amplify rainfall inland" are supported by clear, sequential reasoning.*

Literature – The review of prior work is incomplete and risks misleading readers. For example, the manuscript cites criticisms of the biotic pump but omits published rebuttals of this criticism and various other studies that have advanced the debate. At minimum—if the focus on the biotic pump is maintained—the authors should add references to both critiques and responses, note further advances, and explain where their model and implied results sit relative to these debates.
Response:
We agree that the literature review is incomplete. We will:

- *Remove the focus on the "biotic pump" in the introduction.*
- *Expand the review to include **key mechanisms and models** for long-term moisture transport and moisture-rain conversion, citing both critiques and advances in the field.*
- *Position our model within this broader context, clarifying how it complements or diverges from existing debates.*

Validation – Does the model capture real patterns and processes? We don't know. Even a simple comparison figure or discussion would help.
Response:
To address concerns about model validation, we will:

- *Add a **comparison figure** using Australia as a case study, extending Fig. 2 to show how our model's predictions align with observed patterns (selected profiles of relative humidity and precipitations).*
- *Include a **discussion section** to interpret these comparisons, highlighting strengths and limitations of the model's predictive power.*

Specific sections:

Introduction – Lacks a clear framing of the research gap. It blends critiques of the biotic pump with broad statements about forests and hydrology, which makes it difficult to identify a clear focus. The introduction should be restructured to identify the unresolved question and state precisely how the new model contributes.
Response:
We will restructure the introduction to:

1. *Clearly define the **research gap**: How do forests and aquifers interact to sustain inland rainfall, and what are the limitations of current models?*
2. *Outline the **three key processes** our model addresses: moisture transport, moisture-rain conversion, and the hydrologic cycle.*
3. *End with a **concise statement** of our model's novelty and its potential as a conceptual tool.*

Section 2 and Figure 1 – The purpose is unclear. It is not evident whether these results reproduce earlier work or simply serve as context/background. As written, the section is difficult to follow, and the connection to the rest of the paper is weak. If Figure 1 is meant to replicate established results, this should be stated explicitly and properly cited; if it introduces something new, the text should highlight what differs from prior publications and why this matters. In either case, the caption should clarify the intent. It did stimulate questions (not sure if relevant): If a comparison with past publications is intended then we need to know are the data suitable to show what is intended? How do these patterns compare if other data sources are used? What are the differences and why?
Response:
We recognize that Section 2 and Figure 1 lack clarity and purpose. We will:

- ***Remove Figure 1** and its associated text to streamline the paper.*
- *Ensure that all remaining figures and sections are **explicitly tied to the research questions** outlined in the introduction.*

Results – The results are presented with little explanation of the logic linking assumptions to outcomes. It is opaque where it needs to be clear. Statements such as "forests amplify rainfall inland" are asserted without the required step-by-step justification. This section should be rewritten to guide the reader through the results.
Response:
*We will revise the **Results** section to:*

- ***Link each result** to the research questions posed in the introduction.*
- *Adding **dedicated experiments** to explore the relative influence of wind and dispersion on moisture transport, ensuring that assertions like "forests amplify rainfall inland" would require intense new developments. Interesting for a future paper.*

Discussion – The discussion is underdeveloped. The authors should expand this section to situate their findings within some broader debate(s) and to clarify whether their model supports, contradicts, or simply complements the biotic pump hypothesis (a clearer goal would help too).
Response:
*We will expand the **Discussion** to:*

- *Situate our findings within the broader debate on forest–rainfall interactions.*
- *Clarify whether our model **supports, contradicts, or complements** the biotic pump hypothesis.*
- *Discuss the **advantages and limitations** of our model formulation, using the Australia case study as a point of comparison.*

Conclusions – This section seems more a restatement of intent than a synthesis. Asserting that "forests sustain rainfall" seems too general (we know that already). The conclusions should restate the core contribution and new insights with clarity and precision.
Response:
*We will revise the **Conclusions** to:*

- ***Synthesize the core contribution** of our model, avoiding overly broad statements like "forests sustain rainfall."*
- *Highlight the **specific insights** our framework provides, such as the role of aquifers in moisture-rain conversion, and suggest directions for future research.*

Minor:
Terminology is inconsistent; clarify early whether "biotic pump" refers to the original condensation-driven hypothesis or a broader forest–rainfall linkage.
Response:
We will restrict the use of "biotic pump" to the original condensation-driven hypothesis.

Long, complex sentences should be broken into shorter, clearer ones.
Response:
We will do so.

Overall: contains some stimulating ideas about important topics but needs substantial work on framing, clarity, literature, and validation before it might be published.
Response:
We will try to fulfill these recommendations in a revised version.