

Response (**in bold**) to May 9, 2025 revision reviewer 2 (*in italics*):

The revised manuscript offers a comprehensive blueprint for CMIP7, detailing the expanded DECK, the Assessment Fast Track (AFT) suite, and the rationale behind the new emissions-driven and process-oriented experiments. Relative to the first revision, the paper is notably clearer, better structured, and more tightly linked to the four flagship science questions. These improvements make the manuscript substantially more readable and impactful. However, the interaction between carbon and water cycles remains insufficiently addressed in the revised Section 2.3. The manuscript also still contains overly long sentences and occasional grammatical errors, which at times impede readability. Further proofreading is recommended. I suggest a minor revision focused on strengthening Section 2.3 and improving the clarity of the writing. A number of specific comments are provided below for the authors' consideration.

We thank the reviewer for their attention and comments and have addressed them in the below responses and through another general round of careful reading for language to clarify the points including further clarification of guidance on Scenarios. We have added emphasis on opportunities for coupled water-climate-carbon in the Transient Climate Response to Cumulative emissions and expectations of improved soil carbon representation in Section 2.3.

- *Lines 64–70: “The historical publicly availability of CMIP ensembles have...” → “has.” Also, the sentence is too long. Suggest splitting: “...in house. This accessibility has advanced...”*

We have fixed the singular verb and broken up the sentence.

- *Line 95: “Unfortunately. the necessary ESM capabilities...” → “Unfortunately, the necessary...”*

Fixed

- *Lines 119–124: Break into three sentences for clarity:*

“The paper then provides guidance on protocols for the mandatory Diagnostics, Evaluation, and Characterization of Klima (DECK) experiments and the recommended Assessment Fast Track experiments (Section 3). It distinguishes between experiments with a stronger emphasis on assessment and service-oriented prediction and projection, and those aimed at process understanding through characterization and attribution. The paper concludes with a discussion of CMIP’s evolving role in the research community.”

We have broken up the sentence and added further section titles.

- *Lines 180–182: Consider revising for improved clarity as follows: “State-of-the-art coupled carbon cycle–climate modeling lies at the intersection of climate science, ecosystems, hydrology, biogeochemistry, and socioeconomic systems. The future resilience of natural systems and human-modulated carbon sinks remains one of the key uncertainties in efforts toward climate stabilization and warming reversal.”*

So taken

- Lines 213–216: Would this be better:

“Forest dieback and demographic shifts, for example, depend heavily on drought risk and related thermal and hydrological stressors (Drijfhout et al., 2015). This makes the representation of climate–vegetation interactions critical for robust assessments of potential change, especially as resilience may already be declining in the Amazon (Boulton et al., 2022).”

Taken with modification.

- Lines 284–285: “recommend extend the simulation out to 300 years” → “recommend extending the simulation to 300 years”

Accepted

- Line 310: Suggest breaking into two sentences: “...(if applicable). In other words,...”

Accepted

- Lines 328–331: Consider revising to:

“As background, modeling centers are advised to improve the historical CO₂ trend in their esm-hist simulations, addressing biases observed in the CMIP6 ensemble, which ranged from –15 to +20 ppm by 2014 (Gier et al., 2020). The causes of these biases and strategies for reconciling model output with observations have been the focus of extensive recent research (e.g., Hajima et al., 2025).”

The sentence has been split and revised.

- Lines 544–546: Consider revising to:

“Thematic diagnostic groups and sustained-mode initiatives are also being established, with teams focusing on the CMIP carbon footprint, controlled vocabularies, and quality control/assurance.”

So taken.