Dear Stroo et al., thank you for your detailed responses and clarifications to my comments. I am pleased to see that the revised manuscript includes helpful information and interesting discussion in response to the community and reviewer comments.

**Comments on the revised manuscript:**

In the revised manuscript the authors have made a number of corrections that are very helpful for improving the clarity and readability of the work. Additionally, the authors have completed detailed revisions explaining their temporal correlation scheme, identifying suggested mechanisms for the history of H_2 growth, and explaining differences in soil uptake seasonality between their theoretical prior and posterior schemes.

I find the discussion from lines 307-321 particularly helpful as the authors weigh underlying mechanisms that lead to increases or decreases in H_2 to give explanation to their findings – particularly the soil H_2 sink may have weakened through environmental and moisture limitations – also in line with a signal responding to ENSO. Importantly this discussion reinforces the hypothesis that H_2 growth has been dominated by increasing global CH_4.

In lines 323-334, Appendix B and Tab.F3, the authors leverage the ability of their framework to constrain the seasonality of soil uptake. Through this they identify the strength of the seasonality of uptake in different latitude bands and regions. This compares favourably with recent work from Stone et al. and constrains uptake to a smaller seasonality than in our earlier work (Tardito Chaudhri and Stevenson, 2025) that was based on minimising the change in a prototype soil sink scheme needed to bring prescribed boundary layer chemistry experiments into agreement with observations. Importantly, Stroo et al. show that by also updating the chemical production of hydrogen, an updated soil uptake scheme can have a substantially smaller seasonality.

I am pleased to read that work is underway to build on Pieterse et al. in the TM5 model for future work.

I suggest that the manuscript should be accepted for publication in its current form.