

## ***Interactive comment on “A consistent molecular hydrogen isotope chemistry scheme based on an independent bond approximation” by G. Pieterse et al.***

**G. Pieterse et al.**

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We thank the referee for the constructive comments. We will implement the suggested changes with care. In the following we specify the changes related to the specific comments.

Comment in last paragraph on S1809: We will expand the discussion in Section 5 to summarize the sensitivity of the model outcome to the most critical reaction steps and assumptions.

Comment regarding lines 93-103: Yes, MIE is a counting effect. As the other referees have similar comments regarding the explanation of this term, we will rewrite this section to improve clarity.

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Comment regarding Table 4: This is a very valuable comment and leads to the scientific question for further experimental analysis of the fate of hydrogen in nitrogen fixation. In fact, our group has recently carried out new experiments on the isotope signature of biologically produced H<sub>2</sub>, which is now being prepared for publication. Whereas these data confirm the low value (even -700permil) of biologically produced H<sub>2</sub>, the effect of the oxidation before H<sub>2</sub> can escape to the atmosphere has not yet been assessed in any study. In the absence of suitable data, we would like to keep the value in the table and to add a short discussion there.

Comment regarding Table 5: The values in the table are the result of the contributions of isotope effects in the production as well destruction of the mentioned species. Therefore, the values are not the source signatures.

Comment regarding lines 449-451: We will clarify the sentence. We meant to say that the KIE is known, but the amount of deuterated methyl that is formed from this reaction is unknown because the probability of the abstraction (i.e. the branching ratios) of the deuteron is hard to validate experimentally. Therefore, we were interested in the sensitivity of the model outcome to changes in the branching ratios.

Comment regarding lines 482-485: We will rephrase this sentence.

Comment regarding lines 531-536: We mean to say that inserting the KIE values reported by Feilberg leads to an isotopic composition of hydrogen that is much lower than observed experimentally and that significant changes would be required in other parts of the budget to get a more realistic isotopic composition. Hence, we think that something might be inconsistent in the above mentioned study. At the moment, we are also discussing this with the authors.

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 5679, 2009.

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