

Interactive comment on “Interannual variability of isotopic composition in water vapor over West Africa and its relation to ENSO” by A. Okazaki et al.

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In the manuscript “Interannual variability of isotopic composition in water vapor over West Africa and its relation to ENSO”, the authors, Okazaki, A. et al., use a global, isotope-enabled climate model, in order to examine the relationship between West African rainfall patterns and ENSO activity.

The evaluation of the model with respect to the given region nicely shows that the model is suitable to face the given science question. The analysis method and the sensitivity experiment are well chosen. The relationship with ENSO shows the value of

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this method for climate reconstructions. The conclusion section as well as some parts of the other sections, however, are somewhat disorganised and require restructuring. Moreover, several minor aspects should be taken into account before publishing. A list of specific comments and some technical corrections is given below.

Specific comments:

1. P24444 L11f: “As the observations cover relatively short periods” seems to be a rather one-sided reason for choosing to use a model.
2. P24444 L15: A (half) sentence about the compared time scales of the variability could be added here.
3. P24444 L16: The sensitivity experiments should be mentioned here.
4. I would appreciate some brief information about the technical realisation of the method described in Sect. 2.3.
5. P24448 L15-16: “Multiplying Eq. (1) by R_w , subtracting from Eq. (2) yields”. The sentence and the procedure is unclear to me.
6. P24449 L14: In order to strengthen your evaluation you could refer to Werner et al. 2011 here, since they write: “According to C. Frankenberg (personal communication, 2010), potential errors in the satellite retrieval algorithms might lead to a general bias of absolute SCIAMACHY δD_v values up to 20%.” However, I am not sure if that also applies for the corrected satellite retrieval you are using.
7. Sect. 2.2 is missing a couple of informations about the model and the simulation: Since convection is very important in the study, the applied convection scheme should be mentioned. Also mention the time stepping and the output time step of the simulation are worth mentioning. Is there a reference for the NCEP SSTs?

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What initial conditions were used? Please (despite the reference to Yoshimura et al. 2008) add a little bit of information about the way of the implementation of the water isotopologues into the model. This is important regarding e.g. the assumptions that have been made (see e.g. P13 L12-13).

8. In the description of the sensitivity experiment in Sect 2.2: It should be made more clear that the specific fractionation effects are switched off only in certain regions of the model.
9. P24449 L26 – P10 L1: “The correlation between the two figures” Do you mean the δ value at 10°N here? Please make that more precise. Please also state once, what kind of correlation you are calculating (Pearsons?) and what P stands for.
10. P24450 L17-19: It would be useful to include the most important values from the table in the text here, too.
11. P24451 L12-22: The last paragraph of Sect. 3.2 is summarising and concluding Sect. 3.1 and Sect 3.2. Therefore, it should be a separate Section (3.3).
12. P24451 L26-P12 L2: Please refer to a figure here.
13. P24452 L26 – P13 L3: The readability of this part could be improved by separating the two points: Analysis period and analysed quantity. The reasons for the repetitive choices would be more clear then. Also, Fig. 5 does not show this point! Maybe you mean Fig. 4.
14. P24453 L4-5: “our simulation does not resolve at what height condensation and re-evaporation take place”. This point as a reason for the choice of the quantity is not obvious to me. I would appreciate a more detailed explanation.
15. P24453 L7. “may be” is very weak here! It should be assured that it is, otherwise, this part of the evaluation would be untenable.

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16. P24453 L16-18: Fig. 8 implies that the overall impact of advection is very low, in comparison to the others. Please state the scientific reason for still carrying out the analysis. Without, it seems pointless to do it.
17. P24453 L23: “the southerly flow decreases δw and the easterly flow increases δw ”. Can you add brief explanations for this behaviour?
18. P24454 L4: It seems like the correlation values R was forgotten here.
19. P24454 L16: Something is incorrect here (number, sign or text). A correlation of $R < -0.4$ is a fairly strong anticorrelation, not a relatively weak correlation.
20. P24456 L7: “ENSO is not the only mode affecting...”. Please mention very briefly what others there are.
21. Captions Fig. 1 and Fig. 2: “the average of the average”. Which average of which average? Anyway it sounds halting, maybe you can once use “mean” instead. Moreover, I am not sure what you mean by “which consists of measurements taken at least 10 times within 6 h”. Maybe: which consists of at least 10 measurements within every 6 h?
22. Fig. 8: The display makes it hard to see the absolute quantities, maybe (dotted) horizontal lines could help
23. Caption Fig. 8: I am not sure about the unit. Should it not only be “%d”? Why mm? Plus, SI unit for day is d.
24. The conclusion Section appears disorganised. E.g. P17 L7-13 and L18-24 are rather a discussion (and kind of outlook) and could be put into the respective Sections (Or a separate discussion section). The last paragraph also is an outlook and has not been discussed before. The chronology of the paper is not represented. **A conclusive statement at the end of the paragraph (and therewith**

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the paper) including the meaning of the study with respect to the actual science question is entirely lacking and missing.

Technical corrections:

1. P24443 L29: Please provide the equation for how to calculate δ values and the standard for $\delta^{18}\text{O}$ you are using.
2. P24447 L22: "...there are no differences in underlying mechanisms to produce changes". Please revise the english.
3. P24447 L27: changes in "the" isotopic composition
4. P24449 L16: "5°W-5°S" should be: "5°W-5°E", plus, a half sentence about what region that covers would improve the readability.
5. P24450 L 4-6: Maybe better: The bias in the mean field and "the" underestimated seasonality are "also" common "in" other GCMs
6. P24450 L20: equilibrium fraction"ation"
7. From Sect. 3.2 on: Please always state that you are analysing isotope "ratios". E.g. P24450 L27ff: Although our target is the isotope ratio of near-surface water vapor, we use the isotope ratio of precipitation to validate model reproducibility of the near-surface water vapor isotope ratio at the interannual timescale.
8. P24451 L2-3: The other "one" is
9. P24452 L3: We term the year"s"
10. P24452 L27: . . . , the analysis period should start before "the" initiation

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11. P24454 L3: the impact of "the" southerly flow
12. P24455 L16-17: ...averaged "the" NINO3 index calculated from "the" NCEP SST...
13. P24456 L5: . . . variability of "the" isotopic composition...
14. P24456 L15: ...the relation between "the" isotope ratio...
15. P24456 L25: GCM"s"
16. P24457 L16: equilibrium fraction"ation"
17. Caption Fig. 7: "isotopic composition". Please state that it is $\delta^{18}\text{O}$ (not another isotope)
18. Caption Fig. 8: ...derivative of "the" isotopic...
19. Caption Fig. 10: ...between "the" annual averaged..., "the" simulated . . . vapor isotope "ratio". 2 times more, please add "ratio"

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 24441, 2014.

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