

Manuscript: „Atmospheric circulation controls on the inter-annual variability in precipitation isotope ratio in Japan “

Authors: N. Kurita, Y. Fujiyoshi, T. Nakayama, Y. Matsumi, H. Kitagawa

Journal: Climate of the Past - Discussions

Review

In this manuscript N. Kurita and co-workers examine the intra-annual and inter-annual variability of stable water isotopes (HDO, H₂¹⁸O) in precipitation over central Japan. By analyses of a one-year event-based precipitation sampling campaign during 2013/14 the authors are able identifying major atmospheric circulation flow pattern driving intra-annual isotope variability in precipitation, both during the summer and winter season. The authors then apply their findings to available GNIP isotope data from Tokyo station covering the period 1962-1979. They convincingly demonstrate that observed inter-annual variability for both summer and winter season can be explained by variations of the same key atmospheric circulation flow pattern as found for intra-annual variability (for summer: warm rainfall events linked to moisture transport from subtropical marine regions; for winter: precipitation from cold frontal rainbands associated with extra-tropical cyclones).

Kurita and colleagues present a very nice study on the chosen topic and their results certainly provide sufficient new material and insights to warrant publication in its present form. The structure of the manuscript is well outlaid although I sometimes got a little bit lost in the very detailed description of the applied methods and analyses. The performed analyses and drawn conclusions are mostly solid and carefully taken.

The only major concern I have with this article is the chosen journal. I do not think that “Climate of the Past” is the most appropriate periodical for this study as it deals with the present-day climate of central Japan, only. The attempts of the authors to emphasize the relevance of their findings for paleoclimate studies are rather unspecific and along the general line of “a better understanding of the present will help us to better understand the past”, only. While this argument is certainly true I have some doubts about the usefulness of this study for many paleoclimate applications. Only very few isotope records with an annual (or even sub-annual)

resolution exists, yet. On the other hand, the authors are just dealing with intra- and inter-annual isotope variability but do not show that changes of the same atmospheric flow pattern are indeed responsible for isotope variations on much longer decadal, centennial, or even millennial time scales, too. Thus, the findings of this study may not be directly applied to many available Japanese paleoclimate isotope records. For this reason I don't think CP is the best choice of journal. However, I will leave the final decision about the appropriateness of CP for this study with the Editor.

Minor issues, which should be addressed before publication:

- Page 3991, Line 3: "Among other materials, these records ..." Please explain, what you mean by other materials that influence the isotope records.
- P3392, L5: a reference is missing
- P3993, L1: please reformulate "In contrast from the tropics, historical..." – This reads as no tropical GNIP data from tropical exists, at all.
- P3993, L16/17: "we can say that isotopic variation in mid-latitude precipitation is not directly controlled by temperature and precipitation amounts" – this statement is true for intra- and inter-annual variability, only. Please reformulate this phrase.
- P3996, L13: What is meant by "internal and external variations"?
- P3996, L15: Please explain how uncertainty for Deuterium excess values ($\pm 2.1\text{‰}$) has been determined. From the given uncertainty values for d18O and dD, one would expect a larger value for d-excess.
- P3996, L23: please insert "... by the same method as for precipitation samples."
- P3998, L19: 24h back trajectories seem rather short for as an indicator of cumulative rainfall before arriving at Nagoya site. Please explain this choice in some more detail.
- P3999, L5: "Because trajectories do not travel far away from Japan, the major source of uncertainty for cumulative rainfall is related to the quality of the precipitation field data, rather than the trajectory uncertainty." This is an important finding for the analyses and should be explained in some more detail. E.g. how many trajectories have been analyzed for each event? What distance is meant by "not far away from Japan"? I recommend that the authors add one extra figure showing examples of the reconstructed trajectories using HYSPLIT.
- P4000, L26: "Unclear seasonality" – please change to "Weak seasonality"

- P4001, L15: Please insert “These findings suggest that...”
- P4001, L20: Delete “with relatively ~~the~~ higher (lower)...”
- P4001, L25: Please correct “sub-synoptic scale rain fronts forms between...”
- P4002, L29: Please use the same sample label in Fig. 6a and Fig.5
- P4004, L13: Omit the comma in “We further examined...”
- P4005: The beginning of Chapter 4 “Inter-annual isotopic variation” starts with (too) many redundant information already given earlier and can be shortened.
- P4005, L16: Please correct “while air mass ~~the~~ traveleded through...”
- P4005, L24: Please give some more detail about the replaced of local precipitation amount by area-averaged precipitation amount. Which area has been considered? How is this area related to the extent of the trajectories used for the prior calculations of cumulative rainfall amount?
- P4008, L16: Please correct “to the years when the isotopic content”
- P4009, L7: The statement “The expectation was for a correlation between d18O variability and ENSO through the PJ pattern” sounds awkward – please rephrase it.
- P4009, L9: Please change “The reason is believed to be...” to “The reason might be...”
- P.4011, L7: Please delete “at ~~the~~ multiple temporal scales.”
- P4011, L8: Please correct “less seasonal variations” to “minor seasonal variations” or similar
- P4012, L12: Please insert “These results indicate that...”
- P4012, L24: I suggest to use the term “isotopic variability of mid-latitude precipitation” instead of “isotopic composition” as this describes much better the presented results
- Fig. 4: Did all precipitation events have the same duration? If not, how much did they differ? Please include this piece of information in the plot or manuscript.
- Fig. 8: Why has GPCC precipitation data instead of GNIP precipitation data been used in this figure? Do large differences in both monthly precipitation data sets exist?
- Fig. 11: Please use the same map projection for Fig.11a and Fig.11b.