

Interactive comment on “Variations of oxygen-18 in West Siberian precipitation during the last 50 yr” by M. Butzin et al.

Anonymous Referee #2

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General Comments

This paper uses the ECHAM5-iso model to look at variations of oxygen-18 in Western Siberian precipitation during the last 50 years, and they aim to "assess the potential of a recently opened monitoring station in Kourovka to successfully track large-scale water cycle and climate change in this area." While this has potential I think that the main message of this work has got lost in the detail. The paper provides much discussion of interannual/decadal variability in temperature, precipitation and d18o - across western Siberia, and at the Kourovka station - although it is not well tied together and the reader is left to disentangle much of the message themselves. I would also like to see much more discussion about how these results could be utilized to take the science forwards. For example although the paper shows that Kourovka d18o is related to the

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temperature of the region - how could this information be used in future studies.

The text on all of the figures is too small. The titles on the figures seem to be meaningful for the authors of this paper, rather than for the readers of the paper.

Specific Comments

Statistics could be used a lot better in this paper. They seem to be only used to provide evidence of obvious statements, while statistics are not used to back up statements which need some justification. Examples of this are: 1. Abstract: Line 15. and P29273 lines 19 and 28. "Annual mean model results and measurements are highly correlated ($r=-0.95$). This is not a good use of correlation/ r values; as it is quite meaningless whether the two are correlated. It is whether the two are close to the 1-1 line that is meaningful in this case. 2. P29275 line 15. You mentioned that global modelled precipitation may have decreased - this is not clear from the plot and would be a good use of statistics to show this. 3 P29275 line 25 - P29276 line 14. Because the data is very noisy it is difficult to be certain about some of these trends. This would be a very useful place to add some statistics to back up what you are saying. 4. P29279 line 3 - "correlation decreases in Northern Siberia" could you say the original and new values of correlation. 5. P29279 lines 11-13. Would be a very good place for some r values, to highlight the relative importance of the NAO on $d18o$ and temperature.

The abstract contains a lot of detail but it is very difficult to extract the main message from this. See general comments. I would suggest that the abstract is fully rewritten to include less detail but that the main message and its importance for the future science is highlighted.

P 29266: line 1-5. Why would it be useful to see Arctic warming in $d18o$? We know the Arctic is warming from temperature observations? Is the point of this for calibrating the paleothermometer for paleo studies? If so this should be mentioned. I would like to see any other justification for this as well.

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P29268: line 1-3: "How well can large-scale West Siberian climate and water cycle variations be observed in the isotopic composition of precipitation at Kourovka Observatory?" I would like to see this question better addressed in the conclusions along with discussion for its utility. (See general comments).

Section 2: Did the model include vegetation? If so how was that treated/initialised/spun up?

P29270 line 18. Stations where monthly mean temperatures disagree by more than 10degC were not included. The 10degC appears quite arbitrary. What about stations where the disagreement was 9degC?

P29271 line 14-15. "Explain what is meant by convolved with averaging kernels", so that the paper can be accessed by those not familiar with this technique, who don't have the Risi paper to hand.

P29271 lines 18-22. It appears that Gribanov 2013 does much data-model comparison with the same model against the same data - and there is a lot of data-model comparison in this paper. It would be useful here to state (as introduction) the additional data-model comparisons that will be performed in this paper and how this takes the Gribanov study forward.

P29273. lines 2-3. Are you saying there is an offset? If so the offset should be added onto the figure so that the reader can understand and compare how the patterns agree more thoroughly.

P29273. line 10. "underestimate the eastward depletion...." by how much?

P29273. line 20. Change the sentence "A linear fit indicates that ECHAM5-wiso tends to underestimate the observed temperatures by 0.6degC". You should not need to do a linear fit to show this - you can simply average the model results and the observations and subtract them.

P29274. line4. Label these stations on the figure to help with clarity.

P29278 line 24. The shift towards the arctic ocean is very difficult to see in the figure. Perhaps a schematic would be better.

P29281 line8 Quantify the importance of temperature on d18o. What percentage of d18o variation can be attributed directly to temperature?

P29281 line 12. You say that "Our analyses support the importance of moisture recycling, involving the delayed re evaporation of isotopically depleted winter precipitation...." However it appears that the only justification for this is that DJF results are better correlated than JJA results. Perhaps you could do some further tests on this using a multiple correlation analysis of upstream DJF temperature and local JJA temperature to determine d18o.

Figure 7. Rescale since everything is red!

Figure 8. I think the caption is wrong as the correlation between "global sea-level pressure and d18o in precipitation at Kourvka" would give a single value - there would be no need for a map. Do you mean "local sea level pressure". Same comment for figure 12.

Technical Comments:

Abstract: line 5 - do you mean "underlying mechanisms causing this variability"

P29265: line 20 - do you mean "until the end of this century"? I think this should be "may have increased by ~25% at the end of the century"

P29266 line 7: "negative zonal isotope gradient". Could you simplify this by showing the exact direction of change. (ie more depleted further East). Also this has been known for some time and some references are needed.

P29274. line 24-25. This is misleading as it implies that the seasonal cycle is sometimes 25permil and sometimes 5permil. This is not what you mean.

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