GChronD

Interactive
comment

Interactive comment on "GeoChronR – an R package to model, analyze and visualize age-uncertain paleoscientific data" *by* Nicholas P. McKay et al.

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Thank you to the reviewer for these comments. Reviewer comments below in *italics*, authors' replies in **bold**.

GeoChronR represents a nice new addition to the field of paleoclimatology and sediment-based paleoenvironmental reconstruction by presenting what is essentially a 'one-stop shop' for age uncertainty analysis in paleoenvironmental sequences, and includes code for analyzing data calibrated via a variety of different methods (e.g. layer counting, U-Th, radiocarbon), etc. This removes the need to use different software for each type of proxy archive, and as the authors note, should speed up the analysis of

large ensembles of paleoclimatic data.

We thank the reviewer for their constructive and encouraging review. We respond to specific points below.

I think the paper is mainly fine as is, just some minor changes to highlight the flexibility of the package and hone some of the science examples presented would be good.

That being said, given that this system uses the LiPD file format, I think it would be useful for the authors to include explicit mention of other utilities that exist (e.g. in Python) for converting other file formats (e.g. text files from NOAA Paleoclimatology). Our community still has a lot of different 'standards' for data archiving floating around, so it would be nice to emphasize that this software package can be used on other data provided the authors are willing to convert files to the correct format.

Thank you for this recommendation. We will include a discussion of the utilities available to convert data to LiPD.

I find the incorporation of correlation analysis especially compelling.

In the examples, for instance in 5.2, the purported lack of correlation between GISP2 and Hulu is quite controversial as I'm sure the authors know. I would like a bit more discussion of the reasons for this - I think the two records can be very strongly linked, but still not show strong Pearson correlations. GISP and sometimes Hulu seems to show 'on' or 'off' values - e.g. the record is jumpy, akin to a Dirac delta function especially for some of the rapid millennial-scale Heinrich events. Pearson product moment correlation, even if spectrally filtered, might not be appropriate, since it focuses on linear association. Would a ranked correlation metric like Spearman's rho show different results? Incorporating alternate metrics of correlation into GeoChronR is in my opinion not needed for this release, but it could be useful to mention here, along with the suggestion that users can use the age model output to build their own analyses using alternate correlation metrics, different assumptions about the underlying distributions

of the data. I imagine that is the hope anyways with such a flexible package.

Thank you for these comments and suggestions. We chose to illustrate the GISP2-Hulu correlation in the manuscript largely because it's an iconic age-uncertain relationship in paleoclimatology that we expected would be of general interest to readers. We also anticipated that the result would indeed be some-what controversial, although that is not our intent. There is a vast literature on Greenland ice core and Asian speleothem relationships, and our simple analy-sis was not intended to weigh in on that discussion, only highlight the potential value of considering age uncertainties when comparing two independently dated chronologies. We will expand on our discussion of the implication of our results to highlight the many of the components that our analysis doesn't examine.

By default, and in this example, geoChronR "gaussianizes" data before correlat-ing them, reducing some of the impact of the "on-off" nature of the Hulu (and many speleothem records. However, including rank-based correlations methods is an excellent, and fairly straightforward suggestion, which we will add to the package and describe in the manuscript.

I may be wrong, but haven't the Greenland ice core chronologies been revised to create chronologies that produce a stronger relationship between greenland oxygen isotopes and the Hulu record?

Certainly a lot of work has been done since 2001 on the chronologies for both the ice cores and the speleothems, which may improve the correlations. We will mention this in our expanded discussion of the results.

I really like the analysis with the Arctic temperature database and hope a more sub-stantial paper on the meaning of these PCs is forthcoming. I wonder if PC2 would be more easily interpreted if varimax rotation or some method were applied.

We agree that the results are interesting and we're keen to explore the implica-

tions of these results.

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Discussion paper