

## PalaeoWISE webinar - Nov 3 2021

### Questions and Answers collated from Chat and Q&A virtual rooms.

*Thank you for your questions. Please feel free to get in contact with any further questions at [info@palaeoclimate.com.au](mailto:info@palaeoclimate.com.au)*

#### **Q. Will the recording be available for download after presentation?**

A. A recording of the webinar is now available at: <https://youtu.be/HxTp7G9Lyrw>

#### **Q. Why is accuracy of palaeoclimate data so important when we are currently estimating 1 in 10,000 year events based on 121 years of "observed" data? That is, what we are doing today is repeatable but not accurate.**

A. Yes we take your point, it does feel strange but the addition of palaeoclimate data should certainly reduce the uncertainty of that estimate. The Bayesian framework is a good one in that respect in that it integrates uncertainty throughout the model so we feel this is an improvement on current applications of short observation records.

#### **Q. If we add the last ten years to our base data set there could be significant changes so palaeoclimate data should soften these changes moving forward once we get past the initial shock, excellent work John and the team for making this data accessible.**

A. That sounds reasonable. The only confounding factor would be when/if climate change trends start to show themselves.

#### **Q. How do you treat the non-annual palaeoclimate data (e.g. lake sediments) when correlating against climate data? Do you linearly interpolate?**

A. We used a correlation with a Gaussian Kernel. This method can deal with uneven time steps and data gaps. Furthermore, we tested correlation not just on value, but also on ranks to deal with potential nonlinearity (like Pearson vs. Spearman). This paper from Jason Roberts at UTAS might be of interest. *Roberts, J.L., Tozer, C.R., Ho, M., Kiem, A.S., Vance, T.R., McCormack, F.S., van Ommen, T.D., 2019. Reconciling Unevenly Sampled Paleoclimate Proxies: a Gaussian Kernel Correlation Multiproxy Reconstruction. J ENVIRON INFORM 35. <https://doi.org/10.3808/jei.201900420>*

#### **Q. How do you account for non-climate impacts on many records, e.g. land use change, pollution, over the last century, as these may conflate the interpretation of climate-proxy relationship?**

A. A great question. The correlations presented in the paper are a systematic first pass, and as there is no interpretation presented in the data paper, non-climate impacts are not considered. For 396 proxies \* 9 variables, and 72 catchments, it would have been quite the job to verify the physical mechanism for the correlation. The next phase of the project will consider both the physical mechanism to explain the correlation, and to investigate any confounding effects.

#### **Q. How do you judge whether a proxy record is well correlated or not? What do you compare it to?**

A. We tested the correlation based on catchment average climate variables on an annual basis. The climate data were sourced from the SILO gridded database. The

variables were average daily temperature, PET, rainfall, SPI-12-24-36-48m and SPEI-12-24-36-48m. Additionally, some extreme dry and wetness indices where classes of SPI and SPEI were considered. We calculated the cross-correlation using a Gaussian Kernel method with values and ranks of the data. Lags from -5 to +5 years were considered. The maximum absolute correlation was sorted for each proxy-climate variable pair and the significance assessed using a simple rule of thumb.

**Q. Great introduction to the project and presentation of the database. I note that the East Java sediment proxy records tend to have the best correlations across SEQ catchments for the majority of the hydro-climate indices. I am very interested to understand this further and whether this could be linked to teleconnections from the Indian Ocean -IOD (Indian Ocean Dipole) or IOBM (Indian Ocean basin mode)?**

A. Great question. We are working to include teleconnection indices into PalaeoWISE-R, and hope that the model and analysis will allow us to elucidate some of these processes. We are very open to collaboration if people are interested!

**Q. Using the Bayesian approach does model performance improve for Qld as a state (rather than nationally) or at catchment scales?**

A. We don't have a state-wide palaeoclimate reconstruction -- we mainly focus on catchment-based assessments. The reason for this was that a catchment-based assessment would be of better utility for our water resource models. A state-wide reconstruction would be interesting though.

**Q. Because the palaeo reconstructions must be bound by observations, this must make it impossible to detect any events more extreme than our experience and also to see any long term trends (e.g. pre-industrial to today). Is there any way to investigate more extreme events and trends?**

A. It's true that the fitting of the palaeoclimate data is limited to the observed dataset. However, the fitted model does allow extrapolation to events larger or longer than what has occurred in the observed data. Furthermore, all reconstructions are probabilistic in nature and have an associated uncertainty. Larger extreme events are also considered in this uncertainty range. The reconstruction does show trends over time that could be investigated.

**Q. Thanks Jacky and team, very interesting work. For water resource applications, how are you intending to integrate current/future anthropogenic climate change with the palaeoclimate information? In Victoria, for water supply planning we have found the low skill/confidence in paleo reconstructions in S. E. Australia limits application potential, whereas we do have quite high confidence in anthropogenic climate change trends.**

A. It would be interesting to repeat this analysis in the SE Australia hydroclimate variables and see what skill does appear based on the 396 proxy records available in PalaeoWise. We haven't compared the reconstructions developed for Queensland yet with Future Climate Change predictions, but this is an interesting part of the next step. Overall, we suspect that the addition of 500+ years of data will help to better inform the time series and estimates of background variability.

**Q. 2.3% for Millennium drought vs 4.3% equals what in ARI?**

- A. The probabilities shown are AEPs so the ARI (as an AEP type of one) is equal to 1/AEP.

**Q. Are you receiving interest globally in accessing the database?**

- A. PalaeoWISE increases availability of collated Southern Hemisphere records and people in the region will be interested. It has only just been published, so now is the time to make people aware it exists. We will use journal metrics in a few months to gauge where this interest lies and report back through the Newsletter.

**Q. If we have two observation climate data sets (from two different regions ~5000 km apart); one with climate proxy and the other with only instrumental observation, if there is a significant correlation in the observed time scale, do you still believe that we can transfer the data to the other site?**

- A. It depends. If there is significant correlation then “yes”. You can treat another observed dataset like a proxy dataset. We have seen a proxy data set like Data Id 269 from North Queensland be an excellent proxy for rainfall throughout the entire state of Queensland, while others have less geographic spread.

**Q. Is there a strategy for communicating this brilliant application to water authorities across the nation?**

- A. This is a priority for us going forward. The focus to date (and in 2022) has been to have data (palaeo and reconstructions) peer reviewed and published. The next phase looks at other applications and further communication with a range of stakeholders.

**Q. Post 21/22 beyond current funding (from DCAP anyway), are you framing a project or activity to take this work further, in Qld, Nationally, internationally...?**

- A. Beyond 2022, we would like to see the application of palaeoclimate reconstructions incorporated into a standardised framework developed to suit water supply authorities and other stakeholders.