

Supplement of *Clim. Past*, 16, 65–78, 2020
<https://doi.org/10.5194/cp-16-65-2020-supplement>
© Author(s) 2020. This work is distributed under
the Creative Commons Attribution 4.0 License.



Supplement of

Joint inversion of proxy system models to reconstruct paleoenvironmental time series from heterogeneous data

Gabriel J. Bowen et al.

Correspondence to: Gabriel J. Bowen (gabe.bowen@utah.edu)

The copyright of individual parts of the supplement might differ from the CC BY 4.0 License.

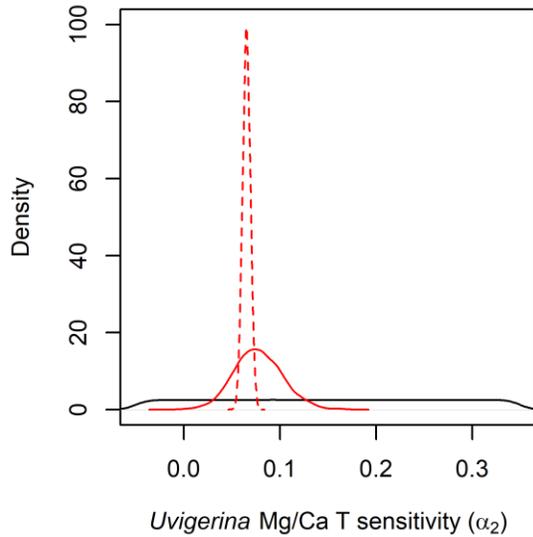


Figure S1: Foraminiferal Mg/Ca temperature sensitivity parameter prior and posterior estimates from independent Bayesian inversion using calibration data only. Dashed red line shows posterior estimated from core-top data described in main text. Solid red line is the posterior estimate based on the down-core calibration approach of Elderfield et al. (2010), using core-top values from site 1123 and the Chat 1K core as representative of Holocene foraminiferal Mg/Ca and $\delta^{18}\text{O}$ values and site 1123 data from 25 – 15 ka to represent the LGM condition, plus an independent estimate of LGM to Holocene seawater $\delta^{18}\text{O}$ change of -1.1 ($1\sigma = 0.1$) from Adkins et al. (2002). The black line give the prior distribution applied in both analyses.

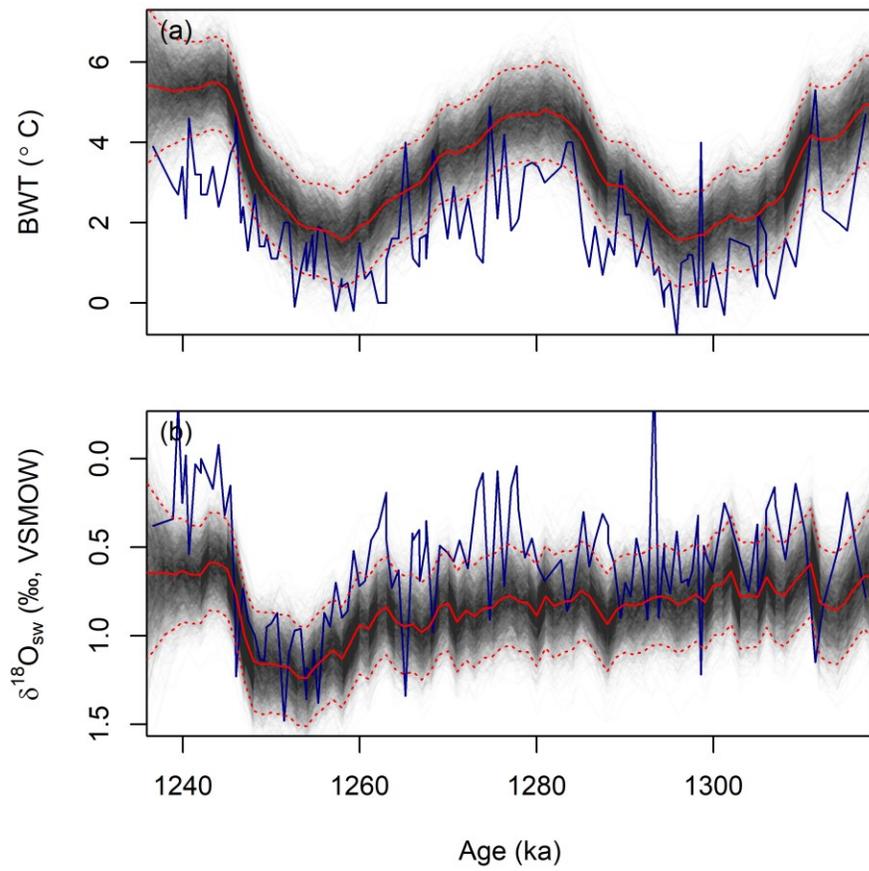


Figure S2: Paleoenvironmental reconstructions from single-site JPI of data from site U1385. (a) Bottom water temperature, and (b) seawater $\delta^{18}\text{O}$. Blue line shows the reconstruction of Birner et al. (2016) based on the Elderfield et al. (2010) down-core calibration. All other symbols as in Figure 2.

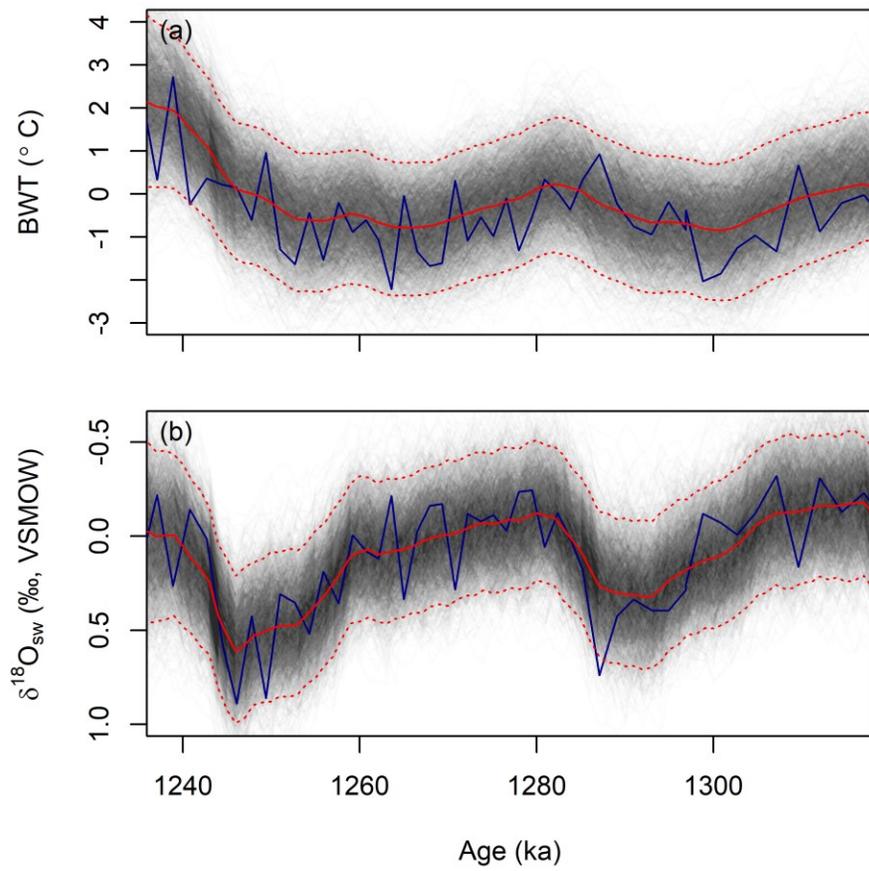


Figure S3: Paleoenvironmental reconstructions from single-site JPI of data from site 1123. (a) Bottom water temperature, and (b) seawater $\delta^{18}\text{O}$. Blue line shows the reconstruction of Elderfield et al. (2012) based on the Elderfield et al. (2010) down-core calibration. All other symbols as in Figure 2.

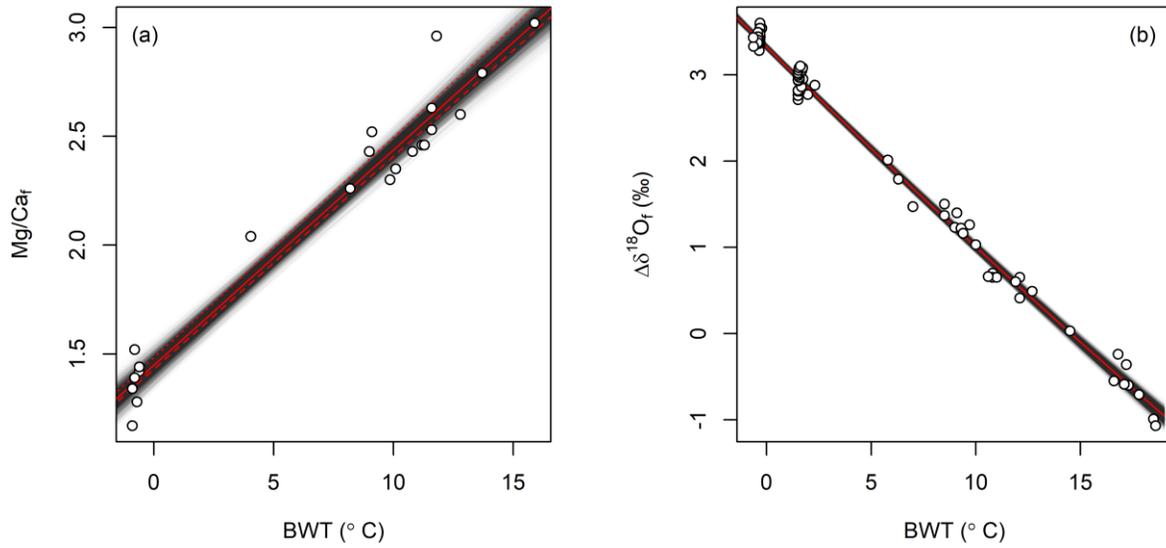


Figure S4: Calibration data and posterior draws from the site 806 analysis showing proxy model relationships between bottom water temperature (BWT) and (a) *O. umbonatus* Mg/Ca (Lear et al., 2015) or (b) *Cibicidoides* ^{18}O -enrichment ($\Delta\delta^{18}\text{O}_f = \delta^{18}\text{O}_f - \delta^{18}\text{O}_{sw}$, values in ‰ VPDB and VSMOW, respectively) (Marchitto et al., 2014). Black lines show individual draws from the posterior; red lines show the median relationship. Posterior draws and red solid line shown in (a) use seawater $\text{Mg}/\text{Ca}_{sw} = 3.5$, dotted and dashed lines use $\text{Mg}/\text{Ca}_{sw} = 1.5$ and 5.5 , respectively. White-filled circles show individual calibration data.

References

- Adkins, J. F., McIntyre, K., and Schrag, D. P.: The salinity, temperature, and $\delta^{18}\text{O}$ of the glacial deep ocean, *Science*, 298, 1769-1773, 2002.
- Birner, B., Hodell, D. A., Tzedakis, P. C., and Skinner, L. C.: Similar millennial climate variability on the Iberian margin during two early Pleistocene glacials and MIS 3, *Paleoceanography*, 31, 203-217, 2016.
- Elderfield, H., Greaves, M., Barker, S., Hall, I. R., Tripathi, A., Ferretti, P., Crowhurst, S., Booth, L., and Daunt, C.: A record of bottom water temperature and seawater $\delta^{18}\text{O}$ for the Southern Ocean over the past 440kyr based on Mg/Ca of benthic foraminiferal *Uvigerina* spp, *Quaternary Science Reviews*, 29, 160-169, <https://doi.org/10.1016/j.quascirev.2009.07.013>, 2010.
- Elderfield, H., Ferretti, P., Greaves, M., Crowhurst, S., McCave, I. N., Hodell, D., and Piotrowski, A. M.: Evolution of Ocean Temperature and Ice Volume Through the Mid-Pleistocene Climate Transition, *Science*, 337, 704, 2012.
- Lear, C. H., Coxall, H. K., Foster, G. L., Lunt, D. J., Mawbey, E. M., Rosenthal, Y., Sosdian, S. M., Thomas, E., and Wilson, P. A.: Neogene ice volume and ocean temperatures: Insights from infaunal foraminiferal Mg/Ca paleothermometry, *Paleoceanography*, 30, 1437-1454, 2015.
- Marchitto, T. M., Curry, W. B., Lynch-Stieglitz, J., Bryan, S. P., Cobb, K. M., and Lund, D. C.: Improved oxygen isotope temperature calibrations for cosmopolitan benthic foraminifera, *Geochim. Cosmochim. Acta*, 130, 1-11, <https://doi.org/10.1016/j.gca.2013.12.034>, 2014.