Supplement of

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

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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 δ^{18}O values and site 1123 data from 25 – 15 ka to represent the LGM condition, plus an independent estimate of LGM to Holocene seawater δ^{18}O change of -1.1 (1σ = 0.1) from Adkins et al. (2002). The black line gives 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 δ¹⁸O. 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 δ¹⁸O. 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 ($\Delta\delta^{18}O = \delta^{18}O_f - \delta^{18}O_{sw}$, 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 $Mg/Ca_{sw} = 3.5$, dotted and dashed lines use $Mg/Ca_{sw} = 1.5$ and 5.5, respectively. White-filled circles show individual calibration data.