Supplementary Material: Bayesian multi-proxy reconstruction of latitudinal temperature gradients applied to the Early Eocene

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## S1. Convergence checks

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| Fig S1. Traceplots of a subset of the unknown model parameters. The four colours correspond to the four independent model runs. a) Traceplot of A, K-A, M, B and ; b) Traceplot of five selected ; c) Traceplot of five selected . All traceplots display mixing of the chains, and relatively quick convergence. |

## S2. Gradient with just the geochemical proxy data

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| Fig S2. Latitudinal temperature gradient with just the geochemical proxies (orange), showing the median (line) and 95% credibal interval (shading). Symbols with vertical lines show the median and 95% credible intervals of . The blue line and shading in the background show the latitudinal temperature gradient with the geochemical and ecological proxy data. |

## S3. Seperate gradients on the northern and southern hemisphere

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| Fig S3. Latitudinal temperature gradient in seperate hemispheres, showing the medians (lines) and 95% credibal intervals (shadings) in the southern (red) and northern hemisphere (blue). Symbols with vertical lines show the median and 95% credible intervals of . Turquoise symbols in the northern hemisphere highlight the ecological proxy data. The grey line and shading in the background show the latitudinal temperature gradient with the data from both hemispheres combined, plotted in both hemispheres. |

## S4. Different shapes of temperature gradients

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| Fig S4. Simulated latitudinal temperature gradients sampled at the absolute latitudes of the EECO data. The dark grey points show the simulated temperature data, the black line shows the shape of the true gradient, and the medians (lines) and 95% credibal intervals (shadings) of the inferred gradients using the model are shown in red. a) linear gradient;  b) flat gradient;  c) quadratic gradient;  d) as c), but the priors on A, M, and B were relaxed to allow for a better fit to the quadratic gradient in high latitudes All latitudinal temperature gradients are well captured by the model in the latitudinal range for which data is provided. If the priors, particularly the prior on the lower limit of the gradient (A), are relaxed (d), the model can approximate a quadratic or linear function even in high latitudes and at cold temperatures. |