| Phylum | Class | Order | Family | Genus |
| --- | --- | --- | --- | --- |
| Annelida | 1 | 2 | 4 | 14 |
| Arthropoda | 4 | 20 | 162 | 623 |
| Brachiopoda | 6 | 22 | 304 | 1,296 |
| Bryozoa | 2 | 13 | 123 | 266 |
| Chordata | 9 | 104 | 250 | 488 |
| Cnidaria | 3 | 16 | 185 | 573 |
| Echinodermata | 8 | 50 | 135 | 249 |
| Foraminifera | 3 | 7 | 31 | 89 |
| Hemichordata | 1 | 3 | 7 | 20 |
| Hyolitha | 1 | 1 | 1 | 1 |
| Mollusca | 8 | 80 | 628 | 2,475 |
| Porifera | 5 | 32 | 109 | 240 |

| Model Structure | Overdispersed | AIC | BIC |
| --- | --- | --- | --- |
| ~ Warming | no \*\*\* | 16,678 | 16,702 |
| ~ Warming + Pal. Int. | no \*\*\* | 16,620 | 16,652 |
| ~ Cooling + Lag | no \*\*\* | 19,502 | 19,527 |
| ~ Cooling + Pal. Int. | no \*\*\* | 18,861 | 18,893 |
| ~ Warming + Lag | no \*\*\* | 15,898 | 15,929 |
| ~ Warming + Lag + Pal. Int. | no \*\*\* | 15,812 | 15,852 |
| ~ Cooling + Lag | no \*\*\* | 15,672 | 15,704 |
| ~ Cooling + Lag + Pal. Int. | no \*\*\* | 15,650 | 15,690 |
| ~ Warming + Lag + Warming:Lag | no \*\*\* | 15,889 | 15,928 |
| ~ Warming + Lag + Warming:Lag + Pal. Int. | no \*\*\* | 15,791 | 15,839 |
| ~ Cooling + Lag + Cooling:Lag | no \*\*\* | 15,554 | 15,594 |
| ~ Cooling + Lag + Cooling:Lag + Pal. Int. | no \*\*\* | 15,535 | 15,583 |

| Type | Model | Intercept | Interaction |
| --- | --- | --- | --- |
| Warming | trend.st1 | -1.9 +- 0.02 \*\*\* | 0.01 +- 0.05 |
| trend.st2 | -1.91 +- 0.02 \*\*\* | -0.26 +- 0.06 \*\*\* |
| trend.st3 | -1.92 +- 0.02 \*\*\* | -0.38 +- 0.1 \*\*\* |
| trend.st4 | -1.91 +- 0.03 \*\*\* | -0.26 +- 0.11 \* |
| trend.st5 | -1.92 +- 0.03 \*\*\* | -0.47 +- 0.1 \*\*\* |
| trend.st6 | -1.94 +- 0.03 \*\*\* | -0.64 +- 0.1 \*\*\* |
| trend.st7 | -1.94 +- 0.03 \*\*\* | -0.68 +- 0.11 \*\*\* |
| trend.st8 | -1.94 +- 0.03 \*\*\* | -0.7 +- 0.11 \*\*\* |
| trend.st9 | -1.91 +- 0.03 \*\*\* | -0.27 +- 0.13 \* |
| trend.st10 | -1.9 +- 0.02 \*\*\* | -0.01 +- 0.13 |
| Cooling | trend.st1 | -1.82 +- 0.02 \*\*\* | 0.19 +- 0.04 \*\*\* |
| trend.st2 | -1.83 +- 0.02 \*\*\* | 0.27 +- 0.06 \*\*\* |
| trend.st3 | -1.82 +- 0.02 \*\*\* | 0.86 +- 0.1 \*\*\* |
| trend.st4 | -1.79 +- 0.02 \*\*\* | 1.44 +- 0.1 \*\*\* |
| trend.st5 | -1.81 +- 0.02 \*\*\* | 1.34 +- 0.11 \*\*\* |
| trend.st6 | -1.83 +- 0.02 \*\*\* | 1.32 +- 0.1 \*\*\* |
| trend.st7 | -1.85 +- 0.02 \*\*\* | 1.25 +- 0.11 \*\*\* |
| trend.st8 | -1.87 +- 0.02 \*\*\* | 1.22 +- 0.12 \*\*\* |
| trend.st9 | -1.88 +- 0.02 \*\*\* | 1.26 +- 0.13 \*\*\* |
| trend.st10 | -1.88 +- 0.02 \*\*\* | 1.31 +- 0.13 \*\*\* |

| Type | Model | AIC | BIC | ΔAIC | ΔBIC |
| --- | --- | --- | --- | --- | --- |
| Warming | trend.st1 | 16,737 | 16,761 | 39.4 | 39.4 |
| trend.st2 | 16,721 | 16,745 | 23.3 | 23.3 |
| trend.st3 | 16,721 | 16,745 | 23.8 | 23.8 |
| trend.st4 | 16,732 | 16,756 | 34.0 | 34.0 |
| trend.st5 | 16,713 | 16,737 | 15.1 | 15.1 |
| trend.st6 | 16,700 | 16,724 | 2.0 | 2.0 |
| trend.st7 | 16,698 | 16,722 | 0.0 | 0.0 |
| trend.st8 | 16,702 | 16,726 | 4.4 | 4.4 |
| trend.st9 | 16,732 | 16,756 | 34.9 | 34.9 |
| trend.st10 | 16,737 | 16,761 | 39.4 | 39.4 |
| Cooling | trend.st1 | 19,104 | 19,129 | 173.2 | 173.2 |
| trend.st2 | 19,106 | 19,130 | 174.5 | 174.5 |
| trend.st3 | 19,054 | 19,078 | 122.4 | 122.4 |
| trend.st4 | 18,931 | 18,956 | 0.0 | 0.0 |
| trend.st5 | 18,947 | 18,971 | 15.7 | 15.7 |
| trend.st6 | 18,953 | 18,977 | 21.9 | 21.8 |
| trend.st7 | 18,989 | 19,013 | 57.9 | 57.9 |
| trend.st8 | 19,012 | 19,036 | 80.8 | 80.7 |
| trend.st9 | 19,024 | 19,048 | 92.6 | 92.6 |
| trend.st10 | 19,026 | 19,051 | 95.2 | 95.2 |

| Model | Term | effect | Group | Estimate | Std.error | Z value | P value |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Warming | Intercept | fixed |  | -1.9 | 0.0 | -76.0 | \*\*\* |
| Warming:Trend.st7 | fixed |  | -0.7 | 0.1 | -6.4 | \*\*\* |
| Random effect | ran\_pars | genus | 0.7 |  |  |  |
| Cooling | Intercept | fixed |  | -1.8 | 0.0 | -89.3 | \*\*\* |
| Cooling:Trend.st6 | fixed |  | 1.4 | 0.1 | 13.8 | \*\*\* |
| Random effect | ran\_pars | genus | 0.3 |  |  |  |

| Model | Sigma | LogLik | AIC | BIC | Deviance | DF residual | Overdispersion |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Warming | 1.0 | -8,345 | 16,697 | 16,721 | 14,685 | 22,029 | no \*\*\* |
| Cooling | 1.0 | -9,462 | 18,931 | 18,955 | 18,408 | 24,056 | no \*\*\* |

| Palaeoclimate Interaction | Lower Quartile | Median | Upper Quartile |
| --- | --- | --- | --- |
| Cooling-Cooling | 0.139 | 0.151 | 0.166 |
| Cooling-Warming | 0.091 | 0.112 | 0.149 |
| Warming-Cooling | 0.102 | 0.119 | 0.132 |
| Warming-Warming | 0.081 | 0.104 | 0.140 |

| Parameter | Lower CI | Estimate | Upper CI | Method |
| --- | --- | --- | --- | --- |
| Difference in medians | 3.68 | 3.73 | 3.79 | Bootstrapping |
| 3.81 | 3.92 | 4.02 | Bayesian Estimate |
| Percentage change | 27.39 | 27.80 | 28.26 | Bootstrapping |
| 28.38 | 29.23 | 29.98 | Bayesian Estimate |
| Effect size | 1.29 | 1.31 | 1.33 | Cohen's D |
| 1.41 | 1.43 | 1.46 | Bayesian Estimate |

| Group | Lower CI | Log Odds ratio | Upper CI |
| --- | --- | --- | --- |
| Total | 1.74 | 1.80 | 1.86 |
| Annelida | 0.60 | 1.58 | 2.56 |
| Arthropoda | 2.32 | 2.56 | 2.79 |
| Brachiopoda | 2.05 | 2.19 | 2.34 |
| Bryozoa | 1.87 | 2.17 | 2.47 |
| Chordata | 0.94 | 1.19 | 1.44 |
| Cnidaria | 1.65 | 1.85 | 2.04 |
| Echinodermata | 1.17 | 1.47 | 1.76 |
| Foraminifera | 0.71 | 1.15 | 1.60 |
| Mollusca | 1.53 | 1.63 | 1.73 |
| Porifera | 1.52 | 1.82 | 2.12 |
| Tremadocian-Lochkovian | 3.35 | 3.53 | 3.71 |
| Pragian-Artinskian | 0.34 | 0.51 | 0.67 |
| Kungurian-Pliensbachian | 1.22 | 1.37 | 1.51 |
| Toarcian-Turonian | 1.77 | 1.98 | 2.18 |
| Coniacian-Pleistocene | 0.92 | 1.04 | 1.15 |

| Type | Model | AIC | BIC | logLik |
| --- | --- | --- | --- | --- |
| Warming | Added effect | 16,691 | 16,723 | -8,342 |
| Null model | 16,251 | 16,283 | -8,122 |
| Cooling | Added effect | 18,932 | 18,965 | -9,462 |
| Null model | 18,192 | 18,224 | -9,092 |

| Data | R | Lower CI | Upper CI | R-squared | p-value adj. |
| --- | --- | --- | --- | --- | --- |
| All Data | 0.12 | -0.10 | 0.33 | 0.01 | 1.00 |
| Cool subset | -0.01 | -0.30 | 0.28 | 0.00 | 1.00 |
| Paleozoic | 0.02 | -0.31 | 0.33 | 0.00 | 1.00 |
| Mesozoic | 0.39 | 0.04 | 0.66 | 0.16 | 0.15 |
| Cenozoic | 0.20 | -0.39 | 0.68 | 0.04 | 1.00 |

| Effect | Estimate | Lower CI | Upper CI | Isotope data |
| --- | --- | --- | --- | --- |
| Difference in medians | 1.64 | 1.53 | 1.71 | Song et al. 2019 |
| Percentage Change | 12.30 | 11.53 | 12.88 |
| Difference in medians | 3.92 | 3.81 | 4.02 | Veizer & Prokoph 2015 |
| Percentage Change | 29.23 | 28.38 | 29.98 |