Some like it hot: climate niche occupation of Jurassic dinosaurs

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Dinosaurs were a diverse, widely distributed, and successful group of fossil reptiles that dominated Mesozoic terrestrial ecosystems for over 150 million years. Across this interval, the global climate changed considerably, which impacted dinosaur diversity and biogeography. During the Jurassic, as dinosaurs rose to ecological dominance, global temperatures and humidity increased as Pangaea started to break apart. Towards the latter half of the Jurassic, strikingly different dinosaur lineages diversified. Earlier Jurassic assemblages consisted mainly of basal sauropodomorphs, basal ornithischians and some theropods, whereas later assemblages included a broader range of major dinosaur clades. A possible explanation for this change in diversity is changes in climate conditions. However, previous examinations of the links between Jurassic dinosaur diversity and climate have focussed on broad-scale patterns, specific geographic regions or used coarse global approximations of variables.

Here, we quantify and explore the climatic niche spaces occupied by Jurassic dinosaurs at a global scale by combining fossil occurrence data from the Paleobiology Database with a general circulation climate model (HadCM3L). Our results indicate that climate niche spaces of major dinosaur groups shifted from a more generalised occupation in the Early Jurassic to more restricted spaces in the Late Jurassic. Temperature ranges of dinosaurs dropped from the Early to the Middle Jurassic. Using evolutionary model-fitting analyses, we find evidence for an evolutionary shift from wetter and cooler niche spaces to drier and warmer niche spaces in key dinosaur clades across the Middle–Late Jurassic boundary. Our findings provide further support for the influence of climate on the evolutionary success of dinosaurs.