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Topographic and climate change differentially drive Pliocene and Pleistocene mammalian beta diversity of the Great Basin and Great Plains provinces of North America

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ABSTRACT

Hypothesis: The Great Basin of the western USA has currently elevated beta (between-site) diversity because topographic change, mediated by regional tectonic activity, has driven increased habitat packing throughout the past 17 million years.

Organisms: Non-volant (non-flying) land mammals, excluding introduced species and humans.

Times and places: Late Miocene to Recent of the Great Basin of the USA, centred on Nevada, and (as a control system) the central Great Plains of the USA, centred on Nebraska.

Analytical methods: We obtained mammalian faunal lists from the FAUNMAP II database and partitioned the data into intervals based on mammalian biochronology. We estimated beta diversity for each time-slice based on richness and evenness. We used cluster analysis of sites by taxon relative abundance to investigate unexpectedly high evenness beta diversity of the Great Plains Holocene.

Results: Beta diversity is higher in the Great Basin than the Great Plains at all intervals except the Holocene, which revealed unexpectedly high (and as yet unexplained) evenness-beta for the Great Plains. Our overall results support the hypothesis that Great Basin beta diversity has been driven primarily by tectonic change.

Keywords: alpha diversity, beta diversity, climate change, desert ecosystem, gamma diversity, Great Basin, Great Plains, paleoecology, tectonic change.

INTRODUCTION

Research has shown that desert ecosystems tend to have higher landscape-scale beta (β) diversity than non-desert ecosystems (Tueller *et al.*, 1991; Kelt *et al.*, 1996; MacNally *et al.*, 2004). Some workers have suggested that the desert ecosystems of the Great Basin have been shaped

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