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

Amy Lynn Atwater and Edward Byrd Davis

Department of Geological Sciences and the Museum of Natural and Cultural History, University of Oregon, Eugene, Oregon, USA

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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