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Mammalian communities document a latitudinal environmental gradient during the miocene climatic optimum in western Europe

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ABSTRACT

A total of 17 mammalian communities from south-central Spain to northern Germany spanning the middle Miocene Climatic Optimum (ca. 17–14 Ma) are analyzed. Mammalian body-weight structures (cenograms) are constructed and discussed in terms of paleoenvironmental affinities. They indicate an arid climate and open environments in south-central Spain and closed and densely forested regions with very humid conditions to the north. The data reveal the presence of a strong latitudinal environmental gradient during this period. Other studies based on the fossil records of plants or ectothermic vertebrates showed that virtually no temperature gradient was present in Europe at that time and that mean annual temperatures were very high, probably around 20° C. Mammalian communities, therefore, show the presence of a southwest–northeast aridity-humidity gradient and confirm recent findings based on air-breathing fish distribution and pollen spectra. Atmospheric circulations could be responsible for this meridional gradient, but other regional causes cannot be ruled out. This study indicates that mammal body weight distributions are excellent proxies to investigate the environmental and climatic evolution and compare well with other paleoenvironmental proxies.