



The impact of Miocene atmospheric carbon dioxide fluctuations on climate and the evolution of terrestrial ecosystems

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The Miocene is characterized by a series of key climatic events that lead to the founding of the Late Cenozoic icehouse mode and the dawn of modern biota. The processes that caused these developments and particularly the role of atmospheric CO₂ as a forcing factor is poorly understood. Here we present a CO₂ record based on stomatal frequency data from multiple tree species. Our data show striking CO₂ fluctuations between about 600 and 300 ppmv. Periods of low CO₂ are contemporaneous with major glaciations while elevated CO₂ of at least 600 ppmv coincides with the climatic optima in the middle Miocene and the latest Oligocene. Our data point to a long – term coupling between atmospheric CO₂ and climate. Major changes in Miocene terrestrial ecosystems, such as the expansion of grasslands and radiations among terrestrial herbivores such as horses can be linked to these marked fluctuations in CO₂.