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Neogene evolution of paleoenvironments in the North American Great Plains from a stable isotope study

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The Great Plains of North America provide a setting in which to document climatic cooling since the mid-Miocene Climatic Optimum, including an opportunity to demonstrate hydroclimate and landscape evolution change in response to long-term changes in global climate and atmospheric pCO_2. The Great Plains have the interesting characteristic that there is a single moisture source for precipitation: the Great Plains Low-Level Jet. The Great Plains are underlain by the spatially and temporally extensive terrestrial sediments of the Ogallala Formation which is Miocene to Pliocene in age, and thus has the potential to show changes in the Low-Level Jet. We sampled sedimentary, authigenic soil carbonate from which we measured $\delta^{18}O$ and $\delta^{13}C$. These data record signatures of past hydroclimate conditions, such as the strength of the Great Plains Low-Level-Jet, and allow us to link this information to the paleoenvironment. More broadly, we consider how changes in global climate may have driven water availability and landscape evolution in the Great Plains through the last 15 million years. An improved understanding of the relationship between atmospheric CO_2 and regional hydroclimate will provide critical constraints on a wide spectrum of Earth system parameters, such as biodiversity, plant productivity, and runoff.