Effects of Miocene Climatic Fluctuations on Fluvial Architecture in Andean Continental Environments

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ABSTRACT

Fluvial sandstones form complex, but important hydrocarbon reservoirs worldwide. Changes in architectural elements (channel dimensions and stacking patterns) and facies associations of fluvial deposits affect reservoir quality and reflect changing climate and tectonics. Climatic fluctuations control million-year scale changes in the style and rates of continental sedimentation through by controlling sediment supply. Significant global climate fluctuations took place during the Miocene epoch, most notably the Late Miocene Cooling (LMC). Whereas the effect of the LMC on ocean temperatures and CO2 is relatively well understood, its potential effect on continental deposition is unconstrained. The Central Andes of Argentina contain spectacular exposures of Miocene fluvial deposits. We will focus on two key sites: the Vinchina basin and the Corral Quemado basin. These deposits offer a unique setting in which to identify the signature of changing climate on fluvial architecture because of their extensive exposure, availability of geochronological and paleoclimate proxies, and lack of marine influence. The deformational history of these basins is well known, which will allow for isolation of the climate signal from the tectonic signal. We will collect new multidisciplinary data to create a more detailed paleoclimate framework for the LMC and characterize the fluvial architecture by quantifying channel dimensions, stacking patterns, and connectivity using digital outcrop modeling and stochastic facies modeling. Relationships between timing of deformation and Miocene climate change will be analyzed where architectural changes are observed. We predict that beginning ca. 8 Ma, the fluvial architecture will begin to show significant changes consistent with strengthening monsoonal conditions.

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