Constraining the Onset of Exhumation in the Southern Colombian Andes, implications for Oil Exploration in the Putumayo Basin

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ABSTRACT

The Putumayo Basin (PB) is an underexplored zone situated between major oil-producing regions of the northern Andean foreland. The timing of oil generation and the source rocks in the Putumayo Basin is debated. The main phase of hydrocarbon generation is thought to have occurred during the Late Cretaceous to Eocene or during the Miocene. Proposed Cretaceous source rocks are usually thermally immature within the basin which has led to the idea that the oil was generated in a hypothetical thermally mature source rock located west of the basin, in the region now occupied by the Southern Colombian Andes (SCA), this kitchen has since been exhumed and eroded. The timing of exhumation of the SCA is poorly constrained, yet critical to constrain the duration of hydrocarbon generation. This information, in turn, can be used to define the age of the reservoir rocks and structural traps where the oil could have migrated. In this study, I will determine the onset of exhumation in the SCA. Low-temperature apatite fission-track thermochronology (AFT) will be used to constrain the thermal history and infer the chronology of exhumation. This technique allows us to constrain when rocks cooled below the AFT closure temperature (~120 °C). Exhumation, and subsequent cooling of the rocks in this region is the result the foreland-ward migration of thrust faulting. The chronology of tectonic deformation derived from this work will inform ongoing debates related to the Cenozoic paleogeography of northern South America and its petroleum systems. This work will also provide insight into the evolution of the Amazon, Orinoco and Magdalena basins rivers and the effects of Andean uplift on the regional environments and biodiversity.

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