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Cenozoic History of the Easternmost Eastern Venezuela Foreland Basin and Orinoco Delta System

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Abstract

The Eastern Venezuelan foreland basin (EVB) has been filling from the southwest by the Orinoco River since Late Miocene-Early Pliocene. The easternmost part of the basin (EEVB) has been overfilled since the Pliocene and has spilled over to form the 12-km-thick Orinoco delta system (ODS) on the Atlantic margin of northeastern Venezuela. EVB is the second largest, hydrocarbon-producing basin in Venezuela with proven reserves of 36 billion barrels. To improve our understanding of the paleogeography and hydrocarbon potential of the EEVB and the adjacent ODS, we interpret 620 km^2 of 3D seismic, 650 km of 2D seismic, and 6 wells with well logs from the EEVB near the Columbus Channel and maritime border with Trinidad and combine this with the results of previous workers to the south in the area of the ODS. The following sequence of Cenozoic events affecting the study area are proposed: 1) passive margin setting since the Cretaceous to Paleogene, 2) Caribbean plate oblique collision causing a foreland stage in the EEVB since Late Oligocene, 3) during the Oligocene and Early Miocene, south-north-flowing fluvial systems and associated deltas prograded northward from the Guyana shield into the EVB; 4) the Late Miocene Messinian event lowered eustatic sea level along the passive margin and produced a major erosional event and submarine canyons that allowed the ODS to suddenly prograde eastward from the EEVB into the deeper water Atlantic area in the earliest Pliocene; and 5) Early Pliocene to recent progradation of the ODS into the Atlantic Ocean. The onset of major input of the Orinoco River in this area is considered by most workers to be Late Miocene in age, which is supported by my proposed change in the flow direction, from a south to north direction in the pre-Late Miocene-Early Pliocene section to a southwest to northeast direction in the Pliocene to recent sequence. Through the Cenozoic time, superposition of Mio-Pliocene fluvial systems over deltaic and deep water facies documents the eastward progradation of the ODS and its filling of the easternmost EVB.