Seismic Characterization of the Upper Cretaceous Submarine Fan System in the Deepwater Foz do Amazonas Basin, Northern Brazil: An analog for Upper Cretaceous Fan Plays on Atlantic Passive Margins

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ABSTRACT

The deepwater Foz do Amazonas Basin shares the same working, petroleum system linked to the 2011 Zaedyus Field (700 million barrels of oil) and 2017 Liza Field (800 million barrels of oil equivalent) discovered in the French Guiana–Guyana–Suriname basins to the northwest: A Cenomanian-Turonian age source rock charging Upper Cretaceous deepwater fan reservoirs. We conducted seismic facies analysis and geomorphology on the Upper Cretaceous submarine fan systems (Limoeiro Formation) using 21,369 km of 2D depth-converted seismic tied to 3 exploration wells, in order to: (1) distinguish mud-prone vs. sand-prone deposits on seismic data; (2) understand depositional controls on stratigraphic traps within the fans; and (3) determine reservoir quality of fan sandstones. The Upper Cretaceous deepwater fan system of the Foz do Amazonas Basin deposited ~40 km seaward from the paleoshelf break and includes: (1) upper slope fans interpreted as sand-prone, channel-levee complexes expressed on reflection derate amplitude strength; (2) basin floors fans seen as high-amplitude, continuous reflection packages (HARPs) of sand sheets with little to no structural deformation; (3) shingled turbidites expressed as offlaping reflections of moderate amplitude strength, and (4) shale packages of lowamplitude strength reflections. These large Upper Cretaceous fan complexes (~800 km2) were sourced by mature terrigenous sands eroded from hills located close to the paleoshoreline, and deposited in conditions of: (1) ~3.19° gradient along a ~95 km long slope; (2) strong turbidity currents; and (3) steepening of the margin as a result of rifting and passive margin subsidence. These factors combine to create conditions for good reservoir quality and trap preservation with multiple seals and traps.