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Structure and multiphased evolution of the Demerara plateau (offshore Suriname, French Guiana)

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Offshore Suriname and French Guiana, the Demerara plateau is a continental indentation at the intersection of two oceanic domains : the Jurassic Central Atlantic and the Early Cretaceous Equatorial Atlantic. Its three borders are passive margins. The northern one is a transform margin, the two others are rifted margins, thinned during Trias/Jurassic (westward), and a second time during Early Cretaceous (eastward). The main stratigraphic feature of the Demerara plateau is the major upper Albian angular erosive unconformity, synchronous to the Equatorial Atlantic break-up. We here focus on the sedimentary records observed below the upper Albian discordance, where seismic data show more than 13 km of layered units.

The aim of this study is to give new insights about the evolution of the Demerara plateau during Mesozoic times, in order to constrain vertical displacements especially in relation with the transform margin. We use mostly structural interpretation of industrial and academic seismic lines (GUYAPLAC, 2003 and IGUANES, 2013), calibrated by industrial wells down to Berriasian times. It allows us to propose structural maps and regional interpretative cross-sections of the plateau and its three borders.

On seismic lines, undated prominent seismic units are characterized by important thickness variations, and weak continuity of intern reflectors. They thicken westward (toward the Central Atlantic ocean). One possible interpretation is to relate these units to trias/jurassic syn-rift sediments deposition associated to a continentward dipping fault. But the complex is formed by a repetition of several layer fans. Hence one alternative interpretation would be that these units were seaward dipping reflectors stacked during Trias/Jurassic rifting, suggesting that the role of magmatism should have been predominant during the first phase of the plateau formation.

All the sediments of the plateau, including Aptian sediments, are deformed with numerous structures (strike-slip faults, inverse faults and grabens). Some strike-slip faults are compatible with what can be expected along the Albian transform margin. However many directions of inverse and normal faults are difficult to put together in a single structural pattern. They are clearly non-synchronous and their chronology is hard to decipher. Nonetheless some structures (notably folds and inverse faults) lie below an undated angular erosive unconformity, which is itself tilted during later phases of deformation. This unconformity allows us to propose a relative chronology between structures and characterize the multi-phased picture of the Demerara plateau history.