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Seismic architecture and morphology of Neogenic sediment waves and drifts, offshore West Africa

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The three dimension visualisation softwares of seismic data and the recent development of semi-automatic interpretation tools allow to define the 3D morphology of ancient depositional systems at a resolution never achieved before.
This study analyses a Neogenic stratigraphic interval in the deep water of the West African margin. The purpose of the work is the understanding of the sedimentary architectures and the link with the genetic depositional processes. The study is mainly based on the interpretation of seismic geometries and amplitude/isochron maps derived from newly-interpreted seismic horizons.
The seismic stratigraphy reveals abrupt changes in depositional styles and sedimentary processes. Transitions between Sediment Drifts (SD), Sediment Waves (SWs) and Mass Transport Complexes (MTCs) are here frequently observed, suggesting that cyclically either bottom-current intensity decreased or gravity-flow input overwhelmed the bottom-current signal.

The lower studied interval corresponds to a SD sequence, made up of stacked individual packages and having a maximum thickness of 300 ms. The landward drift morphology is characterized by convex-upward, mounded seismic reflections. Each drift onlaps on a seaward-dipping reflection interpreted as paleo-slope. These contouritic deposits are concentrated near the base of slope, and fade out downdip. The drift appears to be grown from the deeper part of the basin and backstepped up the slope. It is inferred that the deposition of the drifts took place under the influence of a marine current, subparallel to the southern margin of West African coast. The backstepping of the onlapping architecture may have resulted from bottom current acceleration across the ramp.

The intermediate studied interval represents a transitional sequence in which SW are alternated with MTDs of minor size (up to 60 ms thick).
In this transition interval, onlap relationships and thickness variations suggest that gravity flow deposits preferentially fill SW troughs. The positive relief of wave crests guided sediment gravity flows, inducing erosion and deposition focused along wave troughs.

The shallower interval is fully dominated by bottom current deposits. A succession of SW around 300 ms thick covers the central-eastern sector of the study area. The described SW field is about 5 km wide and continuous over a distance of 30 km, and the average wavelength between two crests is 2 km. It is connected updip with a time equivalent rectilinear canyon-shaped erosive feature, whose genetic relation with the SW is now matter of discussion. The presence of upslope migrating SW indicates deposition by bottom current [U+FB02]owing upslope, under the in[U+FB02]uence of the Coriolis force. Such landwards-directed bottom currents on the slope probably represent the still active South-East Atlantic Upwelling, which has been present along the West Africa margin throughout the Neogene.