Submarine Canyons - Deepwater Sediment Highways: Types, Evolution Dynamics and Prospectivity, Examples from the Niger Delta

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Deepwater deposits constitute one of the most intensively explored sedimentary systems in basins worldwide. These deposits are the product of turbidity currents distributed largely on the continental slope as well as the abyssal plain and are characterized by various architectures such as channel-levee complexes and lobes that result from the transportation dynamics. The episodic downslope movement of deepwater sediment cycles are triggered by shelf / slope sediment erosion during a relative drop in sea-level, shelf edge submarine canyon sediment conduit supply, exceeding storage at basin margin and gravity induced displacement of unstable slope sediments. Of these factors, the role played by submarine canyons is one of the most important as it constitutes a direct sediment highway from the shelf to slope. Some of the major deepwater fields of the Niger delta show spectacular geomorphologies that are in some way thought to be related or connected to submarine canyons when traced upslope. These canyons which are important during lowstand times can be 'shelf breaching', i.e. traversing the shelf landward and connecting to incised valley or they may indent the outer reaches of the deltaic platform (or "shelf margin"), known as 'shelf indenting canyons'. They can also be 'slope confined canyons' which cut through the upper and middle slope and act as feeder systems for lower slope turbidites and deep sea fans as long as there is sustained sediment supply. All these canyons have varying infilling complexities related to stratigraphic cycles, tectonics and topography. They can be sand prone, particularly those that develop at the shelf margin and middle slope or they may be mud prone such as the upper slope canyons.These systems change through time as a result of a complex play of relative sea level changes, retrogressive slumping, wall collapse, tectonics and sediment supply leading to the canyon evolution and downslope sediment transport implications.

Taking examples from Niger delta we highlight the importance of submarine canyons, the understanding of their origin and evolution dynamics in relation to deepwater deposition which allows us to further characterize the Niger Delta slope architecture and downslope prospectivity.