Processes Associated with Meandering Channel Migration in Deepwater Systems Based on 3-D Seismic and Outcrop Data

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Outcrops from the Permian Karoo basin, South Africa, are compared with seismic reflection profiles and plan view images from the Gulf of Mexico to illustrate both the geomorphology as well as the physical stratigraphy of meandering channel deposits. Based on these data, two models to explain the process of channel migration associated with meandering are proposed. 1. Lateral accretion associated with relatively long term continuous flow. This produces in outcrop as well as seismic data a stratigraphic geometry comprising inclined bedding oriented transverse to the direction of flow that is similar to point bar deposits in fluvial systems.

Outcrop data suggests that this process results in a stratigraphic architecture that is commonly at sub-seismic scale. 2. Punctuated meander loop migration associated with successive cut and fill events. Discrete turbidity flow events, which are confined within earlier-formed, partially-filled channels, initially erode the substrate, preferentially along the cut bank margin. During the waning phases of these flows the channels fill, though not completely. This tends to preserve a channel morphology for the next flow to follow. The result of this punctuated channel shifting is a pattern of lateral accretion and down-system meander loop migration on seismic data.

However, in outcrop these deposits are characterized by a succession of cut and fill associated with horizontally bedded geometry. The thalweg in each instance is located asymmetrically closer to the cut bank margin and migrates in that direction with each successive channel fill. Successive horizontally-bedded channel fill deposits tend to be truncated on the cut bank side. The deposits associated with this process are likely to be at a scale that can be observed on multichannel seismic data.