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TURBIDITE SLOPE CHANNELS

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Abstract

Extensive 3D seismic data from West Africa has started to show remarkable details of the geometry and facies of Tertiary turbidite slope channels. The slope systems which have been studied are characterised by subtle to complex topography created by salt or shale diapirism or faults. In the upper part of the slope the channels are often relatively narrow (<1km) with fairly straight leveed margins which may or may not contain a moderate-high sinuosity channel axis. Downslope the channels become broader (1-2km), highly sinuous (sinuosity >2) with erosional bases and local levee and crevasse-splay development. In this part of the slope the channels typically show a vertical sequence which comprises an erosional base, a coarse grained lag (by-pass phase), slumps and/or debris flows (locally derived or more distant transport?), high N:G sandy fill of stacked channels which may be straight or sinuous and finally a lower N:G with highly sinuous channels and levees. The relative proportion of each of these facies can vary significantly.

Moderate to high sinuosity is a characteristic of many of the channels however a range of sinuosity styles are present these include i. Sinuosity controlled by local sea-floor topography ii. sinuous channels which show dominantly vertical aggradation iii sinuous channels which show successive lateral shifts in the channel axis and iv. Channels, usually on a smaller scale (10's to 100m wide) which may show inclined reflectors dipping in the direction of channel migration. It is this latter form of sinuosity which produces features very similar to fluvial systems. Facies seen in cores indicates that turbidity current and debris flows process are dominant in all cases.

In our experience ponded systems i.e. basins in which the channel systems terminate on the slope as a result of slope topography, are not common. The appearance of 'ponding' can be a function of the extent of the 3-D data set. In areas of smaller data coverage it is often easy to interpret channel systems terminating in intra-slope basins. However with increasing coverage of 3-D data the channels can usually be seen to have continuous but very convoluted courses which takes them through and beyond complex slope topography. At sharp bends in channels it is common to observe sheet-like seismic facies (although generally thin), extending away from the channels.

Topographic constraints within the slope topography may locally fix the course of the channel system for some time while down-slope of the constriction the channels take different, usually compensatory off-setting courses through time.

Associated with the channels are more sheet-like seismic facies. The origin of these features is less clear and quite possibly they have multiple origins. They may be parts of levees of the larger channels, minor splays which were deposited laterally, splays which are an initial part of the channel avulsion process (similar to the HARPs of the Amazon Fan), or by processes unrelated to the major channels.

These Tertiary channel systems have very similar geometries to those observed in many modern fans such as the Amazon and the Zaire and pose many questions regarding the nature of the currents which transported and deposited the sediments.