Channel Architectural Element Analysis of Deep Marine Channels: Examples from Outcrop and Implications for the Predictability of Channel Systems

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Submarine channels may take any of three forms: aggradational, graded, or erosional. These states correspond more or less with distinct stratigraphic architectures that form channel elements. Channel elements are the building blocks of composite channel bodies or channel complexes.

Channel elements are divided into those of a predominantly laterally accreting style, an aggrading style, or an erosional/amalgamational style, which form the end-members of a channel-element continuum, each with its own distinctive properties. Lateral accretion channel elements are shown to have high width/thickness ratios, and entire channel-elements are commonly preserved; paleocurrent data show a wide spread, with flow down-channel, perpendicular to, and up-channel. Aggradational channel elements are shown to have intermediate width/thickness ratios, again with entire channel-elements commonly preserved; paleocurrent data trend predominantly down-channel. Erosional/amalgamational channel elements are shown to have the lowest width/thickness ratios, with entire channel elements never preserved (always eroded laterally and/or vertically). Paleocurrent directions are generally subparallel to the channel-trend. Channel element data from a Campanian-Maastrichtian channel and canyon complex on the Pacific coast of Baja California, Mexico, are used to illustrate these properties.

Extension of these data into seismic-scale indicates that this type of element analysis carries over into the subsurface, where lateral accretion, aggradation, and amalgamation are again recognized as end-member type systems, typically at larger scales. This analysis may be scalable, and can be used to help predict the internal complexity of reservoirs.