Tectono-eustatic controls on the development of submarine channels.

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Eustatic sea-level changes are commonly regarded as being the main mechanism driving the evolution and infill of submarine canyons and channels. The location and morphology of canyons and channels, however, are generally ascribed to pre-existing fault topography and syn-sedimentary (growth) faulting. Here we present a model to show how changes in accommodation space and the depositional style of a channel can be driven by the interaction of tectonics and eustatic sea-level changes. We use field outcrops to demonstrate the dynamic interaction of these processes. Linked tectono-eustatic controls are especially important in small fast-forming basins, where modifications of the basin-floor gradient (due to differential uplift/subsidence) impacts on the development of channels.

Relative hinterland uplift and basinward subsidence will result in a steeper basin-floor gradient and will lead to an associated phase of sediment by-pass. If there is a decrease in basin-floor gradient (i.e. hinterland subsidence and/or basinward uplift), there will be a period of aggradation and infill, which may be associated with the back-stepping of sands, and eventually leading to the abandonment of the channel. Intra-channel angular unconformities are a distinctive feature of channels driven by tectonics. Where purely eustatic processes dominate, repeated phases of aggradation and erosion will occur to form intra-channel disconformities. The results of this study has important implications for sequence-stratigraphic modelling, where the development of channels by shifts in base-level, due to eustatic sea-level fluctuations, are normally emphasised.