Geophysical Research Abstracts, Vol. 8, 07050, 2006
SRef-ID: 1607-7962/gra/EGU06-A-07050


# Stratigraphical and sedimentological evolution of a sand-rich slope channel-levee complex: a high-resolution analysis of the erosional and depositional record

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Submarine slope channel complexes are major conduits in the supply of sediment from the shelf to the basin-floor. Commonly, these complexes record multiple cycles of erosion/bypass, aggradation and re-incision. Their history is dominated by erosional processes and sediment bypass, with the aggradation phase recorded in their fill. However, sites adjacent to the main conduit are dominated by depositional processes that record the stratigraphic development of the erosional channel system. Commonly, km-wide submarine slope channel systems are imaged in seismic and modern seafloor datasets, but exposure limitations usually preclude the identification and detailed analysis of complete systems of this scale at outcrop. In the Laingsburg Depocentre, Karoo Basin, South Africa, however, excellent exposures of a Permian SW-NE oriented slope channel complex (Unit C) allows the detailed assessment of its erosional and aggradational history. Additionally, the fine-grained thin-bedded successions that developed adjacent to the channel complex are well exposed.

In the off-axis layered deposits, key stratigraphic surfaces were identified (two mudstones intervals in particular) and mapped using dGPS technology towards the axis of the channel system. The lower mudstone is cut out in two places and these define the eastern and western margins of the 4 km wide channel complex. The upper mudstone is continuous over the channel complex, thus defining a stratigraphic window when erosional and aggradational processes were active in the channel system. Thickness and facies trends identified through mapping and logging indicate that the adjacent thin-bedded deposits thin and fine away along strike from the channel com-

plex, and are therefore interpreted as constructional sand-rich levee features, up to 8 km wide. Within the channel complex, closely spaced sedimentary logs (typically every 20 m) were collected to identify the relationship between erosional surfaces and facies distributions. Erosion surfaces were mapped (using dGPS). The aspect ratio of these surfaces is difficult to define because of the large number of incisional events; however a hierarchy of surfaces can be defined. The largest surfaces cut down 20-50 metres and define the bounding surfaces of $\sim$500-1000-wide channel complexes. Within these major cuts smaller-scale 2-5 metre deep and 100-300 m-wide erosion surfaces define single channels. The whole 4 km-wide system is defined as a channel complex set. Interestingly, the orientation of all the remnant erosional surfaces display a strong westward stepping trend, such that the westernmost channel complexes and channels represent the last phases of cut and fill.

The channel system crops out 2-3 km down dip on the other limb of an E-W-trending syncline. This provides an unprecedented opportunity to study the down stream erosional and depositional development of the channel complex set, which splits into km-wide isolated channel complexes. Initial mapping indicates that the development of the early channel complexes was controlled by seabed topography caused by incipient fold growth as they turn to the east, whereas younger channels cut across the tectonic structure. Ongoing work aims to understand the precise stratigraphic link between phases of channel erosion and sediment bypass and levee construction.