



Early syndepositional fault control and the development of inverse grading in a deep-water channel-overbank system: Sanguinière sub-basin of the Eocene Annot Formation, SE France

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A deepwater channel-overbank system in the Sanguinière sub-basin of the Alpine-related Eocene Annot Formation of Southeast France is under investigation to understand the role of syndepositional faulting on lateral changes in sandstone bed architecture and sedimentology. Syndepositional faults which exhibit incremental, small-scale movement (metre-scale) were a critical factor in the development of both the stratigraphic architecture, and the detailed sedimentology of individual event-beds. Lateral changes in facies architecture and grading from axial zones dominated by normal-graded beds to marginal zones of inverse-to-normal grading were recorded. These lateral changes were controlled by small-scale accommodation along the syndepositional faults as follows. Initially in a flow, lateral accommodation into these fault zones trapped the coarse fraction, while flow stripping allowed finer sediment to spill over footwall scarp into the overbank. As the accommodation space in the first fault zone filled up (still by the same turbidity current), coarser and coarser sediment could begin to spill over the footwall scarp into the overbank, resulting in an inverse-graded bed. Finally, when the accommodation space in the first fault zone was completely filled (still by the same turbidity current), all the flow could be tapped outboard of that fault zone, and grading would become normal again, resulting overall in an inverse-to-normally graded bed. Therefore, the same beds which are normally graded in the axis of the system become inverse to normally graded on the other side of each of the syndepositional faults. Because this architecture is recorded repeatedly in the vertical section, along a series of normal syndepositional faults outboard of the channel axis, we can confidently directly relate it to this process. These field data call into question the longstanding interpretation of inverse-to-normal grading as a hallmark of hyperpycnal flows.