Event deposits: the role of sediment supply and relative sea-level changes-overview

G. Einsele
Sedimentary Geology 104 (1996) p. 11-37
Course and University Lectures topic

This overview on event deposits is based on (1) a brief summary on denudation rates in regions of various relief and climate as derived from the suspended and bed loads of rivers, (2) the fractions of sand and mud present in the fills of various basins, and (3) the mechanisms controlling sediment remobilization. In continental settings, size and frequency of event deposits (debris flows on alluvial fans, avalanching on fan deltas and overbanking on floodplains) directly reflect erosional processes in the source areas and the ratio of denudation area/ accumulation area. In marine environments, both sediment supply and the change in near-shore accommodation space largely control the nature of stratigraphic sequences. Under conditions of high sediment supply and low-frequency sea-level changes, the thick systems tracts tend to show only minor differences in the presence of event deposits, including tempestites. With decreasing sediment supply, event deposits are increasingly concentrated in the lowstand systems ract. As shown by a number of models (with differential subsidence or uplift of the basin margin), rapid relative sea-level fall accentuates both coastal and submarine sediment remobilization (rich in sand), particularly during the early lowstand phase, as well as delayed valley incision. The resulting submarine fans tend to be sand-dominated, whereas large fans fed by major rivers are dominated by turbidite muds. In regions of coastal uplift, valley incision persists longer than the lowstand period, and sea-level changes may cause 'pulses of uplift' and phases of punctuated cliff erosion. Along carbonate buildups, lowstands of third-order or higher frequency sea-level changes are often recorded by coarse skeletal debris and megabreccias and/or, in the case of mixed systems, by siliciclastic turbidites. In rapidly closing foreland basin, high-frequency sea-level cycles only tend to affect both the proximal and distal basin margins, whereas third-order sea-level changes have a limited potential to directly control depositional sequences and event deposits close to the overthrust front. With high sediment supply, individual event deposits (such as debris flows, sandy and calcareous tempestites and

turbidites)mostly form at intervals of tens to hundreds up to some thousands of years. Longer recurrence intervals occur in settings with low sediment supply or characterize very large mass flows and megaturbidites.

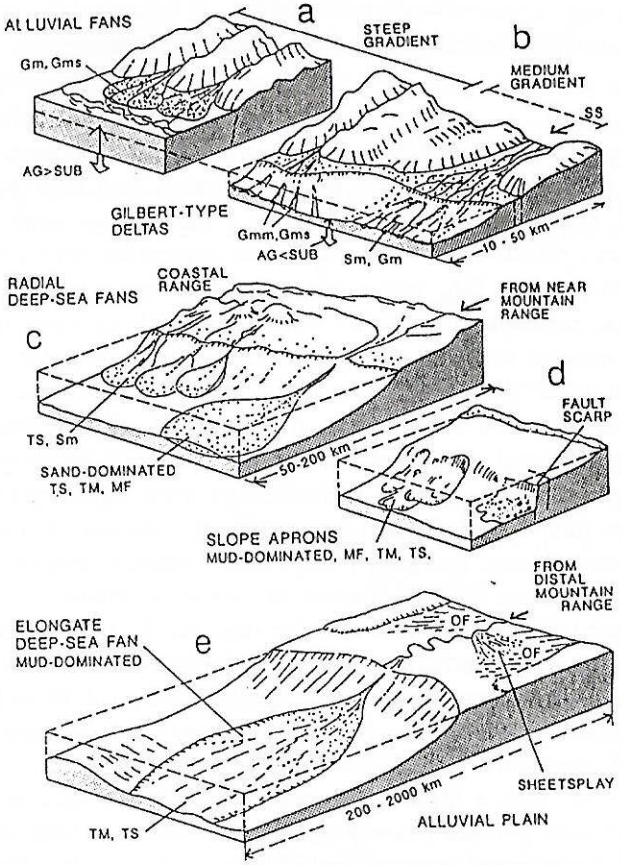


Fig. 2. Various scenarios of sediment accumulation systems with event deposits. *Gm, Gms* = massive gravel, grain-supported or matrix-supported; *Sm* = massive sand; *TS* = turbidite sand; *TM* = turbidite mud; *MF* = mud flow; *OF* = overbank fines; *AG* = aggradation of sediment; *SUB* = subsidence.