Glossary

By Howard Feldman
Kevin Bohacs
Dave Cleveland
Steve Driese

Introduction

The goal of each definition is that it is as simple as possible, and can be used to discriminate the deposits, or that it be actionable. Also, each definition is based on the historical concept as first defined, with the recognition that this may have to be modified based on subsequent research. For example, flow stripping in deepwater channels originally only referred to the removal of fine-grained sediment at the overflow along the outside bends of channels (Piper and Normark, 1983). However, the recognition that levees occur on both sides of sinuous channels, and along straight channels, required that the definition be generalized to include sediment removed through overflow of channels in any deepwater setting.

Several terms in this glossary have developed usages that are contradictory. In these cases, the more common use or the use most consistent with the original definition was utilized. We apologize (not really) if your favorite term is not defined the way you like.

Most of the terms are in alphabetical order. The exception is with proximal and distal modifiers to primary facies terms. There are under the primary term. So proximal lower shoreface is found immediately after lower shoreface.

Glossary

abyssal plain Environment that spans abyssal water depths beyond the continental rise (generally deeper than 3.5 to 4 km)

accommodation The space available for sediments to accumulate and be preserved (Jervey, 1988; Neal et al., 2016).

accommodation space The space available for sediment to accumulate and be preserved space. Just kidding, don't use accommodation space!

accumulation space [eolian] The space from the sediment surface up to the equilibrium height (Kocurek and Havholm, 1993).

acoustic impedance [seismic] A measure of how readily sound travels through a rock. The rock density times the sound velocity through the rock.

adhesion ripples [eolian] Straight-crested ripples a few millimeters high that migrate upstream as windblown sand adheres to the damp steep faces of the ripples.

aeolian see eolian

aggregation See flocculation

alfisol An Argillisol with an argillic horizon and significant amounts of base cations (original term: Soil Survey Staff, 1999; Retallack, 2019)

alluvial Deposits laid down by flowing water in channels and floodplains (Gibling et al., in press). This term is broader than fluvial.

alluvial fan Small, cone-shaped deposit at the transition from a narrow bedrock-confined valley to a more open basin, with a radius of a few hundred meters to a few kilometers, and dominated by short-duration runoff events, and unconfined to poorly-confined flow (Drew, 1873; Blair and McPherson, 2009; Ventra and Clarke, 2018).

amphidromic point A location in the ocean with no tides, and around which tides propagate, increasing in height away from these points.

anabranch A single channel link in a network of interlinking channels (although the term has not always been used in this sense, and has a complicated history; see Carling et al., 2013).

anabranching rivers Synonym of anastomosing rivers (Carling et al., 2013).

anastomosing rivers Rivers with a network of channels at bank full discharge, separated by islands of vegetated flood plains that are much larger than the largest bars (Schumm, 1985; Bridge, 2003; Carling et al., 2013).

angle of climb The upward trajectory of a dune or ripple crest as it migrates and rises.

angle of repose The maximum gradient that loose sediment will accumulate on top of similar sediment. For dry sand this angle is 32°-34° (Bagnold, 1941; Bristow and Livingstone, 2019). For sand under water the angle of repose is 15°-30° (Al-Hashemi and Al-Amoudi, 2018).

anoxic An aquatic environment with no oxygen. Animal life is not present.

antidunes Small to very large bedforms (a few centimeters from crest to crest, up to approximately a kilometer in some deep marine systems) in which the top of the flow follows the form of the bed surface without flow separation, and in phase, with the bedform. They mostly migrate upflow, but can migrate downflow.

argillic horizon A soil horizon with clay content significantly greater than the overlying horizons.

argillisol A paleosol order in which the most prominent feature is an argillic horizon with abundant illuviated clay.

authigenic growth Rock components that are formed in the place where they are currently found, in contrast to detrital components that were formed elsewhere (Lazar et al., 2015a).

avulsion lobe The lobe-shaped deposits immediately downdip from a levee breach, deposited by unconfined flow.

backshore Supratidal part of the beach only submerged during storms.

backwater length The upstream extent of a river that is affected by hydrodynamic processes in the receiving basin or river mouth (Chatanantavet et al., 2012). This also corresponds to the portion of the channel where the channel base is below base level (Blum et al., 2013).

bar [fluvial] Unvegetated or sparsely vegetated accumulation of sand and gravel, sometimes including mud, in a channel that is submerged and migrates at bankfull discharge. They are distinguished from islands which are relatively permanent, vegetated, and rarely submerged (Schumm, 1985).

barred coast A wave dominated coast with elongate subtidal to intertidal sand bars.

barren meandering rivers Meandering fluvial systems in which plants are rare or absent (Ielpi et al., 2022).

barrier island A wave-dominated, strike elongate, coastal island built of sand accumulating just above high tide, commonly vegetated or with wind-blown dunes. They have a beach on the seaward side and a lagoon on the landward side.

bay head delta (abbr.: **BHD**) A small river delta formed in a bay, commonly within a flooded river valley.

bed The stratum that reveals the principal rock layering. It is the result of a single depositional event and may contain within it laminae and laminasets, or be structureless. Beds are typically mm to meters thick but do not have an absolute range of thickness. They are bounded at the base and top by bedding surfaces of erosion, nondeposition, or correlative conformity (modified from Campbell, 1967; Van Wagoner et al., 1990; Lazar et al., 2022).

bedform A repetitive pattern of bedding surface features composed of loose sediment that form and migrate under flowing or oscillating water or wind (modified from Klaus et al., 2011).

bed load Sediment that is transported by rolling, sliding, or bouncing of grains along the sediment surface (Church, 2006).

bedload convergence zone The part of an estuary in which sand is transported in from both directions, averaged over years (Johnson et al., 1982; Dalrymple and Choi, 2007).

bedload sheets Planar fluvial bedform associated with high bed-load transport of sand or gravel on bar tops (Bridge, 2006).

bedset A relatively conformable succession of two or more genetically related beds (Campbell, 1967; Lazar et al., 2022)

benthic (a) The lowermost zone of a body of water (ocean, lake, river) including the floor of the water body and shallow subsurface; typically within tens

From: The Handbook of Siliciclastic Facies – A guide to the interpretation of depositional environments. SEPM CSP #18. 2024.

of meters of the seafloor in the ocean (Steele, 2001; Wetzel, 2001). (b) An adjective for aquatic organisms that live on or in the sediment. For example a benthic foram.

benthic current A current that flows in the lowermost zone of a body of water, typically within tens of meters of the bottom, driven by density differences within a water mass or between water masses. They are generally slower but more persistent than sediment-gravity flows and flow along-slope, cross-slope, and downslope.

benthic storms Episodes of strong abyssal currents and intense enhancement of suspension in bottom waters generated by a variety of mechanisms, most involving instabilities along interfaces or fronts between water masses of different densities (Gardner et al., 2017).

benthic zone The seafloor, the sediments at the seafloor, and lowermost zone of the ocean, typically within tens of meters of the seafloor.

BHD see bayhead delta.

bigradational sequence [CDS drift deposits] An alternative term for a contourite sequence that emphasizes the symmetrical grain size succession from mud to sand to mud.

biogenic Sediment grains that result from the growth of plants and animals on land and in the water, and include shells, tests, bones, teeth, scales, and aggregates of organic material derived from algae, bacteria, and land plants.

biogenic sediment Sediment containing at least 30% skeletal remains of marine organisms (Mazzullo and Graham, 1988).

biogenic silica A type of amorphous hydrated silica ($SiO_2 \times nH_2O$) secreted by organisms such as diatoms and radiolarians to form intricate skeletons.

biogenic-production-dominated shelf The part of a marine shelf, most commonly on outer marine shelves, with abundant nutrient supply and sheltered from significant clastic influx (either very distal from shore or off axis of clastic transport paths) and dominated by biogenic muddy sediment (Bohacs et al., 2022a).

proximal biogenic-production-dominated-shelf The area of a biogenic-production-dominated marine shelf that is distal to clastic dispersal paths, around the mid-shelf (50 to 100 or more km offshore in modern settings), in which sediment accumulates from moderate to high biological growth punctuated intermittently by influx of argillaceous detritus (Bohacs et al., 2022a).

distal biogenic-production-dominated shelf The area of a biogenic-production-dominated marine shelf very distal to clastic dispersal paths, beyond the mid-shelf out to the shelf edge (up to 100 or more km offshore in modern settings), in which sediment accumulates under high biological input and preservation rates, with minimal argillaceous influx, and infrequent high-energy events (Bohacs et al., 2022a).

birdfoot delta See digitate delta

bog A wetland with a floating mat of vegetation, commonly dominated by mosses with a few trees or bushes. Does not contribute significantly to the accumulation of coal.

bottomsets [delta] The gently basinward-dipping strata just basinward of the foresets of a delta.

bounding surface [eolian] Major stratigraphic boundary or truncation surface in eolian systems.

braid bar (or mid-channel bar) Any sand or gravel bar that divides flow at low flow stage and is submerged at high flow (modified from Allen, 1968, p. 38-39)

braided river A wide, shallow river with many ephemeral mid-channel bars that are significantly smaller than the bankfull channel, unstable, evolve quickly, are sparsely vegetated, and submerged and bank full discharge (Miall, 1996; Surian, 2015). At low flow, water flows around the exposed bars giving rise to the braided pattern.

buoyancy The upward force on an object due to the difference in density between the object and the surrounding fluid.

bypass Sediment transport without net accumulation.

calcareous ooze An unconsolidated deepwater pelagic sediment that contains more than 30% coccoliths and foraminifera.

calcic horizon A soil horizon with >15% pedogenic carbonate and that is thicker than 15 centimeters

calcification [soils] The process of the deposition of calcium carbonate due to insufficient precipitation (rain) for complete leaching of solutes.

calcisol A paleosol order characterized by the pedogenic accumulation of carbonate minerals, mostly calcite, as in a calcic horizon (Mack et al., 1993).

calcite compensation depth (abbr.: **CCD**) The depth in the ocean approximately 0.5 to 1 km below the lysocline where the rate of calcite dissolution equals the rates of calcite influx.(Hüneke and Mulder, 2011). Below the CCD, marine organisms that rely on calcite for their shells and skeletons can no longer survive and only carbonate-free sediments accumulate. The CCD defines the boundary between the accumulation of calcareous sediments and red/brown pelagic clays.

canyon [deep water] A large-scale erosional feature cut into older material.

carbonaceous An adjective describing a mudstone with TOC content between 2 and 25 wt.%. Can also apply to sandstone, but without a specific TOC threshold.

CDS See contourite depositional system

central basin [estuarine] A mostly mud-dominated deposit in the middle of a wave-dominated estuary formed near the turbidity maximum

chalk A rock composed of nearly pure calcarous nanno fossils (shells smaller than 0.02 mm), mostly coccoliths, and their recrystallized remains. It is the rock equivalent of the pelagic sediment calcareous ooze.

channel An elongate depression that is (or was) a conduit for flowing water or sediment gravity flows. For rivers, the water is confined to the conduit for most of the year (Friend, 1983).

channel axis facies Deepwater channel fill facies that is over 90% sand, composed of thick-bedded, amalgamated sand beds mostly deposited by high-concentration turbidity currents, and commonly including gravel (Campion et al., 2000, 2005).

channel belt The combined deposits of a river channel, commonly wider than a single channel due to lateral migration of meandering channels, and includes avulsions at meander bends (Gibling, 2006; Blum et al., 2013). Also applied to meandering channel systems in deepwater fans.

channel complex A group of one or more channel fills that are genetically related (Sprague et al., 2005). Can be applied to deepwater and fluvial systems.

channel distal [deepwater] Refers to levee deposits far from the channel from which they are derived. Antonym: channel proximal.

channel fill The volume of sediment within a channel.

channel-fill-base sub-facies [CDS deposit] The bottom interval of a contourite channel fill that has a sharp, typically erosive basal contact and gradational upper contact; it is composed of amalgamated sandstone beds without bioturbation.

channel-fill-middle sub-facies [CDS deposit] The middle interval of a contourite channel fill that has gradational lower and upper contacts; it comprises alternating bedded and bioturbated sand beds.

channel-fill-top sub-facies [CDS deposit] The uppermost interval of a contourite channel fill that has a gradational lower contact and disconformable upper contact; it is composed of bioturbated sand and mud beds.

channel margin facies Deepwater channel fill facies that is less than 50% sand, composed of non-amalgamated sand beds mostly deposited by low-concentration turbidity currents (Campion et al., 2000, 2005).

channel proximal [deepwater] Refers to levee deposits adjacent to the channel from which they are derived. Antonym: channel distal.

chert A hard, brittle, and low permeability sedimentary rock with a glassy luster that contains more than 80% silica, typically as microcrystalline quartz (Isaacs, 1981).

chutes-and-pools (sometimes shoots-and-pools) A hybrid bedform between antidunes and cyclic steps in which a cyclic step is superimposed on a shorter-wavelength train of antidunes (Slootman et al., 2021).

clast A grain of sediment that is a fragment from another rock. A quartz sand grain originally was a quartz crystal in an older rock, such as granite.

clastic Sediment or sedimentary rock that is composed of clasts.

climbing current ripples Ripple cross lamination in which the trajectory of the ripple crest migrates downstream and upward, recording bed aggradation

clinoform A sloping surface that is part of a large-scale sigmoidal bedding surface. Originally only applied to wave-dominated deltaic processes and the foreset region by Rich (1951), but has since been applied to any scale up to continental slope progradation.

clinothem The volume of sedimentary strata between two clinoforms.

Coastal plain see delta plain.

coastal upwelling The vertical upward component of near-surface ocean currents induced by wind stress interacting with the geography of the coast. Upwelling currents are relatively slow (typically m/day; Knauss, 1996).

combined flows Flows that result from the interaction of unidirectional currents and wave-induced oscillatory flow (Li et al., 2021) The occurrence of such flows is widespread, especially on marine shelves

complex dunes [eolian] Dunes that have superimposed upon them smaller dunes of a different type (e.g. crescentic dunes on the flanks of larger linear or star dunes, or linear dunes with star dune peaks) (Lancaster, 2023).

compound bars A fluvial bar composed of multiple unit bars (Best et al., 2003).

compound dunes [eolian] Dunes that have superimposed upon them smaller dunes of the same morphological type (e.g. superimposition of smaller crescentic dunes on the stoss side of large crescentic dunes) (Landaster, 2023).

compound peds [soils] Peds with multiple nested scales of varying sizes

compound valley fill Two or more nested valley fills, similar to a multistorey channel fill, but at the incised valley level (Holbrook, 2001).

concretions Internally banded or layered mineral accumulations that locally cement the sediment, commonly prior to significant compaction.

contour current A specific type of benthic current that flows parallel to bathymetric contours (alongslope) as part of the deep thermohaline-induced geostrophic circulation of the world ocean (Heezen and Hollister, 1964). Contour currents mostly rework sediments delivered by SGFs.

contourite Sediment deposited or substantially reworked by the persistent action of benthic currents that most commonly occur on the continental slope and rise.

contourite channel An elongate erosional depression on the slopeward margin of a contourite drift.

contourite channel fill [CDS deposit] Sandy fill of a contourite channel that typically occupies the slopeward margin of the contourite depositional system wherein sediment is moved mainly by benthic currents and overflows onto the adjacent contourite drift to basinward.

contourite depositional system (abbr.: **CDS**) The entire extensive sediment body formed by contour and other bottom-water (benthic) currents. It occurs on continental slopes to abyssal plains, aligned generally parallel to bathymetric contours

contourite drift The major component of a CDS that occurs basinward of its associated contourite channel and is dominated by mud. Drifts range in shape from thin tabular sheets (discontinuous to continuous) to mounds.

contourite sequence A decimeter-scale stratal succession deposited by contour currents with five internal divisions: a gradational base that coarsens upward from mud (C1 division) gradationally through silty mud (C2) to sandy silt (C3) overlain conformably by a fining-upward interval from silty mud (C4) to mud (C5) in a gradational top (Gonthier et al., 1984). Conceptually analogous to the Bouma sequence.

Coriolis effect A phenomenon in which the direction of a moving object is deflected relative to the Earth's surface due to the rotation of the Earth (deflection to the left in the Southern hemisphere and to the right in the Northern hemisphere); it is proportional to the velocity of the moving object and increases from zero at the equator to maxima at the poles (Coriolis, 1835; Knauss, 1996).

From: The Handbook of Siliciclastic Facies – A guide to the interpretation of depositional environments. SEPM CSP #18. 2024.

counter point bar [fluvial] Side attached bars that form along the outside of a meander bend (Smith, 2009).

crevasse splay Sandy fan-shaped fluvial deposit created during a flood at a break in a levee.

cross bedding Stratification in which smaller-scale strata are at an angle to the large scale bounding surfaces.

current ripples Small (under 60 centimeters in wavelength, but mostly 5 to 20 cm in wavelength), downstream-migrating asymmetrical bedforms in flowing water in which sand cascades down the lee side of the bedform and the water surface (rivers) or interface (sediment gravity flows) is not deflected by the bedform.

cut bank The outside bend of a meander river loop that is eroded as the river migrates.

cutans The altered ped surfaces, including clay coatings, aligned clays, and slickensides

cyclic steps Large (typically a few meters up to 10s of meters) sand or gravel bedforms that result from an abrupt downstream transition in turbidity currents or rivers from subcritical to supercritical, causing a scour that migrates upstream (Fedele et al., 2016; Slootman and Cartigny, 2020). The resulting deposits have upstream pointing cross beds.

damp interdune [eolian] Interdune in eolian systems that is within the capillary fringe of the water table (Mountney, 2006).

debris flow A cohesive mixture of poorly-sorted sediment and water that moves downslope due to gravity. Cohesion is derived from electrostatically charged clay particles and the friction between the particles. Debris flow deposits do not preserve the original bedding. They can flow without lateral confinement or in channels.

debrite The deposit of a debris flow. Typically a very poorly sorted mixture of mud and sand and possibly coarser grains.

deepwater basin-floor environment (abbr.: **DwBF**) The part of the ocean floor beyond the continental rise in abyssal water depths (generally deeper than 3.5 to 4 km; Anikouchine and Sternberg, 1973; Mitchell, 2015).

deepwater fan Extensive depositional system formed by downslope transport, mostly turbidity currents. It occurs on continental slopes to proximal abyssal plains, aligned generally perpendicular to bathymetric contours.

deflation Net eolian erosion.

delta A subaerial landform that results from a river feeding sediment directly into a standing body of water at a rate that overwhelms any effective dispersal processes such as waves and tides (Syvitski et al., 2022).

delta front The steeply-dipping, sandy part of a delta foreset from the shelf break to the toe of slope. Includes Stream Mouth Bar, medial Delta Front, and distal Delta Front. Modified from Gilbert (1885).

- **medial & distal delta front** Fully subaqueous part of the delta lobe extending from the stream mouth bar to the base of the delta foresets, composed of sediment deposited by density currents and suspension settling from the river plume

delta lobe The deposits of a single delta parasequence. It extends from the delta plain to the distal downlap termination. This term has been applied at a range of scales, but is best restricted to a single parasequence.

delta plain or **coastal plain** Land areas that was built up by coastal or delta progradation; may be marshy and subject to common flooding

denser-water eddies [deepwater] Currents that flow at varying angles to the main current in elliptical swirling patterns.

desert pavement A desert lag formed as a result of finer-grained sediment being transported away by wind.

detached MTC An MTC that forms from an autocyclic failure caused by local slope instabilities and may have little stratigraphic significance (Ortiz-Karpf et al., 2015). Contrast with slope-attached MTC.

detrital Sediment in which the clasts are eroded and transported by a physical process. Clasts include mineral grains, rock fragments, and rip-up clasts .

diagenetic accumulation A deep-sea process that occurs on nodules when dissolved elements diffuse upward in the sediment and precipitate on

From: The Handbook of Siliciclastic Facies – A guide to the interpretation of depositional environments. SEPM CSP #18. 2024.

the bottom side of nodules on the seafloor through reoxidation by oxic bottom waters (Halbach et al., 1981). The resulting nodules tend to be botryoidal in shape with rough surfaces (Yasukawa et al., 2021).

diamictite A poorly sorted terrigenous rock composed of a wide range of grain sizes, such as from mud to cobbles (Flint, et al., 1960).

diapir A large body of rock that has moved upwards due to its lower density compared to the host rock. Salt or mudstone diapirs can be several kilometers in diameter in map view, and are commonly teardrop shape in cross section.

diastasis The stiffening of mud.

diastasis cracks Fracture networks produced in stiffened mud without dewatering (Cowan and James, 1992; McMahon et al., 2017). Also see syneresis cracks.

digitate delta (also called a birdfoot delta) Sandy distributary channel fills embedded in mud with little sandy facies beyond the ends of the channels and so the net sand map is dominated by the branching distributary channels.

dish structures Thin, slightly concave upward, argillaceous discontinuous laminations in sand and coarse silt (Wentworth, 1967 ; Lowe and LoPiccolo, 1974; Collinson, 1994). They are interpreted to form as a result of dewatering.

dish-and-pillar structures Thin, slightly concave upward dishes separated by vertical water escape structures (pillars).

distributive fluvial system (abbr.: **DFS** also called a fluvial fan) A large (commonly 10's of kilometers), low gradient, fan-shaped fluvial system in which the channels form a radiating pattern from an apex, and in which the deposits are dominated by distinct channel fills and overbank deposits (Weissman et al., 2010; Fielding et al., 2012; Ventra and Clarke, 2018).

diurnal tides Only one complete tidal cycle (high and low tide) per day. Compare with semidiurnal.

draa [eolian] A very large bedform of windblown sand with a wavelength of 500 to 5,000 meters that is commonly complex with smaller superimposed dunes upon it (Wilson, 1972; Cosgrove et al., 2021).

drab-haloed root traces A hallow of localized Fe reduction resulting from root decay.

drift facies Sediments that are transported by benthic currents and accumulate downslope of a contourite channel in a contourite drift deposit as a major component of a CDS. Drift facies range in shape from thin tabular sheets (discontinuous to continuous) to mounds. (cf Stow et al., 2002)

- **proximal drift facies** The mixed sandy--muddy--bioclastic part of a contourite drift mound that is closest to the contourite channel (conceptually analogous to a proximal levee setting).
- **medial drift facies** The mixed muddy--sandy part of a contourite drift mound between the distal and proximal contourite drift that typically has faster sediment accumulation than on the distal drift.
- **distal drift facies** The muddy part of a contourite drift mound that is farthest basinward from the contourite channel and laps down onto pre-existing strata.

dry dune systems [eolian] Eolian dunes that are not influenced by moister.

dune (a) [subaqueous] A large wavelength (60 centimeters up to about 10 meters), downstream-migrating asymmetrical bedform in which sand cascades down the lee side of the bedform. The water surface (rivers) or interface (gravity flows) is not deflected, or only slightly deflected (much less than the amplitude of the dune) by the bedform out of phase with the bedform, and they scale with the depth of the flow. (b) [eolian] A large asymmetrical sand bedform with a wavelength of 10 to 500 meters (Wilson, 1972) that does not have smaller dunes upon it.

dysoxic An aquatic setting with 0 to 2 ml O_2/l water. Severely affects biota resulting in low diversity and diminished sizes (Tyson, 1991). In the ancient this term is commonly used to denote interpreted low oxygen settings.

eluviation The process whereby a soil component is removed (eroded or dissolved) from a soil horizon.

endosaturation [soil] Bottom-up induced saturation from water table rise and capillary action (Soil Survey Staff, 1999)

eolian [alternate aeolian] A depositional systems dominated by windblown sand. An erg is a sand sea of any size that is larger than an individual dune (Wilson, 1973; Mountney, 2006).

eolian dune See dune.

ephemeral river A river that does not flow all year, but only in response to precipitation, and at times, is a dry bed.

epi-benthic suspension Sediment in suspension near the sea bottom

episaturation [soil] Top-down saturation of a soil, as from rain and surface ponding and flooding (Soil Survey Staff, 1999).

equilibrium height [eolian] The elevation below which there is a positive sediment budget and above which there is bypass (Kocurek and Havholm, 1993).

equilibrium profile The longitudinal profile of a channelized system (river or turbidity current) in which there is neither aggradation or incision. Any change in the conditions, such as sediment load, discharge, or ultimate base level, will result in incision or aggradation (Mackin, 1948).

erg A sand sea of any size that is larger than an individual dune (Wilson, 1973; Mountney, 2006). (plural: areg).

estuarine circulation Water circulation in an estuary in which fresh water moves basinward above saline water moving landward.

estuarine facies Sediments that are deposited in an estuary, which may or may not have significant tides. Tides propagate further upstream than brackish water (Blum et al, 2013).

estuary [stratigraphy] The seaward portion of a drowned river valley which may receive sediment from both fluvial and marine sources, and which contains facies influenced by tides, waves, and fluvial processes, and where marine processes dominate over fluvial processes (modified from Dalrymple et al., 1991).

excess pore pressure [sediment gravity flows] Pore pressure resulting from water being trapped by low-permeability sediment keeping the flow inflated, and eventually resulting in water escape and other deformation features as the deposit comes to a rest.

external levee [deep water] A levee that is adjacent to a channel complex and outside of the channel fairway. However, the adjacent muddy deposits outside the incisions commonly thin away from the channel complexes only very gradually

facies A volume of rock that shares a common attribute. This can be applied to metamorphic rocks (e.g. greenschist facies), or sedimentary deposits (cross-bedded sandstone facies). Facies can be based on the interpreted origin of the deposits, such as delta front facies or point bar facies.

fair-weather wave base The maximum depth at which passing fair-weather waves begin to interact with the seafloor.

ferralitization The dehydration of iron compounds under intense weathering in well-drained soils in wet climates.

fixed river [fluvial] Narrow river channels that do not migrate (Friend, 1983) and are encased in cohesive sediments.

flame structure A mud-filled feature that is squeezed upwards between the sand loads (Collinson, 1994). They deform the sand laminae in a flame-like shape.

flaser bedding Current rippled sand with mud in the troughs of current ripple bedforms (Reineck and Wunderlich 1968)

flat topped ripples Current ripples with a flat top that was planed off by falling water level.

floc See floccule

flocculation The process of collision and adhesion through which small dispersed sediment particles suspended in a liquid clump together into larger aggregate particles called flocs. Synonymous with aggregation.

floccule (also floc) A loosely aggregated mass of smaller particles that are or were suspended in a liquid.

flooding surface A bedding surface that separates younger from older strata across which there is evidence of an abrupt increase in water depth (Kamola and Van Wagoner, 1995). This does not imply the increase in water depth occurred over a short time period.

floodplains Relatively flat land areas subject to flooding from adjacent rivers. Floodplains receive sediment from the river and aggrade in facies relationship with the river sediments.

flow separation An eddy that forms just downstream of the bedform crest where a flow diverges from the general direction of the main body of flow, typically generating a backflow up the lee side of the bedform. In dunes this can result in current ripples migrating up the lee face of the dune.

flow stripping The process in which turbidity currents overtop the channel edges, thus removing finest sediment from the flow (due to grading of the turbidity current), and increasing the relative sandiness and sorting of the remaining flow. The phrase was initially coined to refer to overflow around the outer bends of channel meanders (Piper and Normark, 1983), but it now is commonly used in the more general sense of any overbank flow.

fluid mud A dense concentration of mud and water, in which settling is hindered by the high sediment concentration, and which can flow and behave as a plastic to pseudoplastic mass (McAnally et al., 2007; Ichaso and Dalrymple, 2009). Fluid mud beds are structureless.

flute A scour eroded into cohesive sediment that widens and shallows downstream (see review of flutes in Peakall et al., 2020).

fluvial Rivers, their sediments, and the processes that erode, and transport, and deposit sediment within rivers (Klaus et al., 2011).

fluvial channel-bar complex A term applied to fluvial channel fills in which the original river or bar morphology is not clear. An accumulation of fluvial sand that cannot be assigned to meandering, braided or fixed rivers.

fluvial distributary channel Downstream bifurcating channels on a delta plain that feed sediment to the coast

fluvial fan Synonym for distributive fluvial system.

fluvial megafan A large distributive fluvial system with a radius greater than 30 kilometers (Gohain and Parkash, 1990).

fluvial-tidal transition zone (abbr.: **FTZ**) The distal zone of a river bounded at the updip end by the tidal limit and at the downdip end by marine salinity (Shchepetkina et al., 2019)

foresets [delta] The most steeply-dipping part of a delta deposited below base level. Corresponds to the delta front.

foreshore (abbr.: **FS**) The intertidal part of the beach dominated by the swash zone.

Froude number The ratio of inertial to gravitational forces.

FS Foreshore or flooding surface, depending on context.

gamma ray well log (abbr.: **GR**) A wireline well log that measures the natural radioactivity of the rock (Doveton, 1994).

geostrophic benthic current A flow wherein the pressure gradient force is balanced by the Coriolis effect and produces a current that flows parallel to the isobars (lines of equal pressure), typically along bathymetric contours.

Gilbert-type delta A special case of lobate deltas formed as a river empties into a basin that is much deeper than the channel depth, and which forms a delta front at the angle of repose, commonly 10° to 25° (Gilbert, 1885; Postma and Roep, 1985).

gilgai Distinctive hummock and swale topography on the top of a soil or paleosol

glaebules [soil] Concentrations of a mineral, commonly carbonate, including nodules and concretions.

gleization The process of reduction of iron in soils due to the release of organic acids by plant material in conjunction with very poor soil drainage. This typically results in color changes from bright to drab.

gleysol A paleosol order characterized by by drab gray and green colors, and by minerals that form in reducing conditions, such as sphaerosiderite and pyrite (Mack et al., 1993).

GR see gamma ray well log

grain flow [sediment gravity flow] A sandy sediment gravity flow in which the grains are suspended by grain-to-grain collisions.

grainfall [eolian] Deposition that results from the wind carrying clouds of suspended sand over a dune crest which settle out of suspension as a

result of flow deceleration and flow separation on the leeward side of a dune (Hunter, 1977).

grainflow [eolian] Sandy gravity-driven flows in which the grains are suspended by grain-to-grain collisions. Used as one word in eolian settings.

gutter casts Small scours in the lower shoreface commonly up to 50 cm wide and up to 30 cm deep that are mostly filled with HCS to wave-rippled, very-fine-grained sand.

gypsic horizon A soil horizon with >5% pedogenic gypsum relative to other subsurface horizons, and it is over 1 meter deep.

gypsisol A paleosol order that includes any paleosol with pedogenic accumulation of gypsum or anhydrite (Mack et al., 1993).

HARP See high amplitude reflection packages.

HCS See hummocky cross stratification.

HEB See hybrid event bed.

hemipelagic A marine environment that has both shelfal and open-ocean (pelagic) characteristics.

hemipelagite An accumulation of sediment in the deep sea in which more than 25% of the size fraction coarser than 5 microns (medium mudstone or coarser) is derived from land, the continental shelf, or volcanic activity, or some combination of these sources (Neuendorf et al., 2011). The biogenic content ranges from ~5 to 74 vol.%; silt-size particles typically constitute more than 40 vol.% of the terrigenous material. In other words, a hemipelagite has a significant component of pelagic origin mixed with land- or volcanic-derived clastic sediment.

herringbone crossbedding Stacked cross bedding from current ripples or dunes that are oriented in the opposite directions in cross section.

HI see hydrogen index.

hiatus A chronostratigraphic surface of non-deposition (Wheeler, 1958).

high amplitude reflection packages (abbr.: **HARPs**) A seismic facies of high-amplitude moderately continuous reflections, commonly occur immediately below channel/levee complexes (Flood et al., 1991).

high-concentration turbidity current A turbidity current with grain-to grain interactions in the near bed portion such that turbulence is dampened, and cross laminations cannot form (Talling et al., 2012). Antonym: low-concentration turbidity current

highstand systems tract (abbr.: **HST**) The part of a sequence that extends from the maximum flooding surface up to the next sequence boundary and is characterized in coastal systems by aggradational to progradational to degradational parasequence stacking (Van Wagoner et al. 1990; Neal and Abreu, 2009).

histosol A paleosol order with *in situ* coal or peat. Does not include transported plant debris.

horizon [soil] A layer or zone of relatively similar compositional or textural features derived from soil-forming processes.

horizonation [soil] The formation of zones or layers of compositional and/or textural differences due to soil-forming processes.

hummocky cross stratification (abbr.: **HCS**) Isotropic bedding with antiformal hummocks and synformal swales in very fine-grained, laminated sand (Harms et al. 1975; Dott and Bourgeois 1982).

hybrid event bed (abbr.: **HEB**) Genetically linked beds that were deposited by two processes, such as a turbidity current and an associated debris flow or slurry (Haughton, et al., 2009).

hydrates Crystalline solids composed of a mixture of water and natural gas that are stable under a narrow range of temperature and pressure. They form where there is a supply of gas migrating up through the sediment.

hydrogen index (abbr.: **HI**) An estimate of the amount of hydrogen in an organic sample expressed as mg of hydrocarbon per gram of organic carbon (mgHC/gTOC; Espitalié et al., 1977). It is derived from a laboratory analysis that heats up a sample to >500 °C and measures the breakdown products (pyrolysis).

hydrogenetic accumulation A deep-sea process that occurs on nodules and crusts when dissolved elements diffuse from the sediment into the bottom waters and are later directly precipitated or adsorbed directly on the top of nodules or crusts as Fe-Mn oxy-hydroxides (Hein and Koschinsky, 2014). The resulting nodules and

From: The Handbook of Siliciclastic Facies – A guide to the interpretation of depositional environments. SEPM CSP #18. 2024.

crusts tend to be spherical in shape with smooth surfaces (Yasukawa et al., 2021).

hydromorphic soil A soil with features indicative of intermittently high, but fluctuating, water table levels.

hyperpycnal flow A flowing mixture of sediment and water that is more dense than the basin water.

hypertidal A tidal range greater than 6 meters (Archer, 2013).

hypopycnal flow A flowing mixture of sediment and water that is less dense than the basin water.

hypoxic See dysoxic

IHS See inclined heterolithic stratification.

illuviation The process of a soil component being added (deposited or precipitated) to a soil horizon through chemical or physical processes.

impactor dune [eolian] A smaller dune that moves faster than, and overtakes, a larger dune called the target dune.

impedance See acoustic impedance

incised valley A long-lived geomorphic feature formed by fluvial erosion and bounded below by a sequence boundary (modified from Maynard et al., 2010).

inclined heterolithic stratification (abbr.: **IHS**) The inclined interbedded mud and sand beds that record the lateral accretion of a point bar (Thomas et al., 1987).

injectite Sandy sediment that is intruded into overlying strata, generally low-permeability mudstone. The formation of injectites typically occurs within a kilometer of the seafloor, and prior to lithification.

interaction bounding surface [eolian] A bounding surface which separates the original impactor dune from the target dune.

interdistributary bay A bay or lagoon that forms between, and is protected by, delta lobes

interdune [eolian] The low area between dunes (Ahlbrandt and Fryberg, 1981).

interdune bounding surface (or **interdune surface**) [eolian] A surface that emerges as a consequence of dune migration, with these surfaces being shaped by the erosive scour that carves the interdune trough between adjacent bedforms. The surface dips at the angle of climb of the original dune (Kocurek, 1996).

interfluve Minimally eroded flat land surface between valley incisions, and may include mature soils that formed during river incision.

internal levee [deep water] A levee adjacent to a channel within a larger channel complex. They do not extend outside the incised channel complex.

Internal tides Internal waves with tidal frequencies

Internal waves Periodic oscillations along a pycnocline (density interface) in the interior of a water body (Cacchione and Wunsch, 1974).

labile channels [fluvial] Rivers in which "the bed sediments are relatively easily and frequently entrained by the flow" (Church, 2006, 2015). Labile channels tend to be associated with meandering and anastomosing rivers.

ladderback ripples Current ripples with smaller current ripples in their troughs that are oriented across the axis of the troughs.

lagoon (a) A long narrow body of water between a barrier island and the mainland. (b) Any small, coastal, semi-enclosed body of water connected to the ocean.

lamina The smallest megascopic stratal layer without internal layers, typically less than a few mm thick (Campbell, 1967; Lazar et al., 2022). A lamina is within a bed.

laminar flow A fluid that flows in parallel layers without disruption.

laminaset A conformable succession of genetically related laminae within a bed (Campbell, 1967; Lazar et al., 2022).

LAPs See lateral accretion packages.

lateral accretion packages (abbr.: **LAPs**). Deepwater channel fills that are shingled in cross section, dipping towards the outside of a meander bend, and deposited on the inner part of the curved meander (Abreu et al., 2003). Analogous to point bars in rivers.

Law of correlation of facies See Walter's law.

leaching A type of eluviation where water-soluble compounds are removed from a soil.

lee The downcurrent or downwind side of anything.

From: The Handbook of Siliciclastic Facies – A guide to the interpretation of depositional environments. SEPM CSP #18. 2024.

lenticular bedding Mud with discontinuous sand beds that are mostly starved ripples (Reineck and Wunderlich 1968).

lessivage Transportation of clay within a soil horizon.

levee A wedge-shaped ridge adjacent to a channel that is elevated above the surrounding floodplain [fluvial] or seafloor [deep water] and which thins away from the channel (modified from Bridge, 2006). The sediment source is overbank flow from the channel.

liquefaction A process by which water-saturated sediment is transformed to a fluid and flows downhill.

lithofacies A body of rock or sediment discriminated based on objective criteria, such as cross-bedded sandstone facies, or bioturbated sandy mudstone facies.

littoral drift See longshore drift

load cast A rounded body of sand that has sunk into the underlying mud that was originally plastic and deformable at the time of formation (Collinson, 1994).

loading A process in which denser sediment, typically sand, is deposited on less dens sediment, typically mud and deforms the mud.

lobate delta A delta parasequence that has a lobate net sand map pattern in which a single feeder channel builds a sandy delta that is tear-drop to equant in map pattern.

lobe [deep water] The deposit at the end of a channel composed of groups of genetically related lobe elements.

lobe complex [deep water] A group of genetically related lobes that all derive from the same feeder channel.

lobe element [deep water] The smallest-scale stacking of genetically related beds within a lobe separated from other lobe elements by laterally-persistent mud beds (Prélat et al., 2009).

loess A terrestrial clastic sediment composed of windblown silt in a deposit of sufficient thickness to be recognized in the field (Pye, 1995; Roberts, 2019; Soreghan, et al., 2023).

loessite Lithified loess.

longitudinal tidal bar A sandy, coarsening upward, mid channel bar, which is elongate parallel to tidal currents, and which accretes laterally and vertically in the mid to upper-estuary.

longshore drift The shore parallel transport of sediment due to currents that are created when waves approach the shore at an oblique angle.

low-concentration turbidity current A turbidity current that is turbulent all the way to the base and can generate bed forms such as current ripples and antidunes. Antonym: high-concentration turbidity current.

lower flow regime The condition of flowing water in which the flow top (water surface in rivers) is flat or out of phase with the underlying bedforms. Associated with low rates of sediment transport. This includes lower plane beds, ripples, and dunes (modified from Harms and Fahnlstock, 1965). This is not equivalent to subcritical flow.

lower plane beds Flat bedding in coarser sediment that forms when the flow is above the Shields threshold, but not sufficiently strong to form dunes.

lower shoreface (abbr.: **LSF**) The zone between fairweather wave base and storm wave base. The deposits are dominated by storm deposits and extend distally to the limit of sand deposition.

- **proximal lower shoreface** (abbr.: **pLSF**) A part of the lower shoreface in which storm beds are amalgamated.
- **distal lower shoreface** (abbr.: **dLSF**) A part of the lower shoreface in which storm beds are separated by mud deposited between storm events.

low-sinuosity fixed channels Stable single-thread river channels that are preserved as sand ribbons embedded in muddy overbank facies.

lowstand systems tract (abbr.: **LST**) A part of a sequence bounded by the sequence boundary below and the transgressive surface (TS) above and is characterized in coastal systems by progradational to aggradational parasequence stacking (Van Wagoner et al., 1990; Neal and Abreu, 2009).

LST See lowstand systems tract.

lysocline Ocean water depth at which the rate of dissolution of carbonate increase rapidly as a

From: The Handbook of Siliciclastic Facies – A guide to the interpretation of depositional environments. SEPM CSP #18. 2024.

response to increased CO_2 and hydraulic pressure; generally between 3 and 5 km deep.

macrotidal A tidal range between 4 and 6 meters

marsh A wetland dominated by grasses and herbs. Marshes do not significantly contribute to coals.

mass transport complex (abbr.: **MTC**) A large volume of mixed slumps, rotated blocks, and debrites from multiple, amalgamated events.

mass transport deposit (abbr.: **MTD**) A large volume of mixed slumps, rotated blocks and debrites from a single event.

mass wasting The downslope movement of sediment due to gravity without the influence of currents in the overlying fluid (water or air).

matrix strength [sediment gravity flows] The result of non-Newtonian behavior of cohesive sediment due to friction between particles and electrostatic attraction between clay and/or silt particles.

maturity [soil] Relative development of soil features. Typically increases with time.

maximum flooding surface (abbr: **MFS**) The flooding surface on top of the most landward parasequence (Neal et al., 2016). Also called the maximum transgressive surface to emphasize that it records the most landward shoreline.

meander scrolls Synonym of scroll bars.

meander translation Downstream meander migration without increasing sinuosity (Daniel, 1971).

meandering river A sinuous, single-thread river channel with a sinuosity over 1.5 (Bridge, 2003) in which deposition occurs along the edges of the meanders and erosion occurs along the opposite bank, and mid-channel bars are rare.

megadune [eolian] See draa

mesotidal A tidal range between 2 and 4 meters.

MFS See maximum flooding surface.

microfossil Fossils that are typically between 0.001 and 1 mm in diameter (Javaux and Benzerara, 2009.)

micromorphology Analysis of the microscopic structure of soils or paleosols using thin sections.

micronodules Deepwater nodules that range in size from very fine sand up to 1 cm in diameter (e.g., Addy, 1978; Winter et al., 1997).

microtidal A tidal range less than 2 meters.

mid-channel bar Synonym of braid bar

middle shoreface (abbr.: **MSF**) Interbedded burrowed and planar laminated sand deposited between the upper and lower shorefaces; origin is not well understood

mixed turbidite-contourite systems Deepwater deposits formed by various degrees of interactions of along-slope benthic currents and downslope sediment-gravity flows at various temporal and spatial scales.

mollic epipedon A soil horizon that is dark due to a significant organic matter, but not enough OM to be a coal. The TOC ranges from 2 to 75%.

MSF See middle shoreface.

MTC See mass transport complex.

MTD See mass transport deposit.

muddy debris flow A debris flow dominated by mud.

mudstone A rock composed of grains that are mostly (>50 vol. %) smaller than 62.5 microns (the boundary between sand and silt) (Lazar et al., 2015a).

mukkara Soil structures of intersecting sets of slickensides. Also called pseudoanticlines.

multilateral Laterally amalgamated storeys (Potter, 1967; Payenberg et al., 2024).

multistorey Superposition of two or more storeys (Potter, 1967; Friend et al., 1979).

neap tide Lowest amplitude tides that occur when the earth, moon, and sun are at approximately right angles. This occurs twice per lunar month.

nepheloid layers Turbid zones in the water column that contain substantially more finer-grain and lower-density sediment in dilute suspension (<0.1 to >1 mg/l) than the surrounding water. Such layers can be many hundreds of meters thick (e.g., Ortega et al., 2007; Gardner et al., 2018).

net sand The total thickness of sand within a genetic unit, such as a bed set or parasequence.

nodules Mineral accumulates that displace the sediment, typically without concentric layering or banding..

non-cohesive debris flow An oxymoron. See grain flow.

off axis facies Deepwater channel fill facies commonly recognized in between axis and margin,

with intermediate characteristics (Campion et al., 2000).

offshore (abbr.: **OS**) The environment below the influence of most storms, and distal to a wave-dominated coast.

proximal offshore (abbr.: **pOS**) The environment just distal to the offshore-transition setting in which the distal most storm-related sand beds are so thin that they are completely bioturbated. See also proximal storm-dominated shelf

distal offshore (abbr.: **dOS**) The environment beyond the seaward limit of shore-derived sand beds, typically dominated by the accumulation of sediment rich in clay-size particles. Also see medial storm-dominated shelf and distal storm-dominated shelf.

offshore mud bank See shoreline-detached subaqueous clinothem.

offshore transition (abbr.: **OSt**) The environment along a wave-dominated coast below the influence of average storms, but in which some discrete sand and silt beds are deposited and preserved, in addition to clay-size sediment.

ombrogenous A coal or peat that forms in vast raised mires that receive practically all their water from rainfall. They typically occur in low-relief areas with high rainfall and low seasonality in tropical climates (Cecil et al., 1985).

ooze Soft unconsolidated deepwater pelagic sediments with more than 30% biogenic components; they are dominantly fine grained (except for some sand-sized fossils) and named according to their dominant mineralogy or most distinctive component: calcareous, siliceous, coccolith, diatom (Mazullo and Graham, 1988)

organic matter [sedimentology] The soft, hydrogen-rich parts of organisms such as unicellular algae and multi-cellular aquatic and land plants (contrasted with the hard, hydrogen-poor parts of organisms such as tests, shells, and skeletons; Bohacs et al., 2013).

organic-matter-rich rocks (abbr.: **ORR**) Sediments or sedimentary rocks with an original TOC content >2 wt.%.

OS See offshore.

OSt See offshore transition.

overbank deposit (a) [fluvial] All sediment derived from the river as a result of the water overtopping the channel edges and flooding the adjacent land, or floodplain. (b) [deepwater] Levees and other muddy deposits that do not abruptly thin away from the channel, but which all originate as overflow from the channels.

oxbow lakes or **abandoned channels** Arcuate abandoned channels that result from a meander cut-off. They form lakes that are slowly filled with mud from channel overflow.

oxic An aquatic setting with over 2.0 ml/l water of dissolved oxygen. Faunas are not affected by oxygen levels (Tyson and Pearson, 1991).

oxisol A paleosol order characterized by highly weathered, extremely mature paleosols, in which chemically unstable minerals were converted to phyllosilicates (such as kaolinite) and sesquioxides (Mack et al., 1993; Original term: Soil Survey Staff, 1999).

paleopedology The study of paleosols

paleosol A fossil soil that is evidence of an ancient landscape formed during a period of low depositional rate.

paralic environment Environments that occur around the shoreline; includes delta plain, lagoon, swamp/mire, and estuary.

parasequence A relatively conformable succession of beds and bedsets, deposited in successively more proximal (or shallower water) settings in a vertical succession as a result of coastal progradation, and bounded ideally by flooding surfaces, or locally by surfaces of erosion or non-deposition, and includes their stratigraphic equivalents in both basinward and landward directions (modified from Kamola and Van Wagoner, 1995).

parting lineations Long, narrow streaks that are parallel to flow on planar-laminated sandstone that record deposition on upper flow regime conditions (Crowell, 1955).

pedogenesis The total set of chemical, mechanical, and biological processes which lead to soil formation through the alteration of a parent material in a subaerial setting.

From: The Handbook of Siliciclastic Facies – A guide to the interpretation of depositional environments. SEPM CSP #18. 2024.

pedoturbation Physical alteration of a soil by shrinking and swelling due to wetting and drying cycles acting on expandable clay minerals causing physical mixing of soil material.

peds Natural aggregates (clumps) of soil between roots, burrows, cracks, or other planes of weakness (Birkeland, 1999; Retallack 2019).

pelagic (a) The environment that spans the open ocean of any depth away from the nearshore or upper shoreface zone (typically deeper than about 10 m). (b) An adjective for marine organisms that live in the open ocean, either floating (plankton) or free swimming (nekton). For example pelagic forams versus benthic forams

pelagic depositional environment The setting in which the dominant or most distinctive processes and components are associated with open-ocean waters, especially the photic zone and the sinking of particles from that zone (Stow and Piper, 1984).

pelagic facies See pelagite

pelagic zone Open ocean waters of any depth beyond the shoreface or littoral zone; it has the largest volume (1,370,000,000 km^3) and greatest vertical range (11 km) of all environments on Earth (Anikouchine and Sternberg, 1973).

pelagite A fine-grained deep-sea sediment that contains >75 vol. % of material derived from the pelagic zone—that is, less than 25% of the size fraction coarser than 5 microns is derived from land, the continental shelf, or volcanic activity, or some combination of these sources (after Neuendorf et al., 2011). This definition is based on the observed composition of the sediment and not on inferred process of deposition; this is preferable to having to interpret the process to describe the deposit (as is done for a turbidite or debrite).

photic zone The uppermost layer of the ocean where there is sufficient light for photosynthesis.

playa An intracontinental arid basin with a negative water balance for over half of each year, which is dry for over 75% of the time, and has a capillary fringe close enough to the surface such that evaporation will cause water to discharge (wick upwards), usually resulting in evaporite precipitation (Briere, 2000).

podzolization The downward movement of solid or dissolved organic matter and/or aluminum and iron oxides.

point bar A side-attached bar on the inside curves of river meanders that accumulates sediment through lateral accretion.

porcelanite A hard, dense, fine-grained sedimentary rock with a dull luster that contains between 50 % and 80 % microcrystalline silica (Isaacs, 1981).

preservation space [eolian] The limit of accumulation which has a high potential for long term preservation. In coastal systems accommodation is the same as both preservation space and accumulation space (Kocurek and Havholm, 1993).

prodelta The distal muddy sediment deposited basinward of the delta front as a lobe-fringing apron.

progradation The seaward extension of the coast due to sedimentation.

protosol Paleosol with poorly-developed pedogenic features, without distinct horizons.

pseudoanticlines See mukkara.

rain drop imprints Small craters (a few mm in diameter) on a sediment surface that were formed by the impact of rain drops.

reactivation surface An inclined erosional surface that separate two cross bed sets generated by currents (water or wind) going approximately the same direction (Collinson, 1970).

red/brown clay [pelagic] A deepwater red-brown sediment that is extremely fine-grained (median < 1 mm) which contains more than 90% clay minerals, along with minor amounts of volcanic debris and such authigenic components as zeolite and iron-manganese micronodules. Iron and manganese oxides, oxyhydroxides, and hydroxides give the sediment its reddish to brownish color.

redoximorphy (adj.: redoxiomorphic) Oxidation and reduction within a paleosol.

reptation An intermediate bedload process between saltation and surface creep, in which grains hop only once due either to being dislodged by a saltating grain or by lift from the wind (Cooke et al., 1993; Lancaster, 2023).

resistivity The intrinsic property of a material to resist current flow measured in ohm meters (ohm m) (Doveton, 1994).

REY minerals Minerals with abundant rare-earth elements and yttrium

Reynolds number The ratio of inertial forces to viscous forces.

river-dominated delta A delta in which the ratio of sediment flux to the river mouth versus sediment that is transported away by tides and waves is greater than 1. In sedimentary successions this is recognized when more than 50% of the sedimentary structures are produced by river processes without tidal or wave influence.

river-dominated shelf The part of a marine shelf directly offshore of a distal delta front where sediment is mostly delivered directly from the river mouth (typically within 50 km). Such areas can contain subaqueous shore-attached clinothems (Bohacs et al., 2014).

- **proximal river-dominated shelf** Inner area of a river-dominated marine shelf approximately 5 to 10 km offshore, frequently subject to the effects of seasonal or episodic floods that generate traction and sediment-gravity flows. Generally corresponds to the proximal area of the bottomsets of a subaerial delta; can be associated with the topset region of a shoreline-attached subaqueous clinothem. Deposits are dominated by muddy sand and sandy mud (Bohacs et al., 2014).
- **medial river-dominated shelf** Area of a river-dominated marine shelf mid-way between the distal delta front and distal edge of direct river influence, approximately 10 to 25 km offshore in modern settings, occasionally subject to the effects of seasonal or episodic floods. Commonly associated with the foreset region of a shoreline-attached subaqueous clinothem. Deposits are dominated by sandy mud and muddy sand (Bohacs et al., 2014).
- **distal river-dominated shelf** Area of a river-dominated shelf at the far end of the direct influence of river influx, approximately 25 to 50 km offshore in modern settings, infrequently subject to the effects of seasonal or episodic floods. Commonly associated with the bottomset region of a shoreline-attached subaqueous clinothem. Deposits dominated by sandy mud (Bohacs et al., 2014).

river-influenced delta A delta with significant river influence, but in which less than 50% of the sedimentary structures are produced by river processes without the influence of waves or tides.

rogue waves Waves larger than twice the significant-wave size, up to several tens of meters in height. They form through various mechanisms including constructive interference and focusing of wave energy (Dysthe et al., 2008).

root The subsurface structural organs of vascular plants.

root trace The cavity or disturbance left behind by roots but lacking the organic structures. They are commonly preserved as clay or sediment-filled trace fossils.

sabkha (also **sebkha**) A marginal marine sandy or muddy flat "where displacive and replacive evaporite minerals form in the capillary zone above a saline water table. Several per cent gypsum or gypsum parting laminae are typical due to preferential halite dissolution during flooding events" (Briere, 2000).

salinization Precipitation (crystallization) of sodium and potassium salts in a soil.

saltation A type of bed load transport in which grains are launched into a moving fluid (air or water) and carried downstream before returning to the bed (McGee, 1908; Church, 2006; Mountney, 2006). This process is much more important in wind transport than in water.

sand sheet [eolian] A flat area of wind-blown sand that lacks dunes (Fryberger et al., 2011).

sand waves Similar to subaqueous dunes in geometry, being triangular in cross section and having sinuous crests and relatively high-angle lee slopes, but are larger than dunes with wavelengths of tens to hundreds of meters and heights of 10's of meters, and have lower height to spacing ratios of 0.05 to 0.01 (Allen, 1980; Kuijpers et al. 1993).

sandflow See grainflow [eolian]

sandy debris flow A debris flow dominated by sand.

scroll bars Arcuate ridges on the accreting side of a meandering river that record previous channel positions (also called meander scrolls), but can also form from levees deposited on the point bars (Mason and Mohrig, 2019)

SCS See swaley cross stratification.

sebkha See sabkha

sediment caliber Grain size.

sediment gravity flow (abbr.: **SGF**) A mixture of sediment (subaerial) or sediment and water (subaqueous) that moves downslope due to gravity (Middleton and Hampton, 1973; Pickering and Hiscott, 2015).

sediment waves [deepwater] Large and aerially extensive compound bedforms with generally triangular longitudinal cross sections similar to sand waves and laterally continuous crests (commonly > 10 km) but with low-angle lee slopes.

semidiurnal inequality Two tidal cycles per day in which the amplitudes between them are unequal.

semidiurnal tides Two tidal cycles (high and low tide) per day.

sequence [stratigraphy] A relatively conformable succession of genetically related strata bounded by subaerial unconformities and their correlative surfaces (sequence boundaries) (modified from Mitchum, 1977; Van Wagoner et al. 1988; Abreu et al., 2017).

sequence boundary A subaerial unconformity and its correlative conformity characterized by a basinward shift in coastal onlap (modified from Van Wagoner et al., 1990).

SGF See sediment gravity flow

shear stress The force of friction resulting from fluid moving against a body, such as a clast, or against the bed of a channel.

sheet Any sand body with a width-to-thickness ratio less than 15 (Friend et al., 1979).

sheetflood [fluvial] A short-duration, catastrophic expanse of unconfined water (Blair and McPherson, 2009).

shelf edge The boundary between the low-gradient (<1^{o}) shallow-water shelf system, and the steeper gradient of the continental slope (2^{o} - 4^{o}). This boundary is most often formed by the deposition of coastal sediments at low sea level.

Shields threshold The minimum shear stress needed to move sediment. This value is named for the seminal PhD dissertation of Albert Frank Shields (Shields, 1936).

shoots-and-pools See chutes-and-pools.

shoreface A sandy or gravely coastal system in which the sediment is primarily transported and deposited by waves, extending from the low tide mark, basinward to the limit of significant-wave influence or the limit of sand deposition and the transition to offshore mud (Barrell, 1912; Johnson, 1919).

shoreline-attached subaqueous clinothem A sigmoid-shaped body of sediment that accumulates on the inner to mid-shelf completely below sea level whose topset layers are continuously connected with the bottomset layers of a shoreline (or subaerial) clinothem as part of a compound clinothem (Pellegrini et al., 2020; Patruno and Helland-Hansen, 2018). Also called a “subaqueous delta” (to contrast with a “subaerial delta” whose topset is the subaerially exposed delta plain), or a “delta-scale subaqueous clinoform” (e.g., Patruno and Helland-Hansen, 2018).

shoreline-detached subaqueous clinothem A sigmoid-shaped body of sediment that accumulates on the shelf completely below sea level whose topset layers do not connect with the bottomset layers of a shoreline (or subaerial) clinothem but lap on farther seaward than the downlap terminations of the shoreline clinothem. Also called an “offshore mud bank” or “subaqueous delta” to contrast with a “subaerial delta” whose topset is the subaerially exposed delta plain. Many such clinothems are simply classified as “prodelta” or “offshore” deposits by numerous authors (e.g., Roberts and Sydow, 2003). Contrast with “shoreline-attached subaqueous clinothem”

sigmoidal cross bed Clay draped dune cross beds that are tangential on the top and base (modified from Kreisa and Moila,1986). They are formed by accelerating and decelerating currents, such as with tides.

significant-wave size The average size of the largest 33% of waves during a given period of time (Knauss, 1996; Holthuijsen 2007). Generally corresponds well with visual estimates of wave height. Most human observers tend to over estimate the real height of waves (NOAA; https://www.weather.gov/mfl/waves; accessed 2024 February 14).

siliceous ooze Soft unconsolidated deepwater pelagic sediment that contains over 30% siliceous microfossils.

siliciclastic A clastic sediment or sedimentary rock made of quartz, clay minerals and other silica-rich clasts. This includes mudstone, sandstone and conglomerate.

simple dune [eolian] A dune without other superimposed dunes upon it.

sinuosity [fluvial] The ratio of the channel thalweg length to the valley length (Leopold and Wolman, 1957), and can be measured for a single sinuous loop, or for a long reach of many sinuous loops.

slide A type of mass wasting in which the sediment body fails and moves downslope as a mostly undeformed mass.

slip face The steeper lee side of a dune or ripple on which sediment cascades down dip.

slope-attached MTC An MTC that forms when the shelf edge or upper slope sediment catastrophically fails (this combines shelf- and slope-attached categories of Moscardelli and Wood, 2008). Commonly very large, with widths in the 10's of km.

slump A type of mass wasting in which unconsolidated sediment on a dipping surface fails and moves downslope as a coherent mass with no liquefaction, but with deformation.

slurry [sediment gravity flow] A sediment gravity flow intermediate between a debris flow and a turbidity current.

slurry bed The deposit that results from a slurry.

soil (a) “the natural medium for the growth of land plants” (Buol et al. 1997). (b) “a natural body comprised of solids (minerals and organic matter), liquids, and gases that occur on the land surface, and characterized by horizons, or layers, that are distinguishable from the initial material as a result of additions, losses, transfers, and transformations of energy and matter and/or the ability to support rooted plants in a natural environment” (Soil Survey Staff, 1999, p. 9).

soliton A class of nonsinusoidal internal waves of complex shape that form episodically and occur as single waves or solitary wave packets (small groups of waves). They maintain their coherence through nonlinear hydrodynamics and appear in images of the sea surface as long, quasilinear stripes (Jackson, 2004).

SP see spontaneous potential well log

spodosol A paleosol order in which the paleosols is dominated by a pedogenic illuviation of organic matter and iron oxides, which results in a spodic horizon (Bs) (Mack et al., 1993; Original term: Soil Survey Staff, 1999).

spontaneous potential well log (abbr.: **SP**) A wireline well log that measures the electrical potential that occurs naturally in boreholes as a result of salinity differences between the rock-pore waters and the borehole fluid. Measured in units of volts of microvolts (Doveton, 1994).

spring tide The highest amplitude tides that occur at new or full moon, when the earth, moon, and sun are approximately in a line. This occurs twice per lunar month.

starved ripple Single sand current ripple in mud that is isolated from other current ripples.

Stokes surface A stratigraphic surface in eolian systems resulting from deflation down to the water table (Stokes, 1963; Fryberger et al., 1988).

storey (or sometimes story) An erosionally-based component of a channel fill (Friend et al., 1979; Gibling, 2006) in either fluvial or sediment gravity flow deposits.

storm-dominated shelf The part of a marine shelf basinward of the offshore-transition zone where sediment is transported by various types of flows induced by storm waves—oscillatory, combined oscillatory and current, and unidirectional current—during stronger than average storms (Bohacs et al., 2014).

- **proximal storm-dominated shelf** Inner area of a storm-dominated marine shelf to basinward of the offshore-transition zone of a wave-

From: The Handbook of Siliciclastic Facies – A guide to the interpretation of depositional environments. SEPM CSP #18. 2024.

dominated coast, subject to frequent high-energy events that generate traction and sediment-gravity flows. Deposits dominated by muddy sandstone to sandy mudstone. See Figure 9.8 for more detail (Bohacs et al., 2014)

medial storm-dominated shelf A moderately energetic area of a storm-dominated marine shelf mid-way between the shoreline and shelf edge subject to occasional high-energy events. Deposits dominated by sandy mudstone. See Figure 9.8 for more detail (Bohacs et al., 2014)

distal storm-dominated shelf A relatively low-energy region of a storm-dominated marine shelf, out by the shelf edge and very distal from the sources of clastic sediment supply, influenced by infrequent high-energy events. Deposits are dominated by mud and sandy mud (Bohacs et al., 2014).

storm wave base The maximum depth at which storm waves interact with the seafloor.

story See storey

stoss The upcurrent or upwind side of anything.

strand plain A progradational wave-dominated sandy coastline without a lagoon on the landward side. They form where the along shore supply of sediment is sufficient for the shoreface to prograde and form new beach ridges, abandoning the older ones and leaving behind a series of beach ridges that record the evolution of the coast.

stratification The layering of sedimentary deposits.

stream mouth bar Subaqueous bars formed by unidirectional currents at the terminal ends of distributary channels. May aggrade updip. This is part of the delta front.

subaqueous delta See shoreline-attached subaqueous clinothem

subaqueous sedimentary cracks (abbr.: **SSC**) Subaqueous mud cracks of uncertain origin, and which may be caused by synaeresis. See also synaeresis cracks.

subcritical Flowing water with a Froude Number less than 1

suboxic An aqueous setting with 0.2 to 0.0 ml/l water of dissolved oxygen. Almost no animal life (Tyson, 1991).

super surface See supersurface.

supercritical Flowing water with a Froude Number greater than 1.

superimposition surface [eolian] An eolian bedding contact formed by the migration of dunes or scour troughs superimposed on the lee face of a larger dune. The smaller bedforms have a major component of motion parallel to the crest of the larger dune (Kocurek, 1996).

supersurface [eolian] A large-scale typically low-relief erosional surface that represents cessation of erg deposition (Kocurek 1988; Kocurek and Havholm, 1993). Formed through deflation, bypass, or stabilization of the erg.

surface creep [eolian] The process in which grains roll or slide due to high wind velocities, but not so high as to lift them.

suspended load Sediment kept in the water column through turbulence (Church, 2006).

swaley cross stratification (abbr.: **SCS**) Bedding consisting of concave up shallow scours a few tens of centimeters deep filled with concentrically laminated very fine sand. Always associated with HCS (Leckie and Walker, 1982).

swamp A wetland dominated by trees.

synaeresis (or syneresis) The process of subaqueous dewatering of a gel, such as clay.

synaeresis cracks Cracks in mud caused by synaeresis, that is they form subaqueously.

synchronous mixed systems Deposits formed by frequent interactions between downslope sediment-gravity flows and along-slope benthic currents that happen at the same time.

syneresis See synaeresis

synodic month [tidal] The length of time from full moon to the next full moon. Also known as a tidal month.

target dune [eolian] A larger dune that is approached, and ultimately merges with, a smaller, faster-moving impactor dune.

tempestite A bed deposited by a storm in shallow water, but deeper than fair-weather wave base (Ager, 1974).

terminal distributary channel The most distal channels of a distributive delta system basinward from the last subaerial bifurcation (Olariu and Bhattacharya, 2006).

terminal lobe The lobe-shaped deposits at the end of a channel that result from unconfined flow.

terra rosa A soil or paleosol enriched in Fe and clay minerals, commonly formed on carbonate substrates.

TFS See tributary fluvial system.

thalweg The path along the deepest part of a channel.

thermohaline Currents resulting from density differences due to salinity and temperature differences

threshold channels [fluvial] Rivers in which "the limit of competence for bed material transport is characteristically exceeded by only a modest amount" (Church, 2006, 2015). Threshold channels tend to be associated with braided rivers

tidal bar See longitudinal tidal bar.

tidal bundle A bed deposited by the stronger tidal current, flood or ebb, in either a cross bed foreset or vertically, as in a tidal flat (modified from Choi and Kim 2016).

tidal channel A channel in a tidal flat that is a conduit for flood and ebb tides, and not connected to the fluvial system. Tidal channels bifurcate updip

tidal delta [shoreface] Sand accumulations either seaward (ebb tidal delta) or landward (flood tidal delta) of a tidal inlet between two barrier islands.

tidal facies Sediments that are transported and deposited by tidal currents.

tidal flat An approximately flat sediment-covered area that is alternately submerged and exposed during daily tidal cycles.

tidal inlet A channel between barrier islands formed by tides.

tidal prism The volume of water that moves in and out of a coastal area during a tidal cycle (Mulhern et al., 2017),

tidal ravinement The scouring of the seafloor by tidal currents. It is particularly important during transgression in estuaries.

tidal ravinement surface The surface produced as a result of tidal ravinement.

tidal rhythmites Laminated to thinly bedded medium-grained sandstone to mudstone in which the bed thickness variations record tidal cycles (Williams 1991; Mazumder and Arima, 2005).

tidally-influenced fluvial point bars Fluvial point bars that form in the upper estuarine system, commonly near the bedload convergence zone.

tide-dominated delta A delta in which the ratio of sediment transported away from the river mouth by tides to the sediment flux delivered by the river is greater than 1. In sedimentary successions this is recognized when greater than 50% of the sedimentary structures are formed by tides. See tide-influence delta.

tide-dominated shelf The part of a marine shelf basinward of the distal-tidal-delta front where sediment is transported to its final depositional site predominantly by tidal currents. This mostly overlaps with the prodelta of a tide-dominated delta (Bohacs et al., 2014).

- **proximal tide-dominated shelf** Area of a tide-dominated marine shelf directly basinward of the distal tidal-delta-front setting, out to about mid-shelf, approximately 5 to 50 km offshore in modern settings, which is subject mostly to combined flow and tidal currents. Deposits are dominated by sandy mudstone with some muddy sandstone (Bohacs et al., 2014).
- **medial tide-dominated shelf** The mid-shelf area of a tidal-current-dominated marine shelf, approximately 50 to 100 km offshore in modern settings), which is subject mostly to currents and sediment-gravity flows initiated by tides. Deposits are dominated by sandy mud and muddy sand (Bohacs et al., 2014).
- **distal tide-dominated shelf** Area of a tidal-current–dominated marine shelf from about mid-shelf out to the shelf edge, up to 100 or more km offshore in modern settings, and which is subject mostly to tidal currents along with wave action and wave-enhanced sediment-gravity flows. Deposits are dominated by mud with thin beds of muddy sand and sandy mud (Bohacs et al., 2014).

tide-influenced delta A delta with significant tidal influence, but in which less than 50% of the sedimentary structures are produced by tides.

TOC See total organic carbon.

tool mark An impression in the sediment made by a solid object (tool) that was carried or dragged

along the seafloor by a moving current or flow. They are preserved on the bottoms of sand beds and are made by bones, shells, wood, and mudstone clasts (Peakall et al., 2020).

topogenous A coal or peat that develops in a topographic low (Cecil et al., 1985).

topset [delta] The gently basinward-dipping strata at the top of a delta succession and deposited by fluvial and overbank processes.

total organic-carbon content (abbr.: **TOC**) The dry weight percentage of organic carbon in the whole rock, i.e., TOC (wt. %) = grams of organic carbon divided by grams of dry rock.

transgressive surface (abbr.: **TS**) The flooding surface on top of the most seaward parasequence (Neal et al., 2016). Also called the maximum regressive surface to emphasize that it records the most seaward shoreline

transgressive systems tract (abbr.:**TST**) A part of a sequence that extends from the transgressive surface up to the maximum flooding surface and is characterized in coastal systems by retrogradational parasequence stacking (Van Wagoner et al., 1990; Neal and Abreu, 2009).

transitional channels [fluvial] River channels intermediate between threshold and labile channels (Church, 2006, 2015).

tributary fluvial system (abbr.: **TFS**) A river system with small tributaries updip that feed larger trunk channels downdip, with the channel size generally increasing downdip (except in arid settings), commonly ending in large deltas at the coast.

TS See transgressive surface.

TST See transgressive systems tract.

tsunami A long period and very long wavelength wave or series of waves formed by sudden vertical displacement of seawater due to fault movement or submarine slides

tsunami-induced currents Benthic traction currents generated where a tsunami interacts with the seafloor through the influence of bed friction (Tang et al., 2008). Significant velocities occur only in shelfal water depths.

turbid Water made cloudy (less transparent) by suspended material, such as fine sediment.

turbidite A bed deposited by a turbidity current.

turbidity The cloudiness or opacity of water due to suspended sediment

turbidity current [sediment gravity flow] A sediment gravity flow in which there is a turbulent suspension of sediment and water which moves downslope due to a density difference between the ambient water and the turbid, turbulent suspension, combined with a bathymetric gradient. Turbidity currents are named for the turbid nature of the flows (Talling et al., 2012).

turbidity maximum The portion of an estuary or delta distributary channel in which the turbidity decreases both distally to the marine system and proximally to the fluvial system (Dyer, 1995).

turbulence The irregular or chaotic macroscopic motion within fluid flows associated with rapid changes in pressure and velocity.

two-way-time (abbr.: **twt**) [seismic] The amount of time it takes sound waves to travel from the sound source to a reflector and return to the receiver in a vertical direction (zero offset from source to receiver). This is a common depth scale for seismic data.

ultisol An Argillisol that is a deeply weathered acidic paleosol rich in clay and depleted in base cations (original term: Soil Survey Staff, 1999; Retallack, 2019)

unit bar A solitary fluvial bedform with a lobate planform, that is built by dunes migrating up the stoss side and sand cascading down the lee end which is at the angle of repose (Bridge, 2006; Ashworth et al., 2011).

upper flow regime Flowing water in which the water surface is out of phase with the underlying bedforms. It is associated with high rates of sediment transport and includes upper plane beds, antidunes, and chutes and pools (modified from Harms and Fahnlstock, 1965). This is not equivalent to supercritical flow.

upper plane bed Horizontal planar sheets of sand formed at a shear stress too high for dunes and too low for antidunes. Upper plane beds form at supercritical conditions in turbidity currents and subcritical conditions in rivers.

upper shoreface (abbr.: **USF**) The zone between the low-tide mark and the deepest part impacted by fair-weather waves.

USF See upper shoreface

vadose zone The interval between the land surface and the top of the water table.

ventifacts Stones that are eroded smooth on one or more sides by suspended sediment in wind (Cooke et al., 1993).

vertisol A paleosol order characterized by clay-rich paleosols with abundant evidence of shrinking and swelling due to wetting and drying cycles acting on expandable clay minerals (Mack et al., 1993; Original term: Soil Survey Staff, 1999).

Walther's law (or the **Law of correlation of facies**) Depositional environments that are adjacent today will be preserved in vertical succession in the sediments (modified from Middleton, 1973; Walther, 1894).

washover fan A lobate body of sand deposited behind a barrier island during a storm, and deposited either in the lagoon or back barrier marsh.

wave base The maximum depth at which waves can modify the sediment.

wave depth See wave base.

wave-dominated delta A delta in which the ratio of sediment transported by waves away from the river mouth to the sediment flux delivered by the river is greater than 1. In sedimentary successions this is recognized when more than 50% of the sedimentary structures are formed by waves.

wave-enhanced sediment-gravity flow (abbr.: **WESGF**) Sediment gravity flows wherein the energy to maintain sediment in suspension is provided by surface waves, instead of gravity-induced turbulence as for classical turbidity currents (Macquaker et al., 2010).

wave-influenced delta A delta with significant wave influence, but in which less than 50% of the sedimentary structures are produced by waves.

wavy bedding Interbedded current-rippled sand and mud with the mud drapes continuing over the ripple crests (Reineck and Wunderlich 1968).

WESGF **See wave-enhanced sediment-gravity flow.**

wet interdune [eolian] An eolian interdune with standing water either frequently or episodically.

wind ripple laminations Laminations in sand a few mm high that are produced by wind ripple migration, and are commonly inversely graded.

wind ripples Small (under 30 centimeters in wavelength and 1 - 3.5 mm high), wind-generated downstream-migrating asymmetrical bedforms with a shallow stoss side and a steeper lee side (Sharp, 1963; Wilson, 1972; Lancaster, 2023).

zibar [eolian] A low-relief eolian feature similar to dunes, but which lack a slipface, and ranges up to 10 meters high (but mostly less then 2 meters) with wavelengths of 35 – 250 meters, and are common in sand sheets (Nielson and Kocurek, 1986; Porter, 1986; Lancaster and Teller, 1988).

References

Abreu, V., Sullivan, M., Pirmez, C. and Mohrig, D., 2003, Lateral accretion packages (LAPs): an important reservoir element in deep water sinuous channels: Marine and Petroleum Geology, v. 20, p. 631-648.

Addy, S.K., 1978, Distribution of Fe, Mn, Cu, Ni and Co in coexisting manganese nodules and micronodules: Marine Geology, v. 28, p. M9-M19.

Ager, D.V., 1974, Storm deposits in the Jurassic of the Moroccan High Atlas: Palaeogeography, Palaeoclimatology, Palaeoecology, v. 15(2), p.83-93.

Ahlbrandt, T.S., And Fryberger, S.G., 1981, Sedimentary features and significance of interdune deposits. *In* Etheridge, F.G., and Flores, R.M., eds., Recent and Ancient Nonmarine Depositional Environments: Models for Exploration: SEPM, Special Publication 31, p. 293–314.

Allen, J.R.L. 1980, Sand waves: A model of origin and internal structure: Sedimentary Geology, v. 26 (4), p. 281–328.

Allen, J.R.L., 1968, Current ripples; their relation to patterns of water and sediment motion: Amsterdam: North-Holland Pub. Co., 433 p.

Anikouchine, W. A. and Sternberg, R.W., 1973, The world ocean, an introduction to oceanography: Prentice Hall, New Jersey. 338 p.

Archer, A.W., 2013, World's highest tides: hypertidal coastal systems in North America, South America and Europe: Sedimentary Geology, v. 284, p. 1–25.

Ashworth, P.J., Sambrook Smith, G.H., Best, J.L., Bridge, J.S., Lane, S.N., Lunt, I.A., Reesink, A.J., Simpson, C.J. and Thomas, R.E., 2011, Evolution and sedimentology of a channel fill in the sandy braided South Saskatchewan River and its comparison to the deposits of an adjacent compound bar: Sedimentology, v. 58(7), p. 1860-1883.

Barrell, J., 1912, Criteria for the recognition of ancient delta deposits: Geological Society of America Bulletin, v. 23, p. 377–446.

Best, J.L., Ashworth, P.J., Bristow, C.S. and Roden, J., 2003, Three-dimensional sedimentary architecture of a large, mid-channel sand braid bar, Jamuna River, Bangladesh: Journal of Sedimentary Research, v. 73(4), p. 516-530.

Birkeland, P.W., 1999, Soils and Geomorphology, 3rd ed.: Oxford University Press, New York, 430 p.

Blair, T.C., and McPherson, J.G., 2009, Processes and forms of alluvial fans. *In* Parsons, A.J., and Abrahams, A.D., eds., Geomorphology of Desert Environments, 2nd ed.: Springer, p. 413-467.

Blum, M., Martin, J., Milliken, K. and Garvin, M., 2013, Paleovalley systems: insights from Quaternary analogs and experiments: Earth-Science Reviews, v. 116, p. 128-169.

Bohacs, K.M., 2022, Chapter 16: Controls on stratal record: mechanisms and contingencies affecting sediment supply and accommodation. *In* Bohacs, K.M., Lazar, O.R., eds., Sequence Stratigraphy—Applications to Fine-Grained Rocks: AAPG Memoir 126, p. 642-686.

Bohacs, K.M., Lazar, O.R., and Demko, T.M., 2014, Parasequence types in shelfal mudstone strata—Quantitative observations of lithofacies and stacking patterns, and conceptual link to modern depositional regimes: Geology v. 42(2), p. 131–134; Data Repository item 2014035.

Bohacs, K.M., Lazar, O.R., and Demko, T.M., Chapter 5, Parasequences. *In* Bohacs, K.M. and Lazar, O.R., eds., Sequence Stratigraphy: Applications to Fine-Grained Rocks: AAPG Memoir 126, p. 107-148.

Bohacs, K.M., Passey, Q. R., Rudnicki, M., Esch, W. L., and Lazar, O. R., 2013, The spectrum of fine-grained reservoirs from 'shale gas' to 'shale oil'/ tight liquids: essential attributes, key controls, practical characterization: IPTC Paper 16676, Beijing, China, 2013.

Bridge, J.S., 2003, River and floodplains: Blackwell, 490 p.

Bridge, J.S., 2006, Fluvial facies models: Recent developments in Posamentier, H.W., and Walker, R.G., eds., Facies Models Revisited: SEPM (Society for Sedimentary Geologists), Special Publication 84, p.85–170

Briere, P., 2000, Playa, playa lake, sabkha: Proposed definitions for old terms: Journal of Arid Environments, v. 45, p. 1-7.

Buol, S.W., Hole, F.D., and McCracken, R.W., 1997, Soil Genesis and Classification, 4th edition: Ames, Iowa: Iowa State University Press, 527 p.

Cacchione, D., and Wunsch, C. 1974, Experimental study of internal waves over a slope: Journal of Fluid Mechanics, v. 66, p. 223 – 239.

Campbell, C.V., 1967, Lamina, laminaset, bed and bedset: Sedimentology, v. 8, p. 7-26.

Campion, K. M., Sprague, A.R., and Sullivan, M.D., 2005, Architecture and lithofacies of the Capistrano Formation (Miocene–Pliocene), San Clemente, California: Annual Fieldtrip Guidebook, Pacific Section SEPM, Book 100, 42 p.

Campion, K.M., Sprague, A.R.G., Mohrig, D.C., Sullivan M.D., Ardill, J., Jensen, G.N., Drzewiecki, P.A., Lovell, R.W., and Sickafoose, D.K., 2000, Outcrop expression of confined channel complexes. *In* Weimer, P., Slatt, R.M., Bouma, A.H., and Lawrence, D.T., eds., Deep-Water Reservoirs of the World: Gulf Coast Section, SEPM, 20th Annual Research Conference, December 3-6, 2000, Houston, p. 127 - 151.

Carling, P., Jansen, J. and Meshkova, L., 2013, Multichannel rivers: their definition and classification: Earth Surface Processes and Landforms, v. 39(1), p. 26-37.

Cecil, C.B., Stanton, R.W., Neuzil, S.G., Dulong, F.T., Ruppert, L.F., and Pierce, B.S., 1985, Paleoclimate controls on late Paleozoic sedimentation and peat formation in the central Appalachian Basin (U.S.A.): International Journal of Coal Geology, v. 5, p. 195–230.

Chatanantavet, P., Lamb, M.P., and Nittrouer, J.A., 2012, Backwater controls of avulsion location on deltas: Geophysical Research Letters, v. 39(1), L01402, 6 p.

Choi, K., and Kim, D.H., 2016, Morphologic and hydrodynamic controls on the occurrence of tidal

bundles in an open-coast macrotidal environment, northern Gyeonggi Bay, west coast of Korea: Sedimentary Geology v. 339, p. 68–82.

Church, M., 2006, Bed material transport and the morphology of alluvial river channels: Annual Review of Earth and Planetary Sciences, v. 34, p. 325–354.

Church, M., 2015, Chapter 12, Channel Stability: Morphodynamics and the morphology of rivers. In Rowiński, P. and Radecki-Pawlik, A. (Editors), Rivers—Physical, Fluvial and Environmental Processes, GeoPlanet: Earth and Planetary Sciences, p. 281-321.

Collinson, J., 1994. Sedimentary deformational structures. In Maltman, A, (Editor). The Geological Deformation of Sediments, Dordrecht: Springer Netherlands, p. 95–125.

Collinson, J.D., 1970. Bedforms of the Tana river, Norway. Geografiska Annaler: Series A, Physical Geography, 52(1), p. 31-56.

Cooke, R., Warren, A., and Goudie, A., 1993, Desert geomorphology. UCL Press Ltd., 526 p.

Coriolis, G. 1835. Mémoire sur les équations du mouvement relatif des systèmes de corps. Annales des Ponts et Chaussées 10:201-310.

Cosgrove, G.I.E., Colombera, L. and Mountney, N.P., 2021. A Database of Aeolian Sedimentary Architecture for the characterization of modern and ancient sedimentary systems. Marine and Petroleum Geology, 127, p.104983.

Cowan, C.A. and James, N.P., 1992, Diastasis cracks: mechanically generated synaeresis-like cracks in Upper Cambrian shallow water oolite and ribbon carbonates: Sedimentology, v. 39(6), p.1101-1118.

Dalrymple, R.W., and Choi, K., 2007, Morphologic and facies trends through the fluvial–marine transition in tide-dominated depositional systems: A schematic framework for environmental and sequence-stratigraphic interpretation: Earth-Science Reviews, v. 81, p. 135–174.

Dalrymple, R.W., Makino, Y., Zaitlin, B.A., 1991, Temporal and spatial patterns of rhythmite deposition on mud flats in the macrotidal Cobequid Bay-Salmon River estuary, Bay of Fundy, Canada, in Smith, D.G., Reinson, G.E., Zaitlin, B.A., Rahmani, R.A., eds., Clastic Tidal Sedimentology: Canadian Society of Petroleum Geologists Memoir, vol. 16. Calgary, AB, Canada, pp. 137–160.

Daniel, J.F., 1971. Channel movement of meandering Indiana streams. US Geological Survey Professional Paper 732-A, 18 p.

Dott Jr, R.H. and Bourgeois, J., 1982. Hummocky stratification: significance of its variable bedding sequences. Geological Society of America Bulletin, 93(8), p. 663-680.

Doveton, J.H., 1994, Geologic Log Interpretation, SEPM Short Course, No. 29. Society for Sedimentary Geology. Tulsa, Oklahoma. P. 33-35.

Drew, F., 1873. Alluvial and lacustrine deposits and glacial records of the Upper Indus Basin. Geological Society of London Quarterly Journal, v. 29, p. 441-471.

Dyer, K.R., 1995, Sediment transport processes in estuaries, in Perillo, G.M.E., ed., Geomorphology and sedimentology of estuaries. Developments in Sedimentology, Elsevier Sciences, p. 423-449.

Espitalié, J., Laporte, J.L., Madec, J., Marquis, F., Leplat, P., Paulet, J., and Boutefeau, A., 1977, Méthode rapide de charactérisation des roches mères, de leur potentiel pétrolier et de leur degré d'évolution: Revues d'Institut Français du Pétrolier, v. 33, p. 23-42.

Fedele, J.J., Hoyal, D.C., Barnaal, Z., Tulenko, J., Awalt, S., 2016. Bedforms created by gravity flows. In Budd, D., Hajek, E., Purkis, S. (Editors). Autogenic Dynamics and Self-Organization in Sedimentary Systems. SEPM Special Publication 106, p. 95–121.

Fedele, J.J., Hoyal, D.C., Barnaal, Z., Tulenko, J., Awalt, S., 2016. Bedforms created by gravity flows. In: In: Budd, D., Hajek, E., Purkis, S. (Editors), Autogenic Dynamics and Self-Organization in Sedimentary Systems 106. SEPM Spec. Pub, pp. 95–121.

Fielding, C.R., Ashworth, P.J., Best, J.L., Prokocki, E.W. and Smith, G.H.S., 2012. Tributary, distributary and other fluvial patterns: What really represents the norm in the continental rock record? Sedimentary Geology, 261, pp.15-32.

Flood, R.D., Manley, P.L., Kowsmann, R.O., Appi, C.J. and Pirmez, C., 1991. Seismic facies and late Quaternary growth of Amazon submarine fan. In Armentrout, J. M., S. J. Malecek, P. Braithwaite, C. R. Beeman, P. Weimer, and M. H. Link (Editors). Seismic facies and sedimentary processes of submarine fans and turbidite systems, Springer, New York, NY, p. 415-433.

Friend, P. F. 1983, Towards the field classification of alluvial architecture or sequence, in Collinson, J.D., and Lewin, J., eds., Modern and ancient fluvial systems, p. 345-354.

Friend, P.F., Slater, M.J., And Williams, R.C., 1979, Vertical and lateral building of river sandstone

bodies, Ebro Basin, Spain: Geological Society of London, Journal, v. 136, p. 39–46.

Fryberger, S.G., Knight, R., Hern, C., Moscariello, A. and Kabel, S., 2011. Rotliegend facies, sedimentary provinces, and stratigraphy, Southern Permian Basin UK and the Netherlands: a review with new observations, in Grötsch, J., and Gaupp, R., The Permian Rotliegend of the Netherlands, SEPM Special Publication No. 98, p. 51–88.

Fryberger, S.G., Schenk, C.J., And Krystinik, L.F., 1988, Stokes surfaces and the effects of near-surface groundwater-table on aeolian deposition: Sedimentology, v. 35, p. 21–41.

Gardner WD, Tucholke BE, Richardson MJ, Biscaye PE.,2017. Benthic storms, nepheloid layers, and linkage with upper ocean dynamics in the western North Atlantic, Marine Geology 385:304-327.

Gardner, W.D., Richardson, M.J., Mishonov, A.V., 2018. Global assessment of benthic nepheloid layers and linkage with upper ocean dynamics. Earth and Planetary Science Letters 482, 126-134.

Gibling, M.R., 2006. Width and thickness of fluvial channel bodies and valley fills in the geological record: a literature compilation and classification. Journal of Sedimentary Research, v. 76, 731–770.

Gilbert, G.K., 1885. The topographic features of lake shores: U.S. Geological Survey Annual Report No. 5, p. 75–123.

Gohain, K. and Parkash, B. 1990. Morphology of the Kosi Megafan. In: Rachocki, A.H. and Church, M. (eds.) Alluvial Fans: a Field Approach. Wiley, Chichester, p. 151–178.

Gonthier, E., Faugères, J.-C., and Stow, D.A.V. 1984. Contourite facies of the Faro Drift, Gulf of Cadiz. In Stow, D.A.V., Piper, D.J.W. (Editors.), Fine Grained Sediments, Deepwater Processes and Facies. Geological Society, London, Special Publication, 15, p. 275–291.

Harms, J.C., and Fahnlstock, R.K., 1965, Stratification bed forms and flow phenomena with an example from the Rio Grande, in Middleton, G.V., (Editors), Primary Sedimentary Structures and Their Hydrodynamic Interpretation: SEPM Special Publication 12, 84-115.

Harms, J.C., Southard, J.B., Spearing, D.R. and Walker, R.G., 1975. Depositional environments as interpreted from primary sedimentary structures and stratification sequences: Society of Economic Paleontologists and Mineralogists Short Course Notes 2. Tulsa, Oklahoma. 161 p.

Haughton, P., Davis, C., McCaffrey, W. and Barker, S., 2009. Hybrid sediment gravity flow deposits–classification, origin and significance. Marine and Petroleum Geology 26(10): 1900-1918.

Heezen, B.C., Hollister, C.D., 1964. Deep sea current evidence from abyssal sediments. Marine Geology 1:141–174.

Holbrook, J., 2001. Origin, genetic interrelationships, and stratigraphy over the continuum of fluvial channel-form bounding surfaces: an illustration from middle Cretaceous strata, southeastern Colorado: *Sedimentary Geology* 144:179-222.

Hoover Mackin, J., 1948. Concept of the graded river. Geological Society of America Bulletin, 59(5), pp.463-512.

Hüneke, H., and Mulder, T., 2011. Deep-Sea Sediments. Developments in Sedimentology, vol. 63. Elsevier, New York. 849 p.

Hunter, R.E., 1977, Basic types of stratification in small eolian dunes. Sedimentology, 24(3), pp.361-387.

Ielpi, A., Lapôtre, M.G.A., Gibling, M.R., and Boyce, K.C. 2022. The impact of vegetation on meandering rivers. Nature Reviews Earth & Environment · January 2022, p. 1-14.

Isaacs, C.M., 1981. Field characterization of rocks in the Monterey Formation along the coast near Santa Barbara, California. AAPG Field Guide 4: 9-24.

Jackson, C.R., 2004. An atlas of Oceanic Internal Solitary Waves. Global Ocean Associates, Rockville, MD (prepared for Office of Naval Research). http://internalwaveatlas.com/Atlas2_index.html Accessed 29 October 2022.

Jervey, M.T. 1988. Quantitative geological modeling of siliciclastic rock sequences and their seismic expression. In: Wilgus, C.K., Hastings, B.S., Posamentier, H., VanWagoner, J., Ross, C.A. & Kendall, C.G.St.C. (Editors), Sea-Level Changes: An Integrated Approach. SEPM Special Publications, 42, p. 47–69.

Johnson, D.W., 1919. Shore processes and shoreline development. John Wiley & Sons, Incorporated. 584 p.

Johnson, M.A., Kenyon, N.H., Belderson, R.H., Stride, A.H., 1982, Sand transport. In Stride, A.H.M., (Editor), Offshore Tidal Sands, Processes and Deposits: Chapman and Hall, London, pp. 58–94.

Kamola, D.L. and Van Wagoner, J.C., 1995. Stratigraphy and facies architecture of parasequences with examples from the Spring Canyon Member,

Blackhawk Formation, Utah. In Van Wagoner, J.C., and Bertram, G.T. (Editors), Sequence stratigraphy of foreland basin deposits, AAPG Memoir 64, p. 27-54.

Klaus, K.E., Neuendorf, K.K.E., Mehl, J.P., Jr., and Jackson, J.A., 2011. Glossary of geology, fifth edition, revised. American Geosciences Institute, 783 p.

Knauss, J.A. 1996. Introduction to physical oceanography, 2nd ed. Prentice Hall, NJ, 309 p.

Kocurek, G., 1988. First-order and super bounding surfaces in eolian sequences—bounding surfaces revisited. Sedimentary Geology, 56(1-4), pp.193-206.

Kocurek, G., 1996, Desert aeolian systems, in Reading, H.G., ed., Sedimentary Environments; Processes, Facies and Stratigraphy, Third Edition: Oxford, U.K., Blackwell Science, p. 125–153.

Kocurek, G., and Havholm, K.G., 1993, Eolian sequence stratigraphy – A conceptual Framework, Chapter 16, in Weimer, P., and Posamentier, H.W.,(Editors), Siliciclastic sequence stratigraphy, AAPG Memoir 58, p. 393-409.

Kreisa, R.D. and Moiola, R.J., 1986, Sigmoidal tidal bundles and other tide-generated sedimentary structures of the Curtis Formation, Utah: Geological Society of America Bulletin, v. 97, p. 381-387.

Kuijpers, A., Werner, F., and Rumohr, J. 1993. Sandwaves and other large-scale bed forms as indicators of nontidal surge currents in the Skagerrak off Northern Denmark. Marine Geology 111:209–221.

Lancaster, N. and Teller, J.T., 1988. Interdune deposits of the Namib sand sea. Sedimentary Geology 55(1-2):91-107.

Lancaster, N., 2023, Geomorphology of desert dunes. Cambridge University Press, 330 p.

Lazar, O.R., Bohacs, K.M., Macquaker, J.H.S., and Schieber, J., and Demko, T.M., 2015a, Capturing key attributes of fine-grained sedimentary rocks in outcrops, cores, and thin sections: Nomenclature and description guidelines: Journal of Sedimentary Research, v. 85, p. 230-246.

Lazar, O.R., Bohacs, K.M., Schieber, J., Macquaker, J.H.S. and Demko, T.M., 2022. Mudstone nomenclature. In Bohacs, K.M., and Lazar, O.R. (Editors). Sequence stratigraphy: Applications to fine-grained rocks: AAPG Memoir 126 p.21-34.

Leckie, D.A., and Walker, R.G., 1982, Storm- and Tide-Dominated Shorelines in Cretaceous Moosebar-Lower Gates Interval—Outcrop Equivalents of Deep Basin Gas Trap in Western Canada. American Association of Petroleum Geologists, v. 66, p. 138-157.

Leopold, L.B. and Wolman, M.G., 1957. River Channel Patterns: Braided, Meandering and Straight. US Geol. Surv. Prof. Pap. 282-B, US Geological Survey, Washington, DC, 85 p.

Li, M.Z., Yongsheng Wu, Charles G. Hannah, and Will A. Perrie. 2021, Seabed disturbance and sediment mobility due to tidal current and waves on the continental shelves of Canada. Canadian Journal of Earth Sciences. 58(11): 1209-1232.

Lowe, D.R. and LoPiccolo, R.D., 1974, The characteristics and origins of dish and pillar structures. Journal of Sedimentary Research 44(2):484-501.

Mack, G.H., James, W.C., and Monger, H.C., 1993, Classification of paleosols: Geological Society of America Bulletin, 105:129-136.

Macquaker, J.H.S., Bentley, S. J., and Bohacs, K.M., 2010, Wave-enhanced sediment-gravity flows and mud dispersal across continental shelves: Reappraising sediment transport processes operating in ancient mudstone successions. Geology, v. 38, p. 947-950.

Mason, J. and Mohrig, D., 2019. Scroll bars are inner bank levees along meandering river bends. Earth Surface Processes and Landforms, 44(13), p. 2649-2659.

Maynard, J.R., Feldman, H.R. and Alway, R., 2010. From bars to valleys: the sedimentology and seismic geomorphology of fluvial to estuarine incised-valley fills of the Grand Rapids Formation (Lower Cretaceous), Iron River Field, Alberta, Canada. Journal of Sedimentary Research, 80(7), p. 611-638.

Mazullo, J. and Graham, A.G., 1988. Handbook for Shipboard Sedimentologists: DSDP Technical Note 8, College Station. Texas, Texas A&M University. http://www-odp.tamu.edu/publications/tnotes/digital/tnote_08.pdf

Mazumder, R., M. Arima, 2005, Tidal rhythmites and their implications. Earth-Science Reviews 69 (2005) 79–95.

McGee, W.J., 1908, Outlines of hydrology. Bulletin of the Geological Society of America, V. 19, p. 193-220.

McMahon, S., van Smeerdijk Hood, A., and McIlroy, D., 2017, The origin and occurrence of subaqueous sedimentary cracks, in Brasier, A. T., McIlroy, D. &McLoughlin, N., eds., Earth System Evolution and Early Life: A Celebration of the Work of Martin Brasier: Geological Society, London, Special Publications, 448, p. 285-309.

Miall, A.D., 1996. The Geology of Fluvial Deposits: Sedimentary Facies, Basin Analysis and Petroleum Geology. Springer-Verlag Inc., Berlin, 582 p.

Middleton, G.V., 1973. Johannes Walther's law of the correlation of facies. Geological Society of America Bulletin, 84(3), p. 979-988.

Middleton, G.V., and Hampton, M.A., 1976, Part I. Sediment gravity flows: mechanics of flow and deposition. in Middleton, G.V., and Bouma, A.H., eds., Turbidites and Deep Water Sedimentation, Short course notes: Pacific Section of the Society of Economic Paleontologists and Mineralogists, p. 1-38.

Mitchell, N. C., 2015, Submarine Geomorphology. Reference module in Earth Systems and Environmental Sciences, Elsevier, https://doi.org/10.1016/B978-0-12-409548-9.09249-6.

Moscardelli, L. and Wood, L., 2008. New classification system for mass transport complexes in offshore Trinidad. Basin Research, 20(1):73-98.

Mountney, N.P., 2006, Eolian Facies Models, in Posamentier HW, Walker RG, editors. Facies models revisited. SEPM Special Publication 84, p. 19-83.

Mulhern, J. S., C. L. Johnson, and J. M. Martin, 2017, Is barrier island morphology a function of tidal and wave regime? Marine geology, v. 387, p. 74–84.

Neal, J.E., Abreu, V., Bohacs, K.M., Feldman, H.R. and Pederson, K.H., 2016. Accommodation succession (δA/δS) sequence stratigraphy: observational method, utility and insights into sequence boundary formation. Journal of the Geological Society, 173(5), p.803-816.

Neuendorf, K.K.E., Mehl, J.P. Jr., Jackson, J.A., 2011, Glossary of geology, fifth edition, revised. American Geosciences Institute. 783 p.

Nielson, J. and Kocurek, G., 1986. Climbing zibars of the Algodones. Sedimentary Geology 48(1-2):1-15.

Olariu, C. and Bhattacharya, J.P., 2006, Terminal distributary channels and delta front architecture of river-dominated delta systems. Journal of Sedimentary Research, v. 76, p. 212–233.

Ortega, P., DeCastro, A.G., and Baptista, M.A. 2007. On the generation and evolution of nepheloid layers. Journal of Geophysical Research 112(C6):C06008.

Ortiz-Karpf, A., Hodgson, D.H., and McCaffrey, W.D., 2015. The role of mass-transport complexes in controlling channel avulsion and the subsequent sediment dispersal patterns on an active margin: The Magdalena Fan, offshore Colombia. Marine and Petroleum Geology 64:58-75.

Patruno, S. and Helland-Hansen, W., 2018. Clinoforms and clinoform systems: Review and dynamic classification scheme for shorelines, subaqueous deltas, shelf edges and continental margins. Earth-Science Reviews, 185, pp.202-233.

Payenberg, T.H.D., Willis, B.J., Sixsmith, B., Connell,, S.D., Powell, A., Milliken, K.T., Posamentier, H.W., Allgoewer, A., Meyers, E., Marsh, T., Sullivan, M.D., Lang., S., Fowler, J., Welch, R., Howe, H., and Ainsworth., R.B., 2024. Quantification and classification of a giant fluvial-distributive system – the Triassic Mungaroo Formation, NWS, Australia. Earth-Science Reviews 249 (2024) 104676.

Peakall, J., Best, J., Baas, J.H., Hodgson, D.M., Clare, M.A., Talling, P.J., Dorrell, R.M. and Lee, D.R., 2020. An integrated process-based model of flutes and tool marks in deep-water environments: Implications for palaeohydraulics, the Bouma sequence and hybrid event beds. Sedimentology 67:1601-1666.

Pellegrini, C., Patruno, S., Helland-Hansen, W., Steel, R.J. and Trincardi, F., 2020. Clinoforms and clinothems: Fundamental elements of basin infill. Basin Research, 32(Clinoforms and Clinothems: Fundamental Elements of Basin Infill), p.187-205.

Pickering, K.T., and Hiscott, R.N., 2015, Deep marine systems. Wiley, 657 p.

Piper, D.J. and Normark, W.R., 1983. Turbidite depositional patterns and flow characteristics, Navy submarine fan, California Borderland. Sedimentology, 30:681-694.

Porter, M.L., 1986. Sedimentary record of erg migration. Geology 14(6):497-500.

Postma, G. and Roep, T.B., 1985, Resedimented conglomerates in the bottomsets of Gilbert-type gravel deltas: Journal of Sedimentary Research, 55(6), p. 874-885.

Potter, P.E., 1967. Sand bodies and sedimentary environments: a review. American Association of Petroleum Geologists Bulletin, 51(3), p. 337-365.

Prélat, A. and Hodgson, D.M., 2013. The full range of turbidite bed thickness patterns in submarine lobes: controls and implications. Journal of the Geological Society 170:209-214.

Pye, K., 1995. The nature, origin and accumulation of loess. Quaternary Science Reviews, 14(7-8), p.653-667.

Reineck, H.E. and Wunderlich, F., 1968, Classification and origin of flaser and lenticular bedding: Sedimentology, v. 11(1-2), p. 99-104.

Retallack, G.J., 2019, Soils of the past: An introduction to paleopedology: 3rd ed., Blackwell Science, Oxford, 534 p.

Rich, J.L., 1951. Three critical environments of deposition, and criteria for recognition of rocks deposited in each of them. Geological Society of America Bulletin, 62(1), pp.1-20.

Roberts, H.H. and Sydow, J., 2003. Late Quaternary stratigraphy and sedimentology of the offshore Mahakam delta, east Kalimantan (Indonesia). In Tropical Deltas of Southeast Asia—Sedimentology, Stratigraphy, and Petroleum Geology. SEPM Special Publication No. 76, p. 125–145.

Roberts, H.M., 2019, Loess. In Livingstone, I., and Warren, A., Aeolian Geomorphology: A New Introduction, First Edition, John Wiley & Sons Ltd., p. 107 – 132.

Schumm, S.A., 1985. Patterns of alluvial rivers. Annual Review of Earth and Planetary Sciences, 13(1), p. 5-27.

Sharp, R. P., 1963. Wind ripples. Journal of Geology, 71, 617–636.

Shchepetkina, A., Gingras, M.K., Mángano, M.G. and Buatois, L.A., 2019, Fluvio-tidal transition zone: Terminology, sedimentological and ichnological characteristics, and significance: Earth-science reviews, v. 192, p. 214-235.

Shields, A. 1936. Anwendung der Ähnlichkeitsmechanik und der Turbulenzforschung auf die Geschiebebewegung. Mitteilungen der Preussischen Versuchsanstalt für Wasserbau und Schiffbau, 26, 1–26.

Slootman, A. and Cartigny, M.J., 2020. Cyclic steps: review and aggradation-based classification. Earth-Science Reviews, 201, 102949, 30 p.

Slootman, A., Vellinga, A.J., Moscariello, A. and Cartigny, M.J., 2021. The depositional signature of high-aggradation chute-and-pool bedforms: the build-and-fill structure. Sedimentology, 68(4), p. 1640-1673.

Soil Survey Staff, 1999, Soil Taxonomy: A basic system of soil classification for making and interpreting soil surveys, 2nd edition: U.S. Department of Agriculture Natural Resources Conservation Service, 871 p.

Soreghan, G.S., Heavens, N.G., Pfeifer, L.S. and Soreghan, M.J., 2023. Dust and loess as archives and agents of climate and climate change in the late Paleozoic Earth system. Geological Society, London, Special Publications, 535(1), p.SP535-2022.

Sprague, A.R.G., Garfield, T.R., Goulding, F.J., Beaubouef, R.T., Sullivan, M.D., Rossen, C., Campion, K.M., Sickafoose, D.K., Abreu, V., Schellpeper, M. E., Jensen, G.N., Jennette, D.C., Pirmez, C., Dixon, B.T., Ying, D., Ardill, J., Mohrig, D.C., Porter, M.L., Farrell, M.E., and Mellere, D., 2005. Integrated slope channel depositional models: the key to successful prediction of reservoir presence and quality in offshore West Africa. CIPM, cuarto E-Exitep, 2005, February, 20e23, 2005, Veracruz, Mexico, pp. 1-13.

Steele, J.H. (Editor), 2001, Encyclopedia of Ocean Sciences (Second Edition), Academic Press, San Diego, p. 328-335.

Stokes, W.L., 1968. Multiple parallel-truncation bedding planes; a feature of wind-deposited sandstone formations. Journal of Sedimentary Research, 38(2), pp.510-515.

Stow, D.A.V. and Piper, D.J.W., 1984. Deep-water fine-grained sediments: facies models. Geological Society, London, Special Publications, 15(1), pp.611-646.

Surian, N., 2015. Chapter 15, Fluvial processes in braided rivers. In Rowiński, P. and Radecki-Pawlik, A. (eds.), Rivers—Physical, Fluvial and Environmental Processes, GeoPlanet: Earth and Planetary Sciences, p. 403-425.

Talling, P.J., Masson, D.G., Sumner, E.J. and Malgesini, G., 2012. Subaqueous sediment density flows: Depositional processes and deposit types. Sedimentology, 59:1937-2003.

Tang, L., Titov, V.V., Wei, Y., Mofjeld, H.O., Spillane, M., Arcas, D., Bernard, E.N., Chamberlin, C., Gica, E. and Newman, J. 2008. Tsunami forecast analysis for the May 2006 Tonga tsunami, Journal of Geophysical Research: Oceans, 113, C12015.

Thomas, R.G., Smith, D.G., Wood, J.M., Visser, J., Calverley-Range, E.A. and Koster, E.H., 1987. Inclined Heterolithic stratification – terminology, description, interpretation and significance. Sedimentary Geology, 53, 123–179.

Tyson, R.V. and Pearson, T.H., 1991. Modern and ancient continental shelf anoxia: an overview. Tyson, R. V. and Pearson, T. H. (Editors), Modern and Ancient Continental Shelf Anoxia, Geological Society, London, Special Publications, 58(1), pp.1-24.

Van Wagoner, J.C., Mitchum, R.M., Campion, K.M., and Rahmanian, V.D., 1990. Siliciclastic sequence

stratigraphy in well logs, cores, and outcrops. AAPG Methods in Exploration Series No. 7, 55 p.

Van Wagoner, J.C., Posamentier, H.W., Mitchum, R.M., Vail, P.R., Sarg, J.F., Loutit, T.S., and Hardenbol, J., 1988, An overview of the fundamentals of sequence stratigraphy and key definitions, in Wilgus, C.K., et al., eds., Sealevel changes: An integrated approach: Society of Economic Paleontologists and Mineralogists Special Publication 42, p. 39–45.

Ventra, D., and Clarke, L.C., 2018. Geology and geomorphology of alluvial and fluvial fans: current progress and research perspectives. In Ventra, D. & Clarke, L. E. (eds) 2018. Geology and Geomorphology of Alluvial and Fluvial Fans: Terrestrial and Planetary Perspectives. Geological Society, London, Special Publications, 440, 1–21.

Walther, J., 1894. Einleitung in die Geologie als historische Wissenschaft. In Lithogenesis der Gegenwart. Jena: Verlag von Gustav Fischer, Bd. 3, p. 535–1055.

Weissmann, G.S., Hartley, A.J., Nichols, G.J., Scuderi, L.A., Olson, M., Buehler, H. and Banteah, R. 2010. Fluvial form in modern continental sedimentary basins: distributive fluvial systems. Geology, 38, 39–42.

Wentworth, C.M., Jr., 1967, Dish structure, a primary sedimentary structure in coarse turbidities. American Association of Petroleum Geologists Bulletin 51:485.

Wetzel, R. G., 2001, Limnology: Lake and River Ecosystems, 3rd edn. Academic Press, San Diego. 637 p.

Wheeler, H.E., 1958, Time-stratigraphy: American Association of Petroleum Geologists Bulletin, 42:1047-1063.

Williams, G.E., 1991. Upper Proterozoic tidal rhythmites, South Australia: sedimentary features, deposition, and implications for the earth's palaeorotation. In: Smith, D.G., Reinson, G.E., Zaitlin, B.A., Rahmani, R.A. (Editors), Clastic Tidal Sedimentology, Canadian Society of Petroleum Geologists, Memoir, vol. 16, p. 161– 177.

Wilson, I.G., 1972. Aeolian bedforms—their development and origins. Sedimentology, v. 19(3-4), p. 173-210.

Wilson, I.G., 1973. Ergs. Sedimentary Geology, v. 10, p. 77-106.

Winter, B.L., Johnson, C.M. and Clark, D.L., 1997. Geochemical constraints on the formation of Late Cenozoic ferromanganese micronodules from the central Arctic Ocean. Marine Geology, 138(1-2), pp.149-169.

Yasukawa, K., Kino, S., Ohta, J., Azami, K., Tanaka, E., Mimura, K., Fujinaga, K., Nakamura, K. and Kato, Y., 2021. Stratigraphic variations of Fe–Mn micronodules and implications for the formation of extremely REY-rich mud in the western North Pacific Ocean. Minerals, 11(3), p.270.