

Sedimentary structures

1. Erosional sedimentary structures
2. Depositional sedimentary structures
3. Penecontemporaneous sedimentary structures



Erosional sedimentary structures

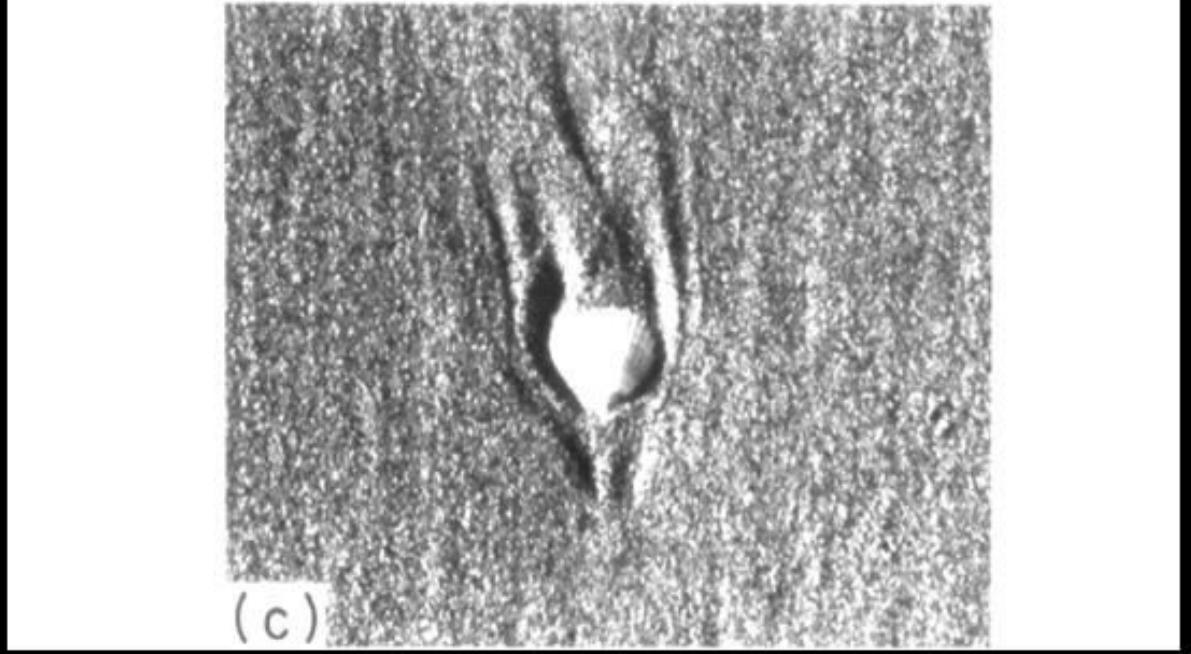
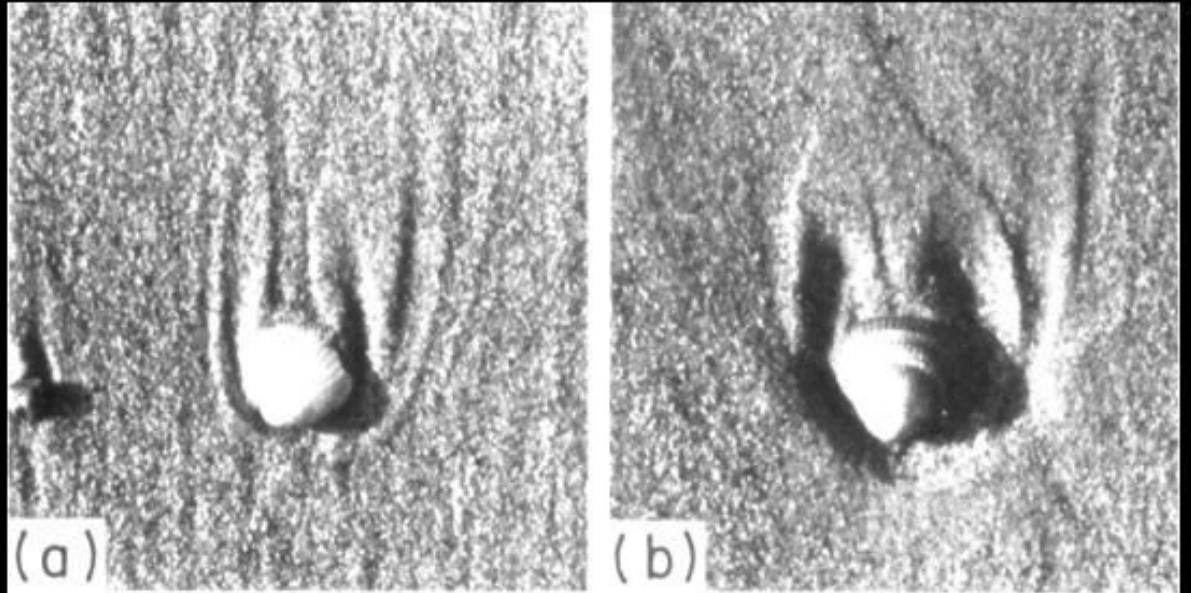
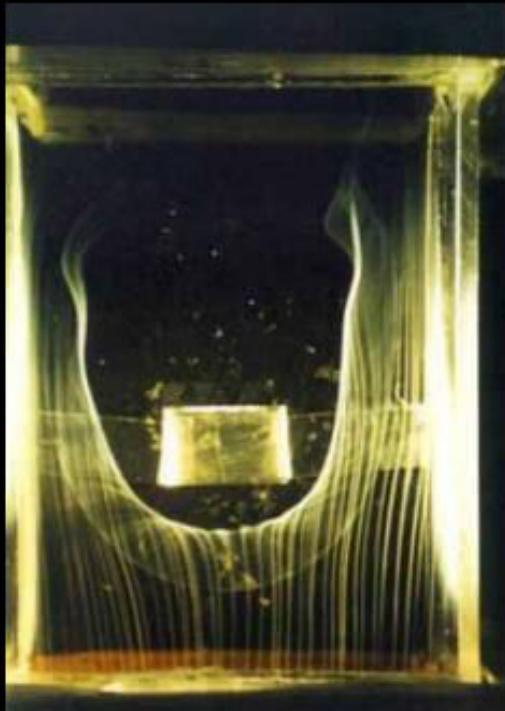
Obstacle scour

Current direction



Obstacle Scours

Scour forms
'horseshoe'
vortex in front
of obstacle
(flow
separation)





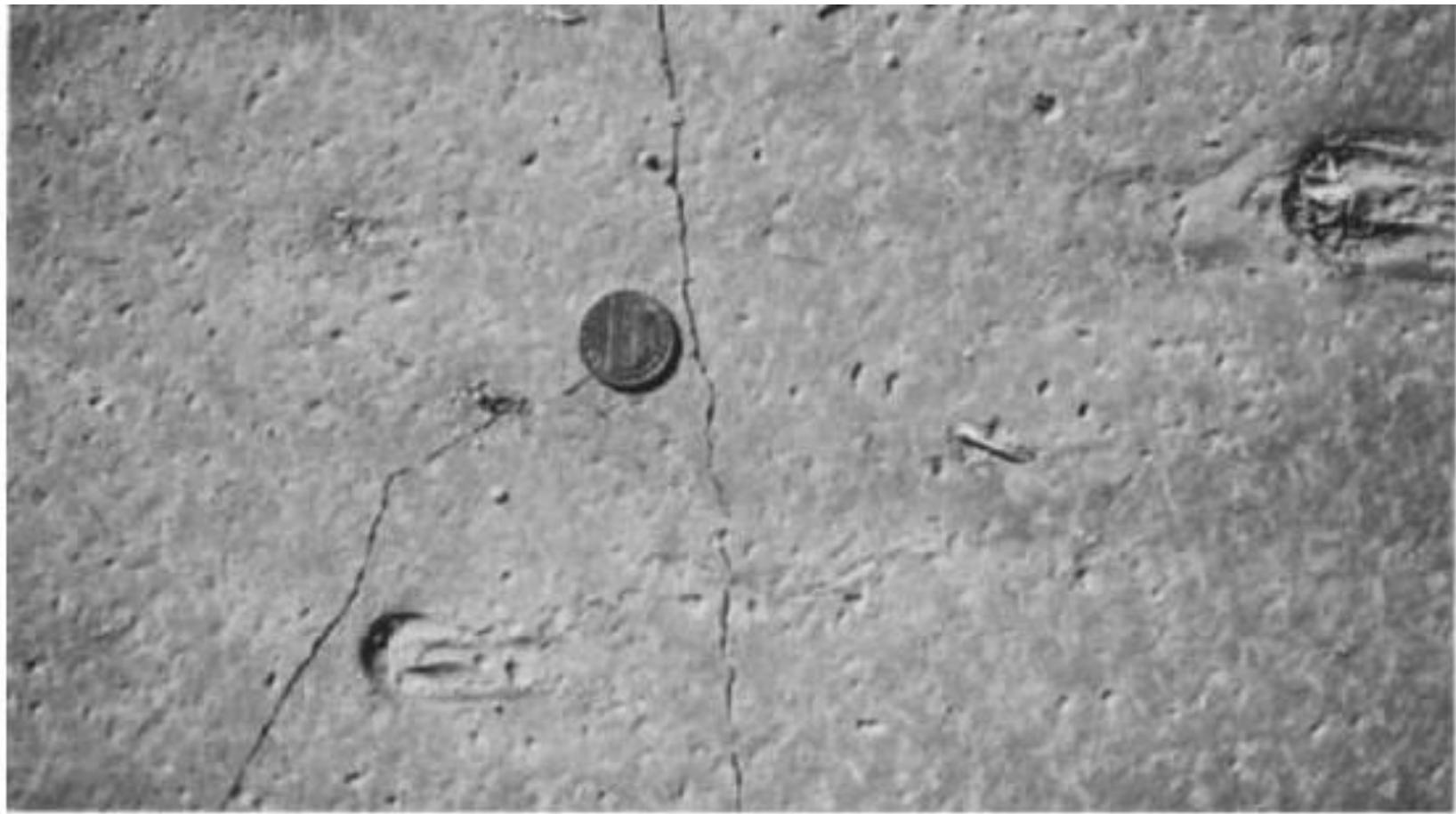
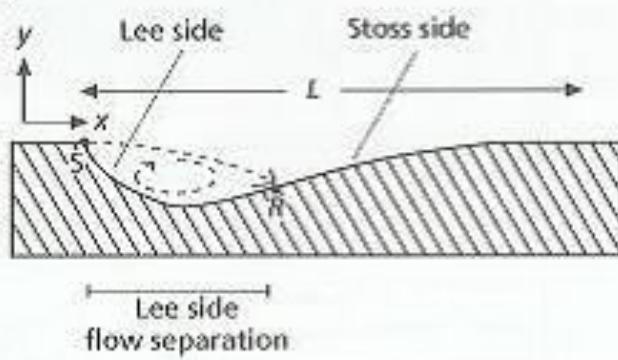
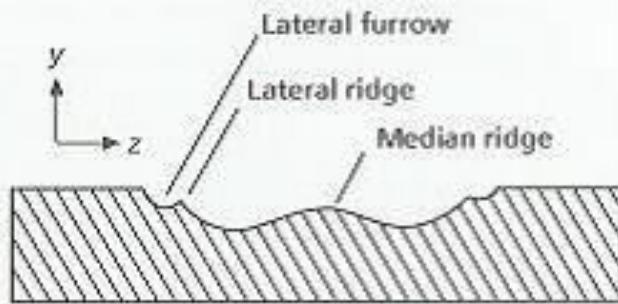
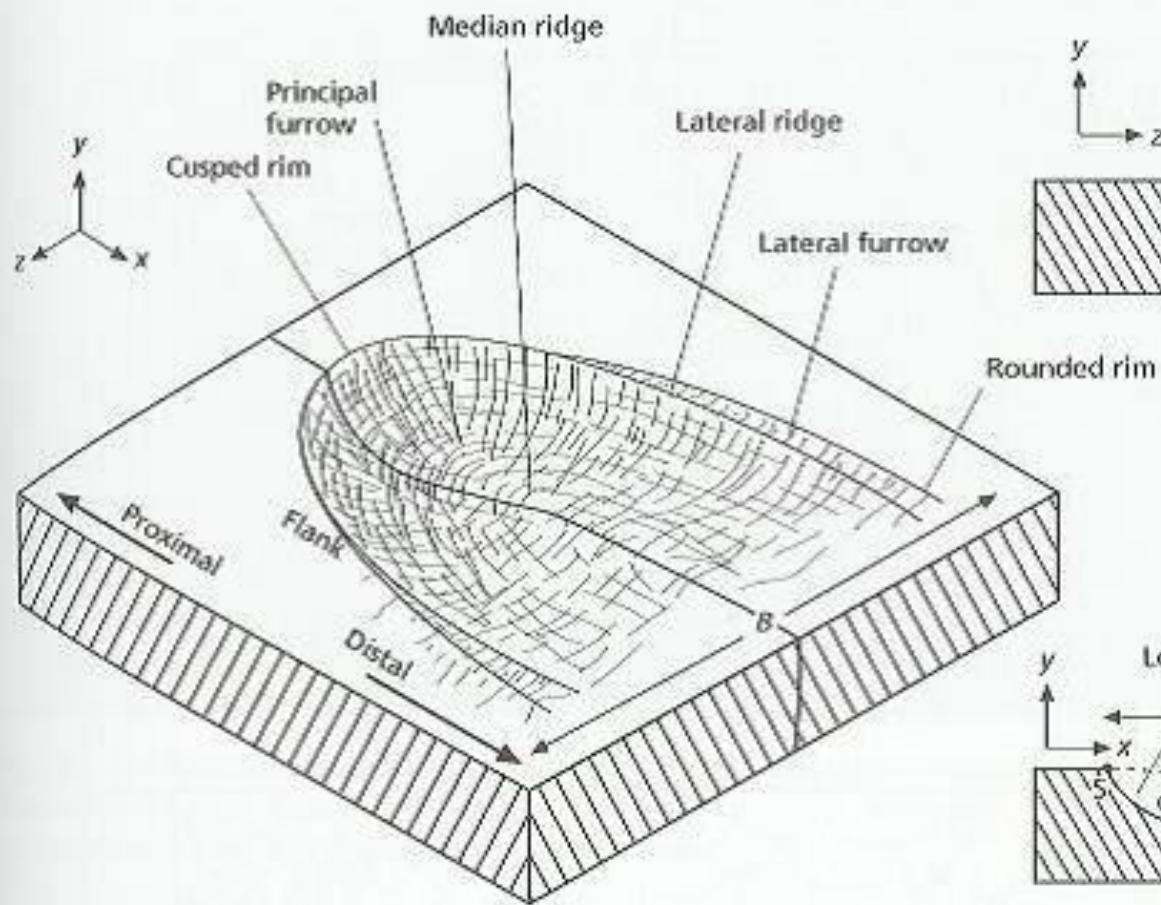


Fig.19. Horse-shoe crescent scours in cohesive mud on high bar, Halfway Hollow. Flow is from left to right. Note the regularity of form in comparison with larger crescent scours developed in channels. The pits in surface are produced by embedded flotsam eventually removed by the wind. Penny for scale.

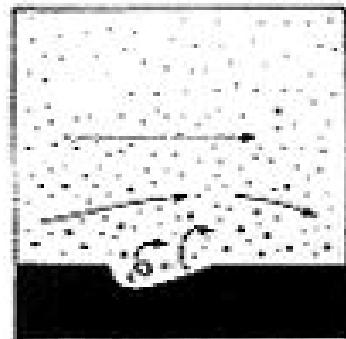
Crescent shape

Flutes or flute marks

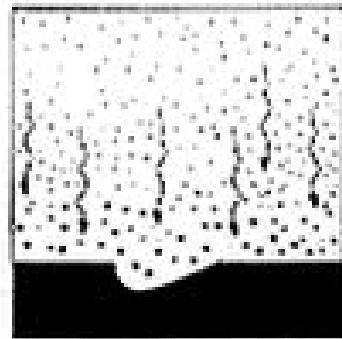




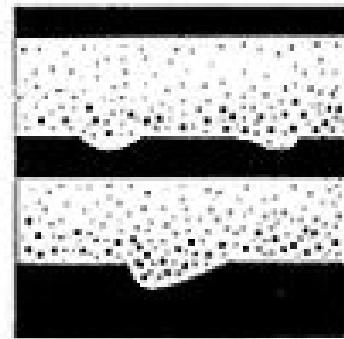
Sole marks



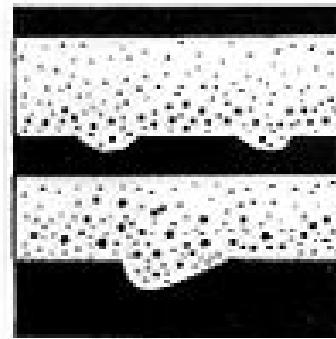
1 bottom erosion by
a current



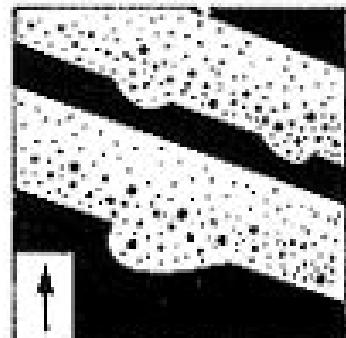
2 deposition starts



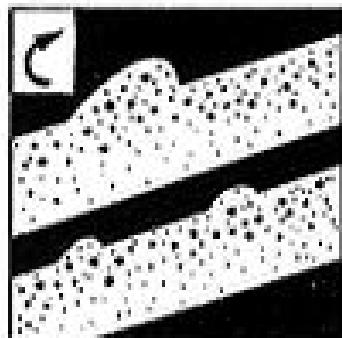
3 burial
(several beds)



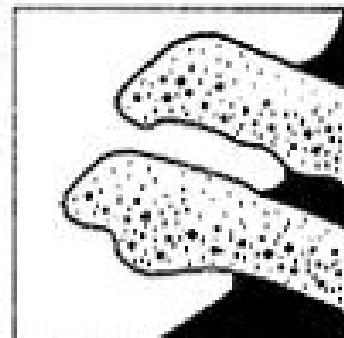
4 diagenesis
(cementation)



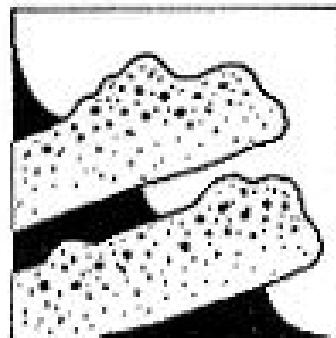
5 tilting and
emergence



5a overturning and
emergence



6 weathering and



6a selective erosion



Flute Marks on base of turbiditic
sandstone; current is from right to left

Depositional sedimentary structures

1. Stratification
2. Bedforms (ripples)
3. Grain size grading

Stratification or layering

Marked by change in composition, texture, colour, smaller scale structures, etc.



3.2.1 Stratification is officially subdivided into *bedding* and *lamination*, depending upon the thickness of the strata, and bedding and lamination are in turn subdivided according to thickness. Figure 3-3 is a chart that gives you all the official terminology. Get used to using this terminology in your descriptions of strata.

BEDDING (bed, beds)	very thick-bedded	100 cm
	thick-bedded	30 cm
	medium-bedded	10 cm
	thin-bedded	3 cm
	very thin-bedded	1 cm
LAMINATION (lamina, laminae)	laminated	0.3 cm
	thinly laminated	

Bedform



RIPPLE MARKS

Undulations of the sediment surface produced as wind or water moves across sand.

Symmetric ripple marks
are produced by waves

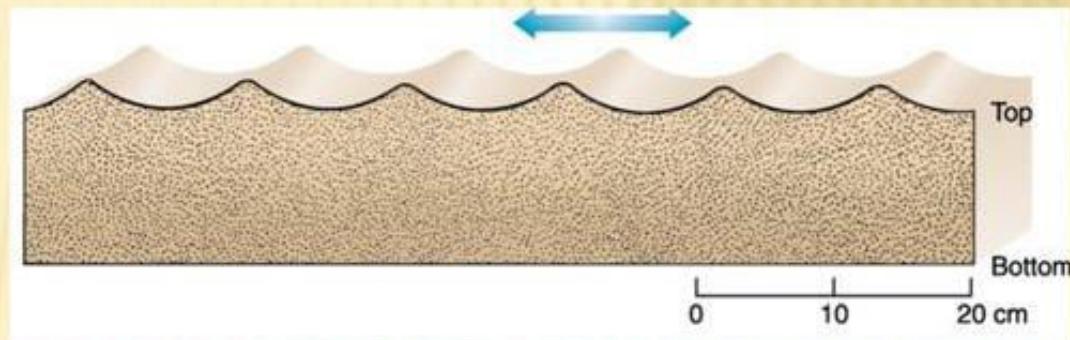
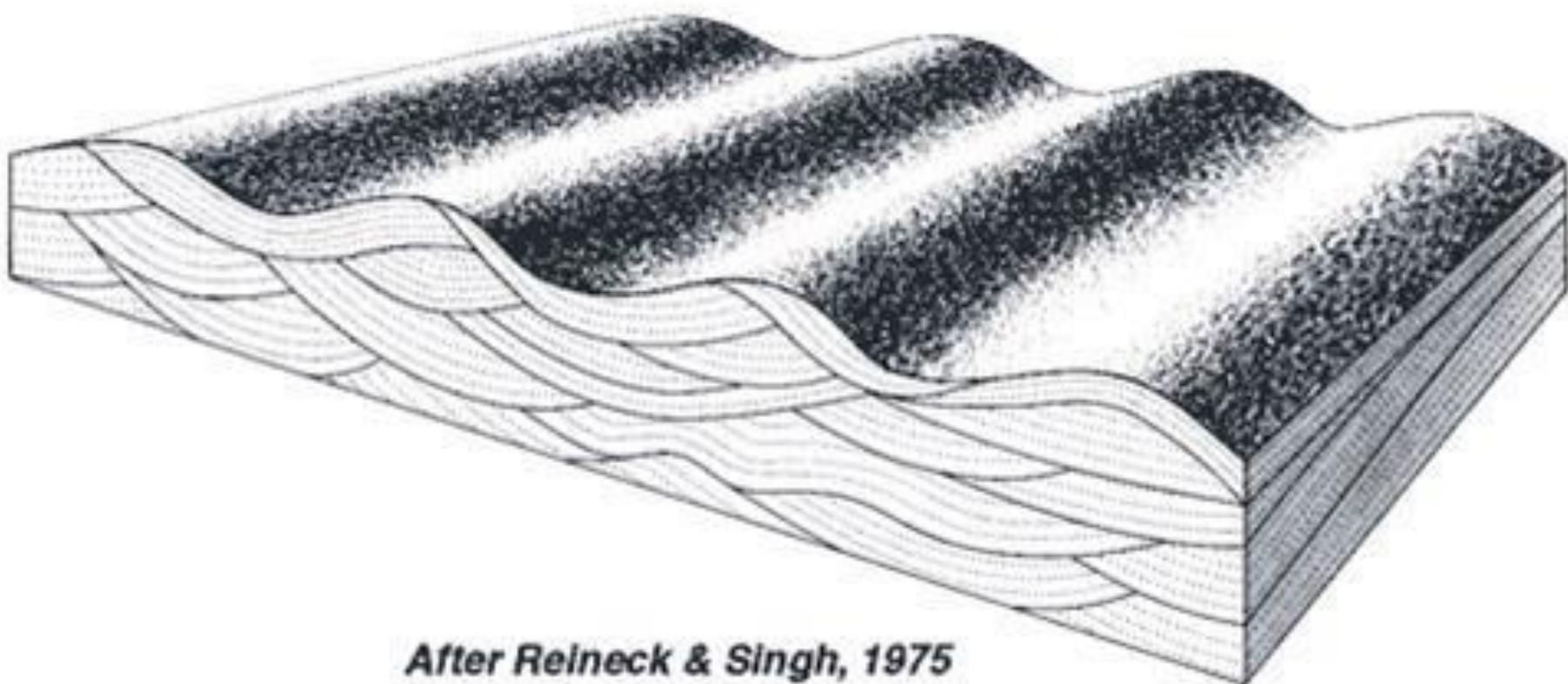


FIGURE 5-22 Profiles of ripple marks. (A) Symmetric ripples. (B) Asymmetric ripples.



Asymmetric ripples form
in unidirectional currents
(such as in streams or
rivers).

Wave ripple

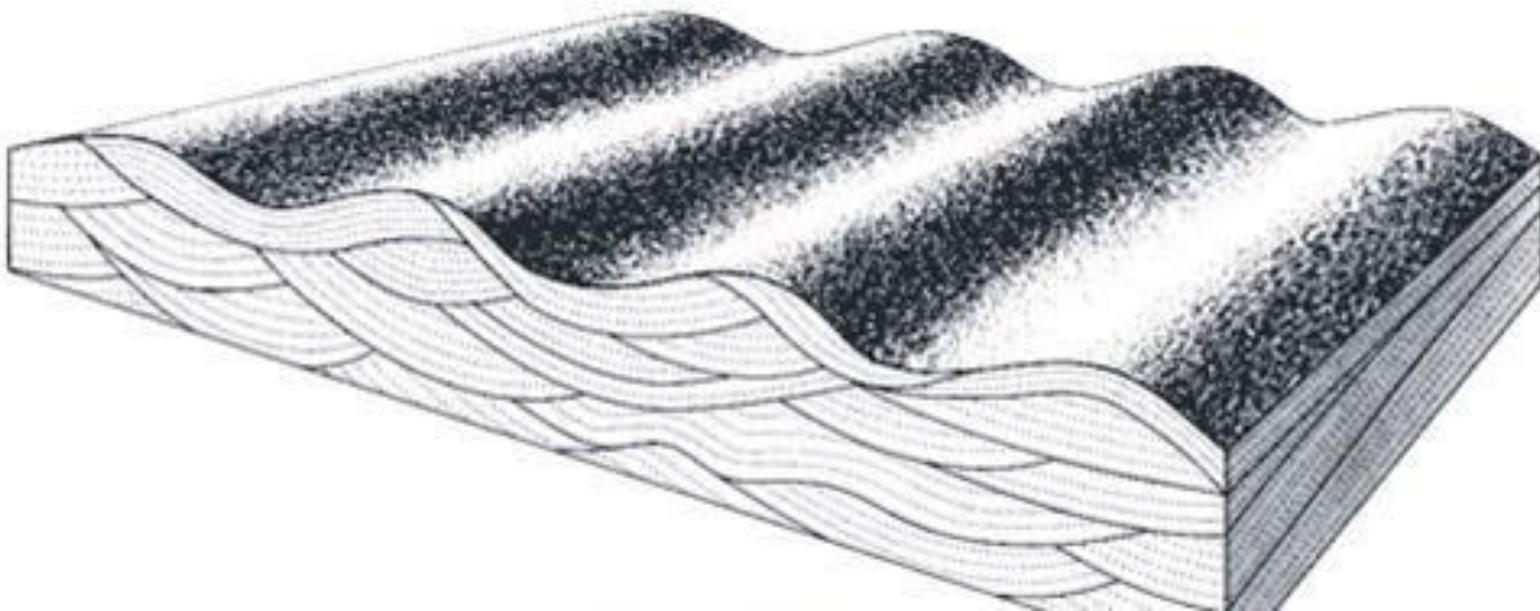


After Reineck & Singh, 1975





Wave ripple

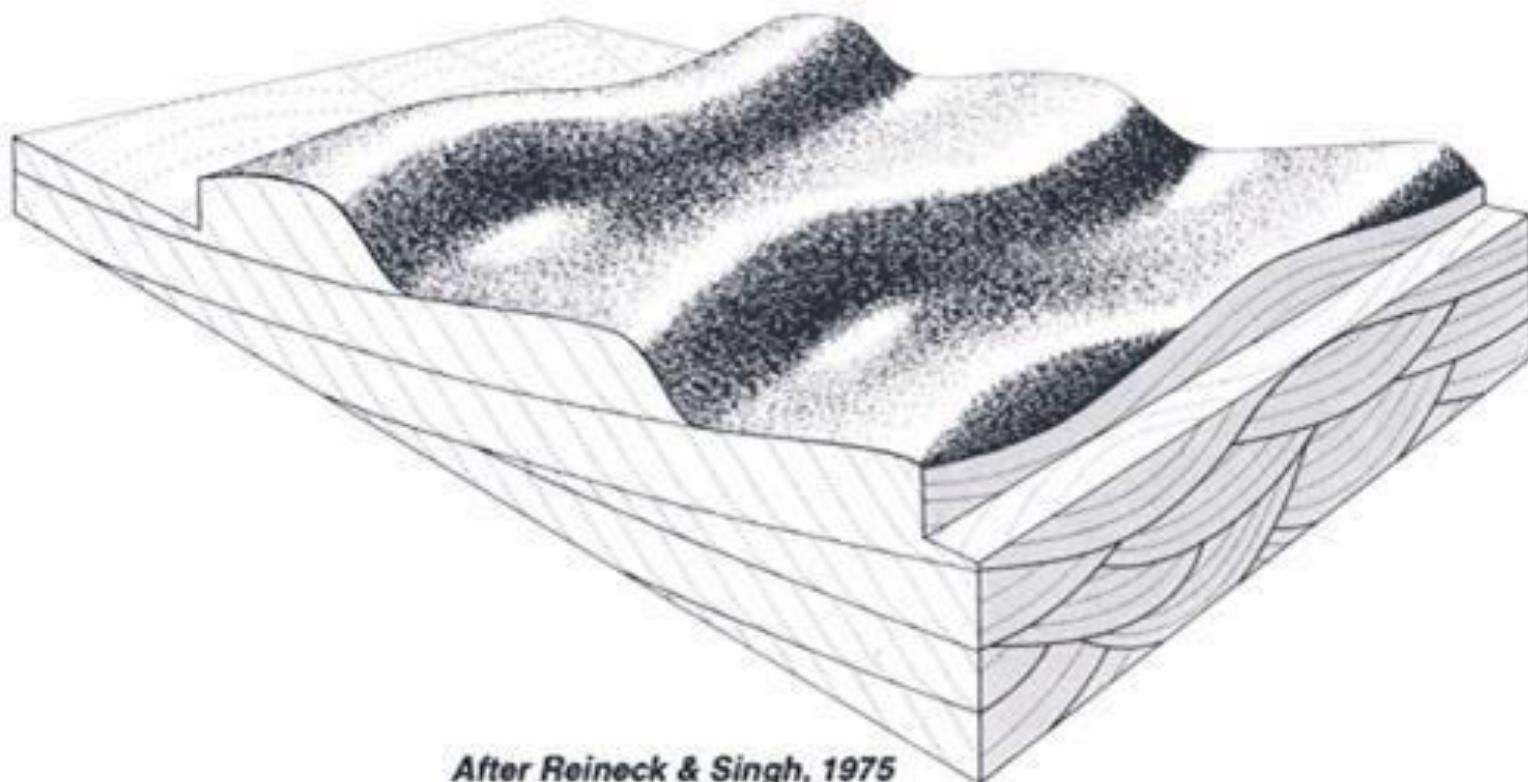


Wave ripple



Wave Ripples. Cross-sectional view of
ripple cross-laminated sandstone

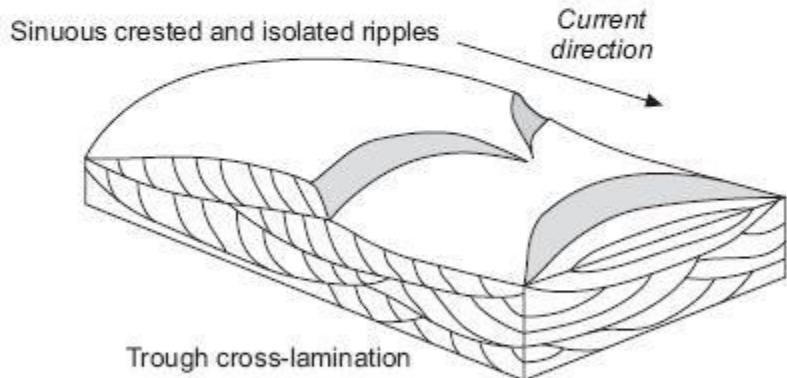
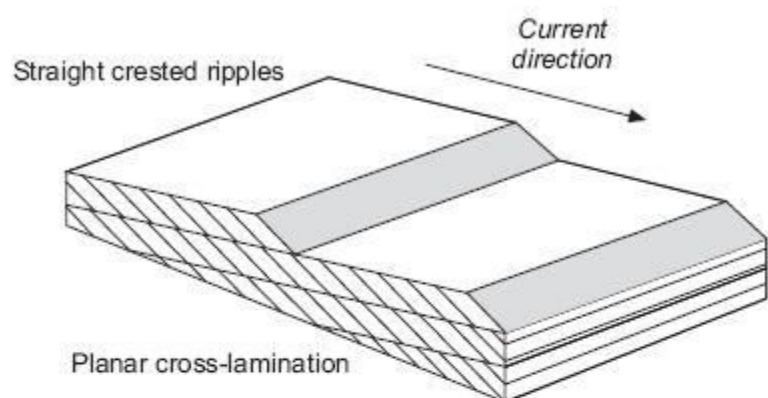
Current ripple



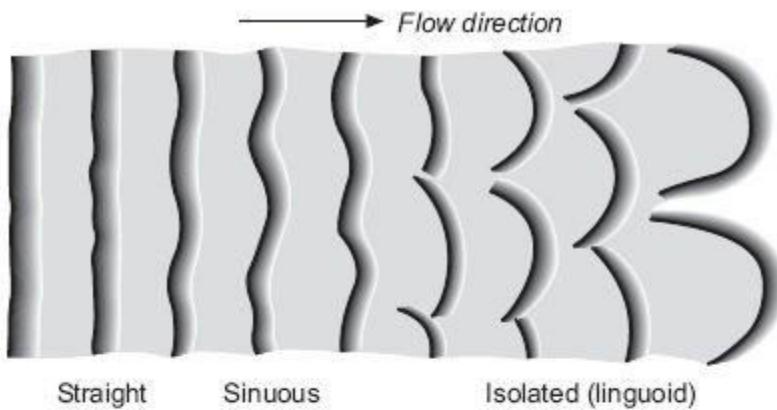
After Reineck & Singh, 1975



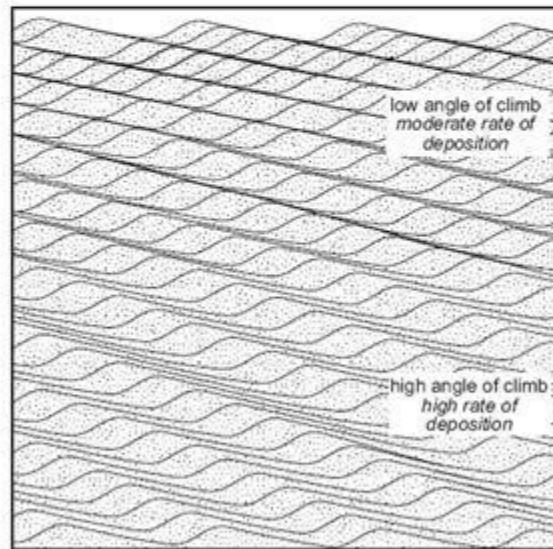
Current ripples



Migrating straight crested ripples form planar cross-lamination. Sinuous or isolated (linguoid or lunate) ripples produce trough cross-lamination.



In plan view current ripples may have straight, sinuous or isolated crests.



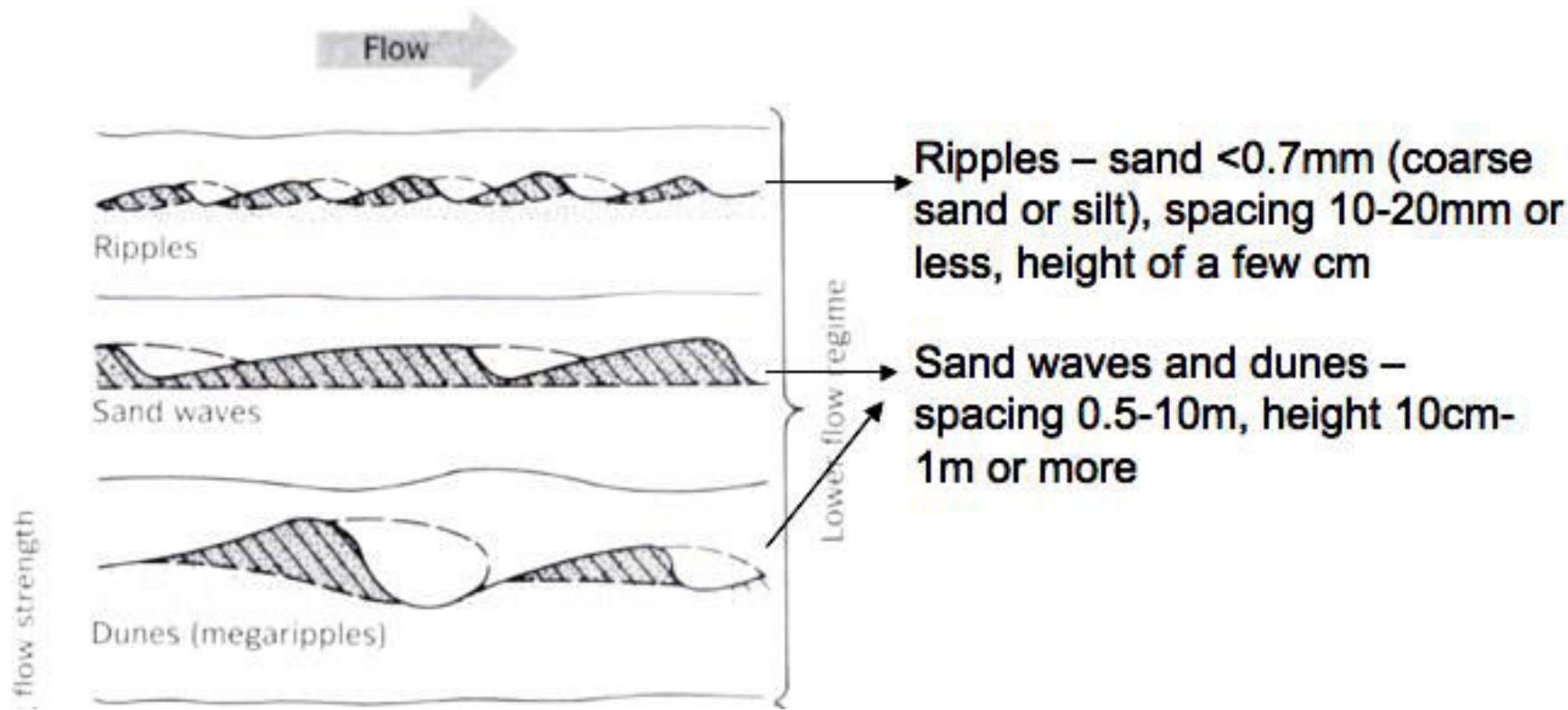
Climbing ripples: in the lower part of the figure, more of the stoss side of the ripple is preserved, resulting in a steeper 'angle of climb'.



Dunes



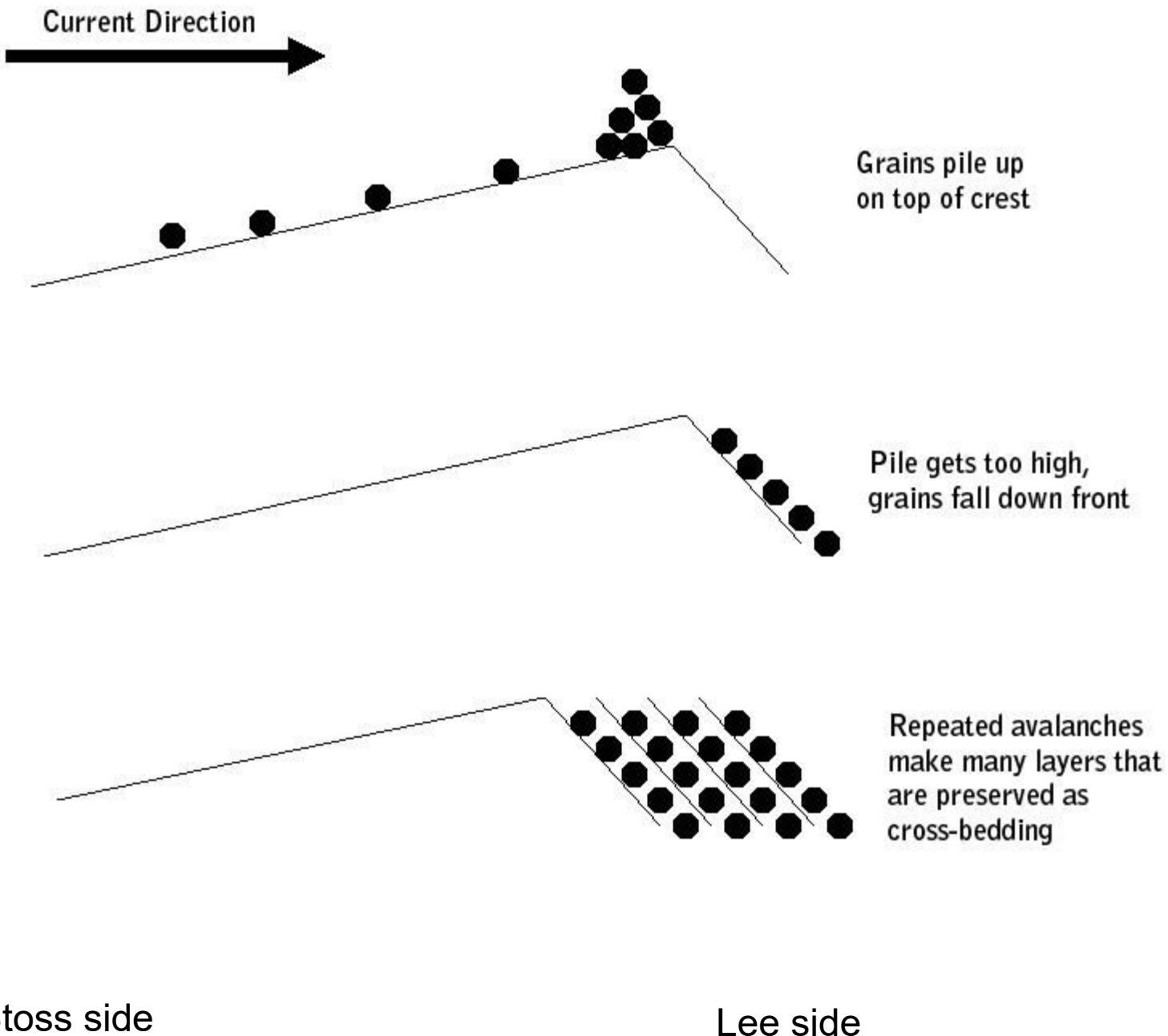
Sandwaves



Cross-bed Formation



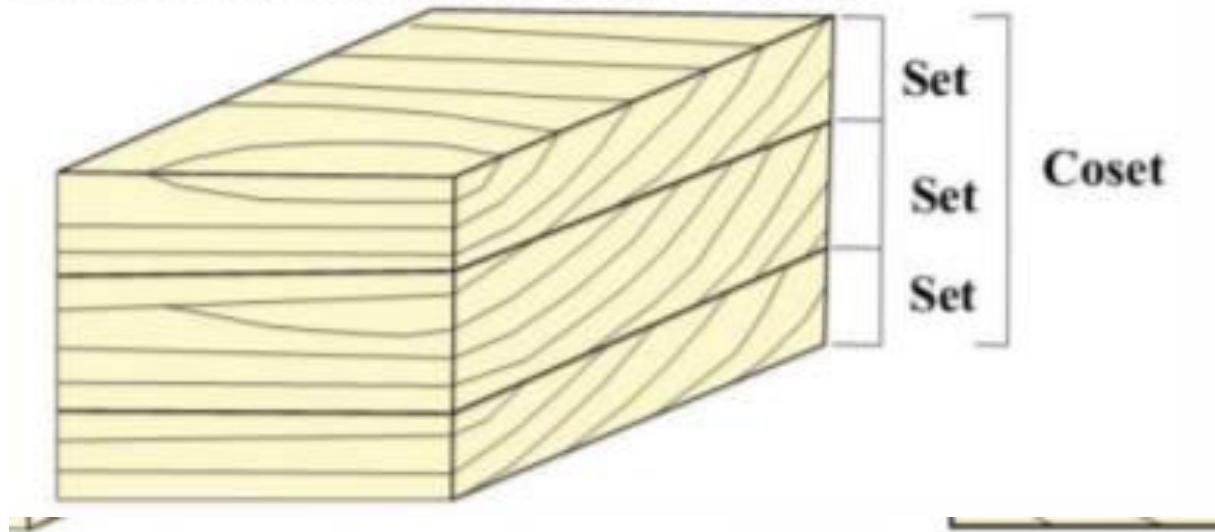
Ripples are characterized internally by cross-bedding. Cross-beds are formed in fluid flow as sediment is eroded from and transported up the relatively gentle stoss side of a ripple and deposited as avalanches on the steeper lee side. Cross-beds form in both aqueous and eolian environments.



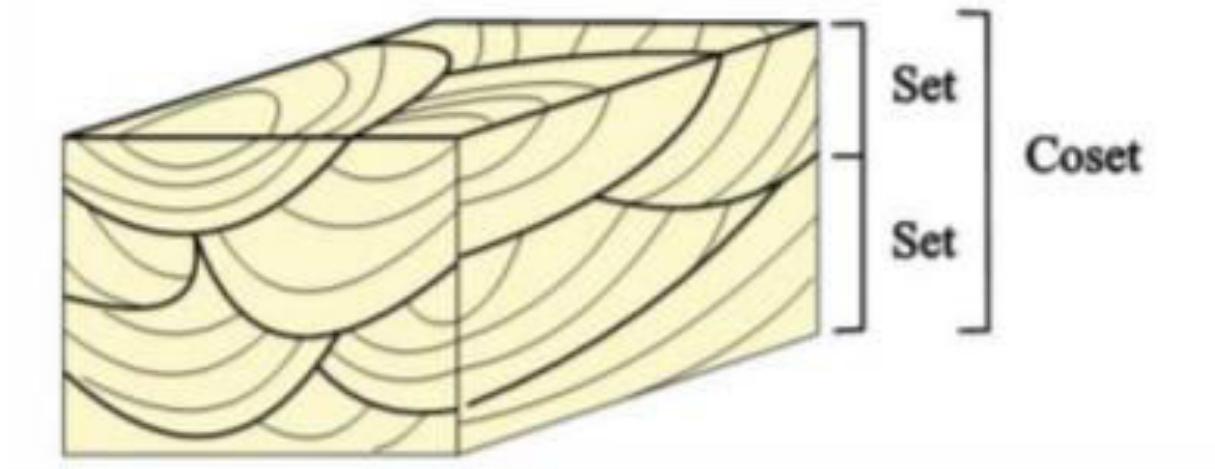




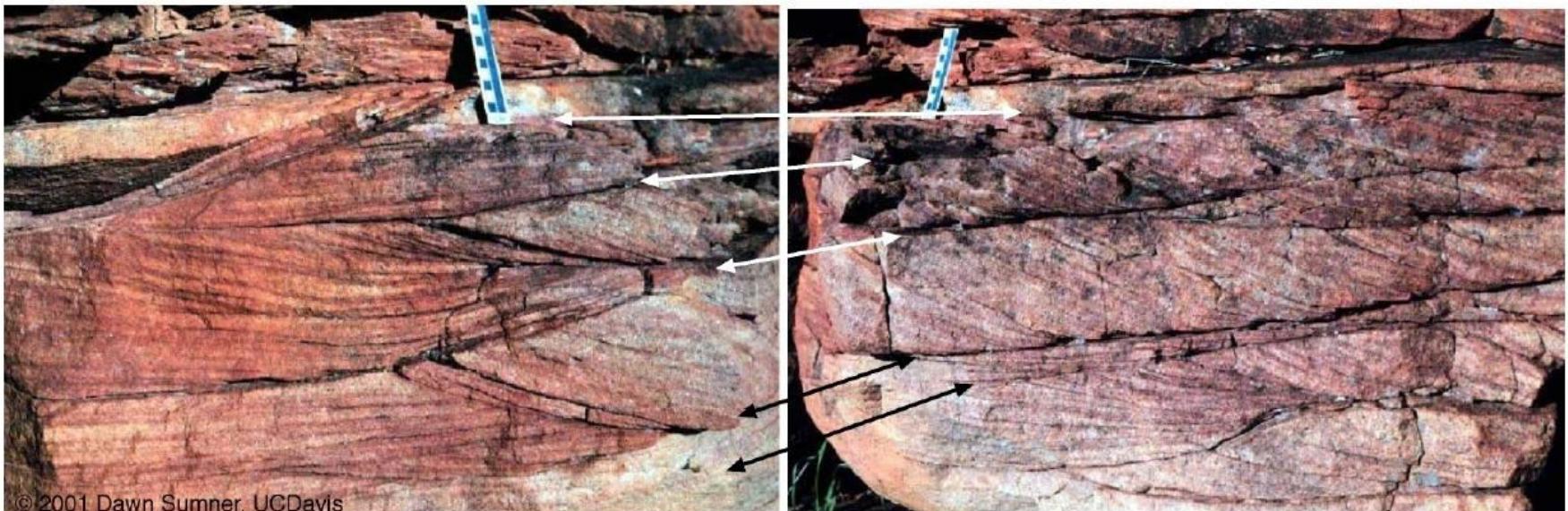
Planar tabular cross-stratification



Trough cross-stratification

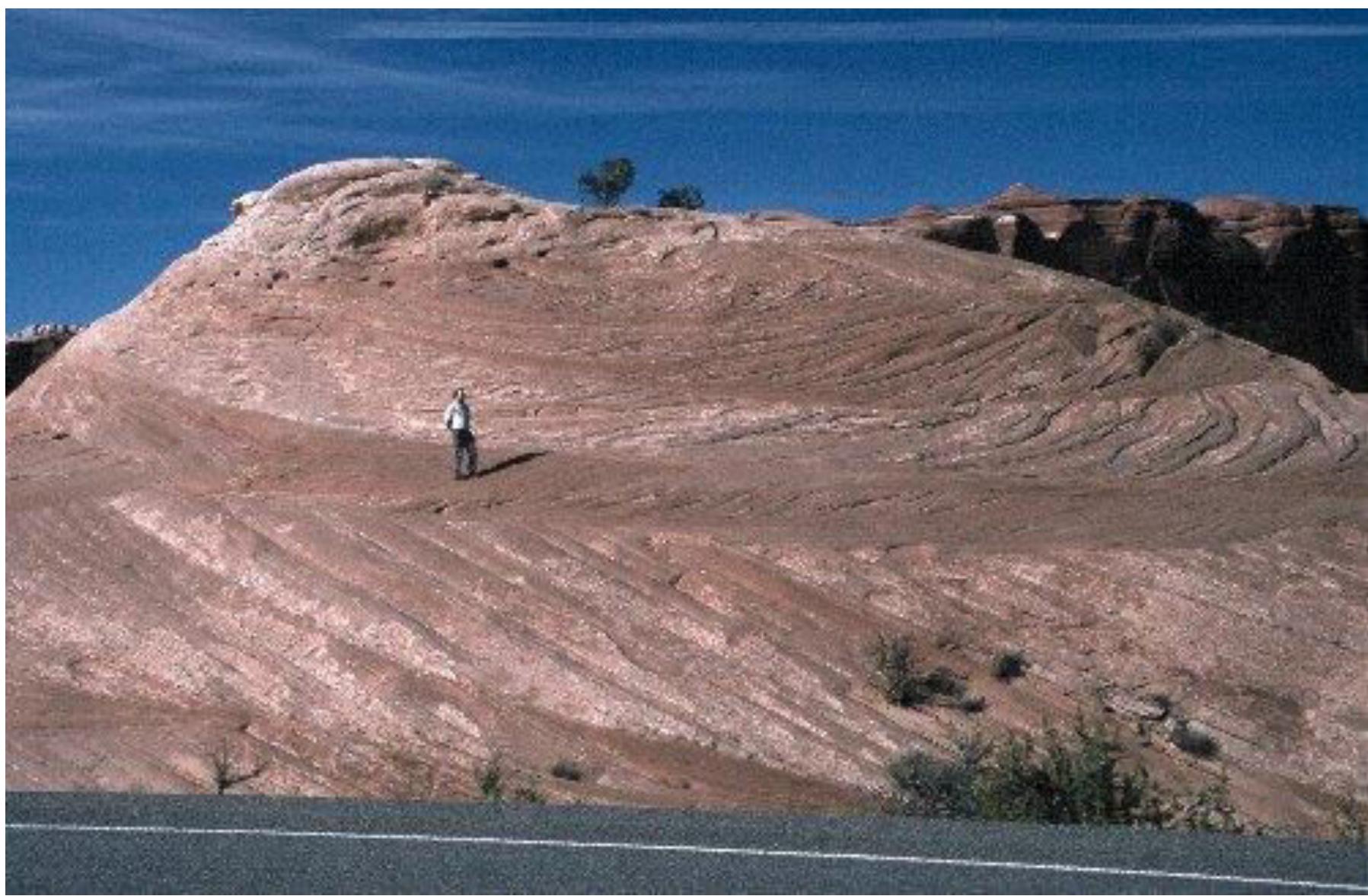


Ancient Trough Cross Stratification, Western Australia



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These photos show two views of trough cross stratification. The scale bar is at the same place in both photos and shows centimeters. Which direction was water flowing? Try to match the pattern of cross stratification to one of the USGS bedform movies. What might the geometry of the bed forms have been?



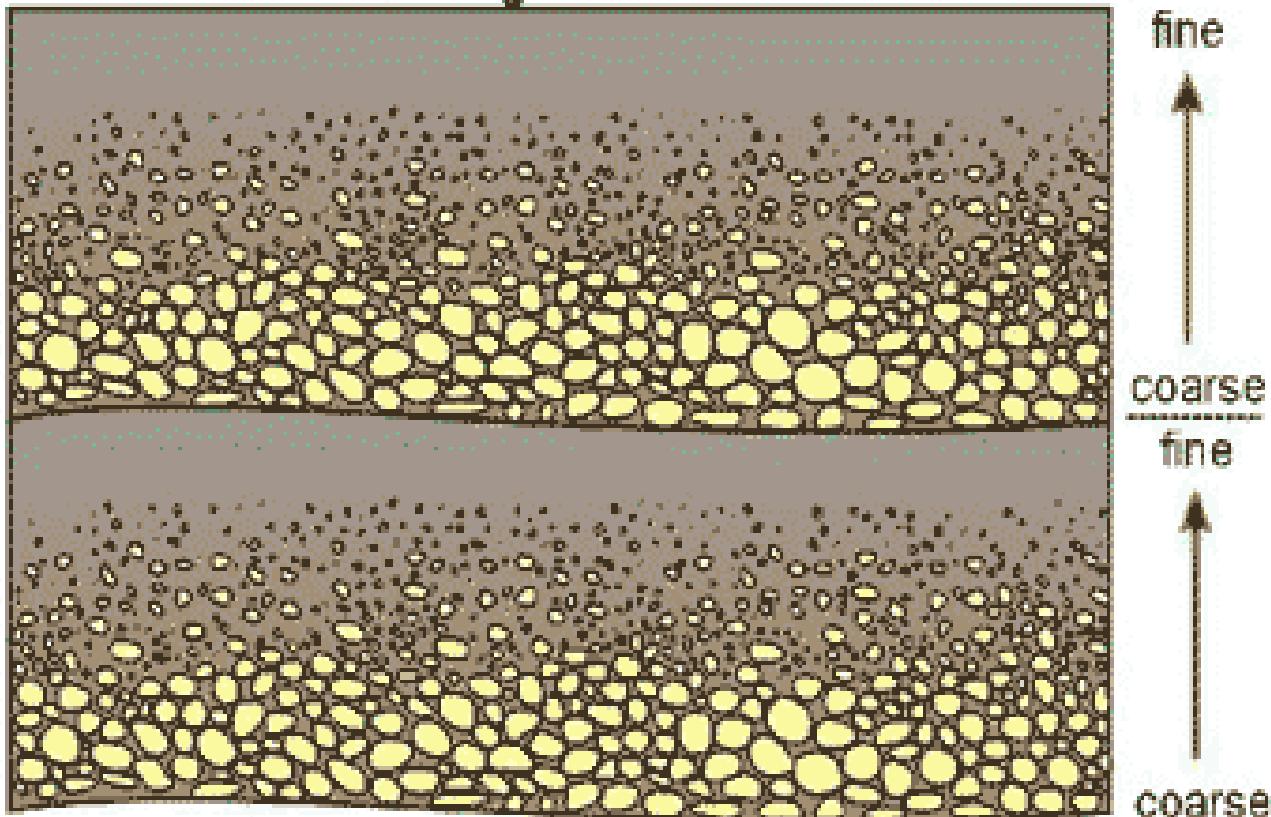
Large scale trough cross bedding

Herringbone cross bedding



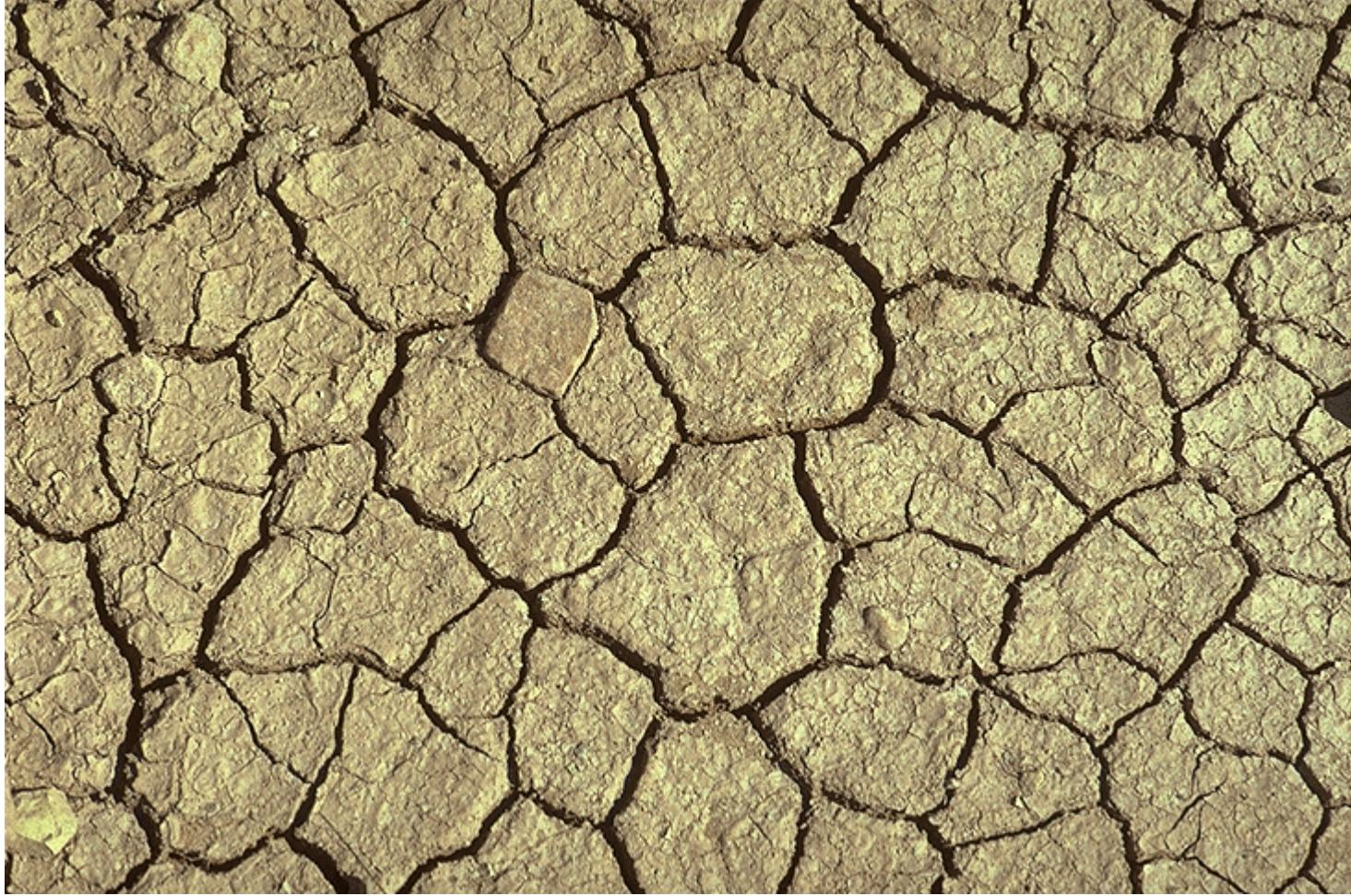
Graded bedding

Decreasing grain size upward through the bed indicating deposition from a *waning* current:









Mud cracks



Penecontemporaneous sedimentary structures
Or soft-sediment deformation structures

Load casts



blobs that form when a denser, wet sediment slumps down on and into a less dense sediment below.



Convolute lamination



Series of upright or overturned folds whose intensity dies out both upwards and downwards within a single bed.

Formed by the expulsion of water from rapidly deposited sediments by an external shock, e.g. an earthquake, the effect of large waves, or by the rising and falling of the water table through the sediment.



Sandstone or clastic dyke

A seam of sedimentary material that fills in a crack and cuts across sedimentary or other types of strata.

Often associated with earthquakes, but may be the result of debris flows, impact craters, salt domes, fault zones, or glaciers.

Cross Section Clastic Dikes

