Deltas

Deltas


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Nome oficial:

Definição:

- Delta: protuberância na costa de mares, lagunas, baías ou lagos formada pelo acúmulo de sedimentos trazidos por um rio. Os deltas se formam quando o suprimento de sedimentos fluviais supera a capacidade de redistribuição destes sedimentos por processos costeiros (Elliot, 1986)

Elementos do sistema deposicional:

- Planície deltaica
    - Canais (distributários deltaicos)
    - Baías interdistributárias
    - Planícies de maré
- Frente Deltaica
- Prodelta

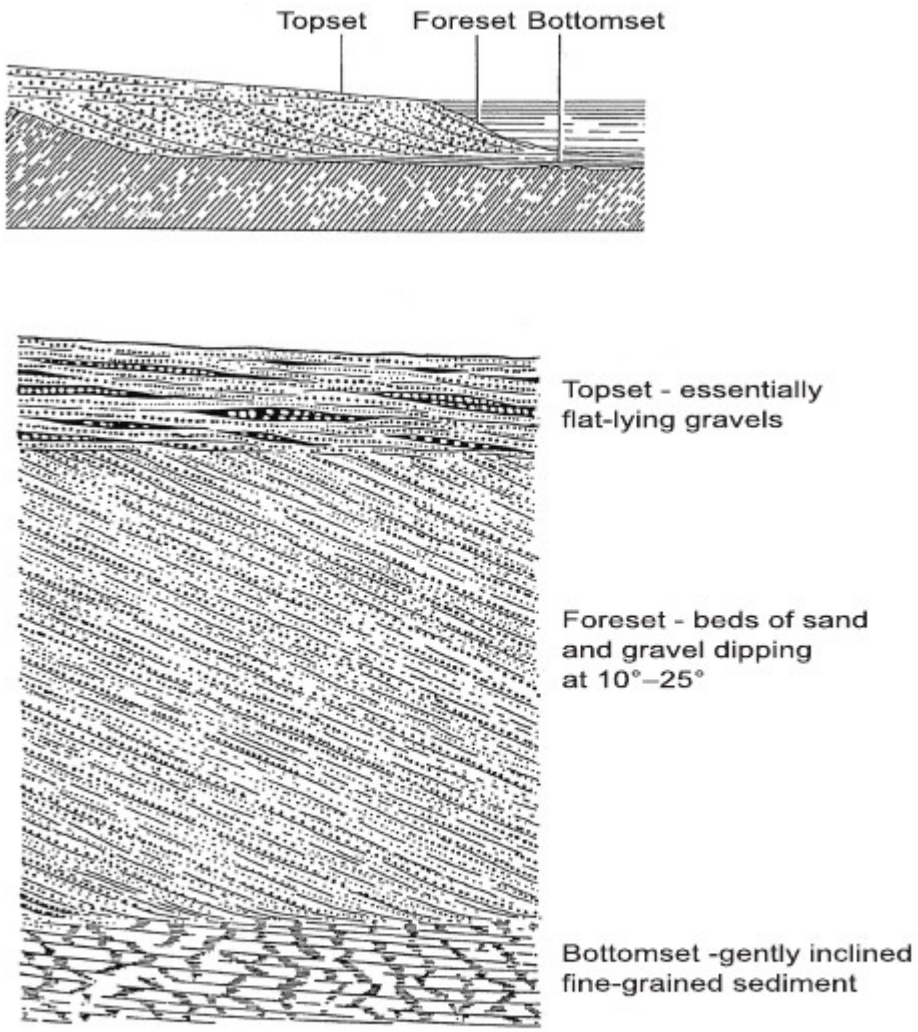
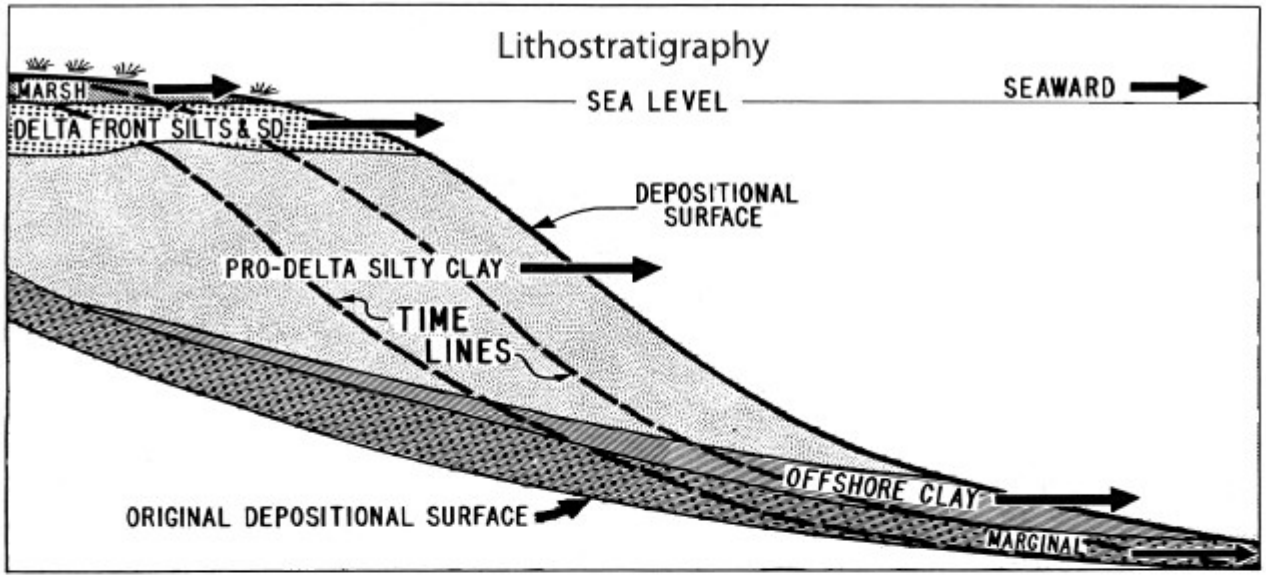
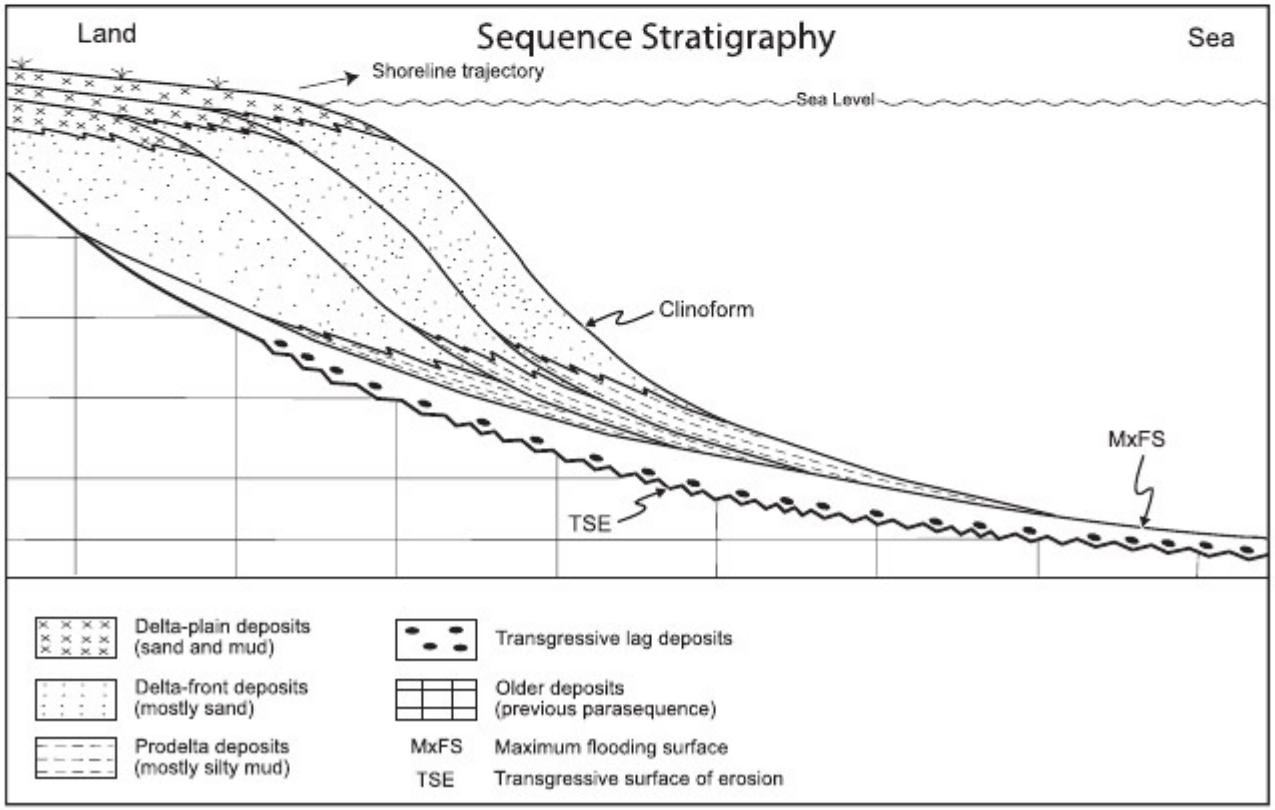


FIG. 2.—Cross-sectional facies architecture and vertical facies succession of a delta showing threefold subdivision into topset, foreset, and bottomset strata. From Elliott (1986), after Gilbert (1885) and Barrell (1912).





Early example of a delta clinoform, showing topset, foreset, and bottomset strata (Scruton, 1960). A) Lithostratigraphic representation shows facies boundaries as undulating but apparently sharp. Arrows indicate direction of progradation. Most modern delta studies still show facies contacts in this manner. B) Correct representation of facies boundaries versus timelines. Bed boundaries are more likely to follow the time lines (From Gani and Bhattacharya, 2005).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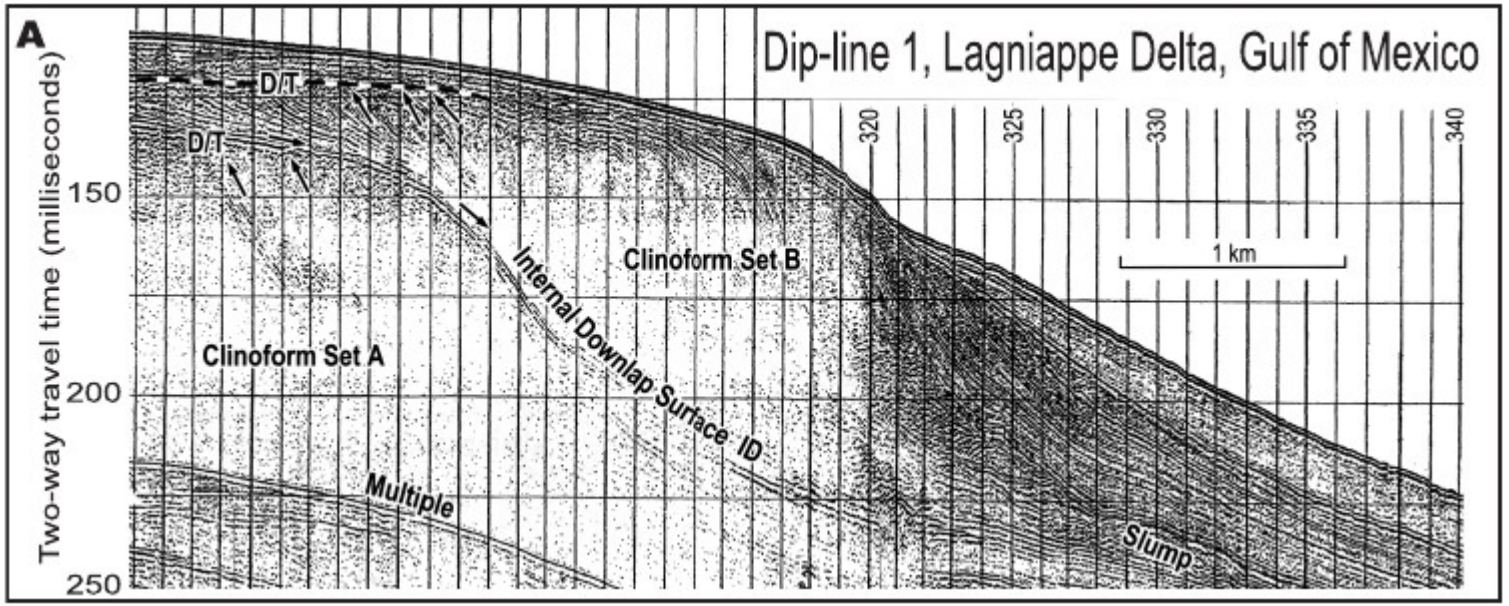
A
Dip-line 1, Lagniappe Delta, Gulf of Mexico
Two-way travel time (milliseconds)
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Clinoform Set B
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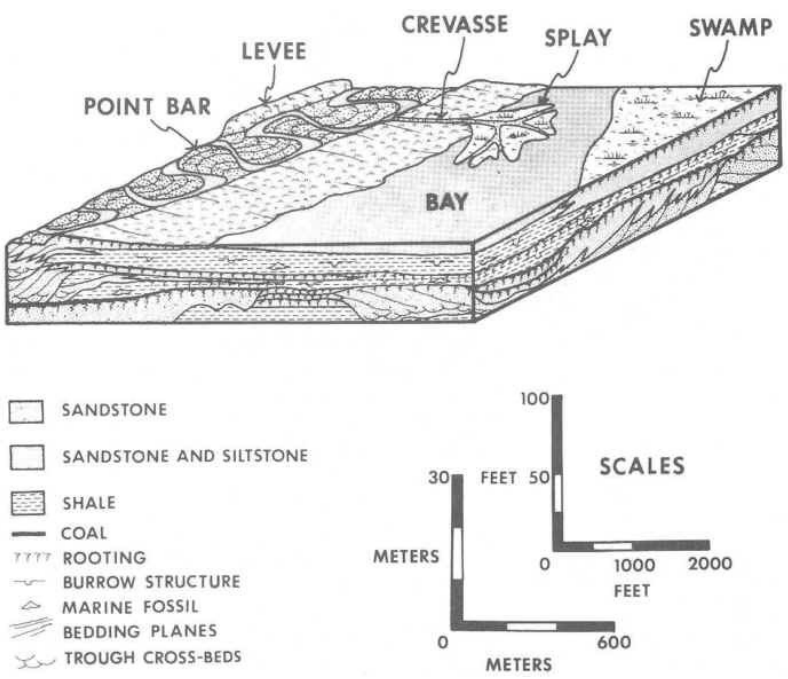
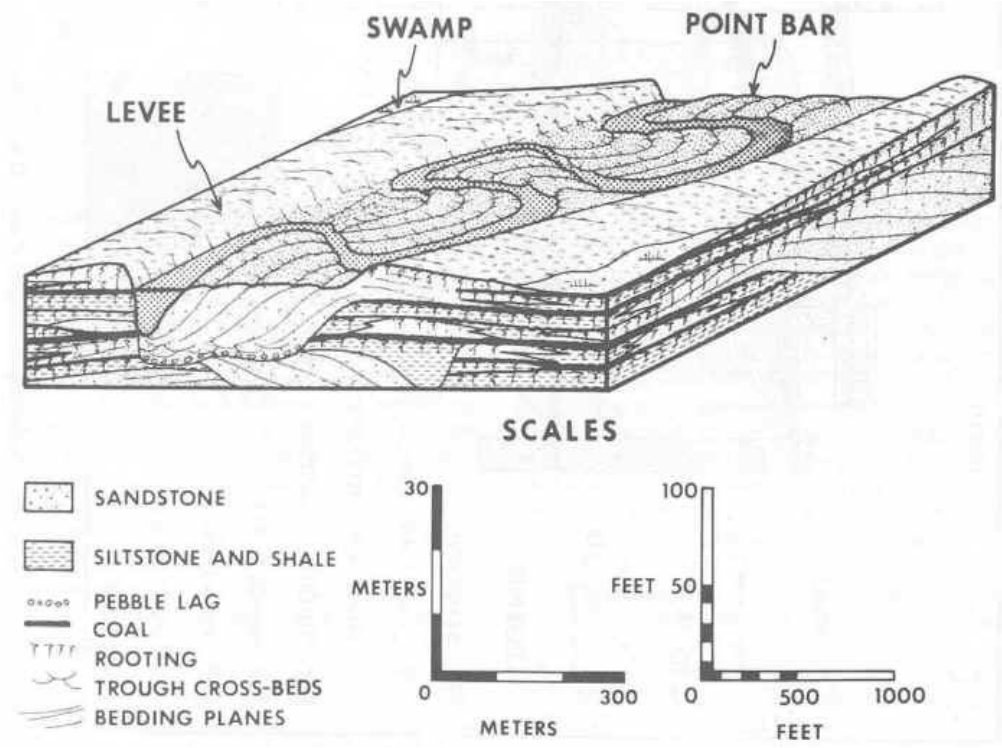
340

Planície Deltaica





-P. D. Superior – Começa quando os canais ficam distributários. Domínio de processos fluviais.

- P. D. Inferior – abaixo da linha de baía – influência de marés nos canais e planície.

-Compreende: canais distributários, pântanos, baías interdistributários e planícies de maré.

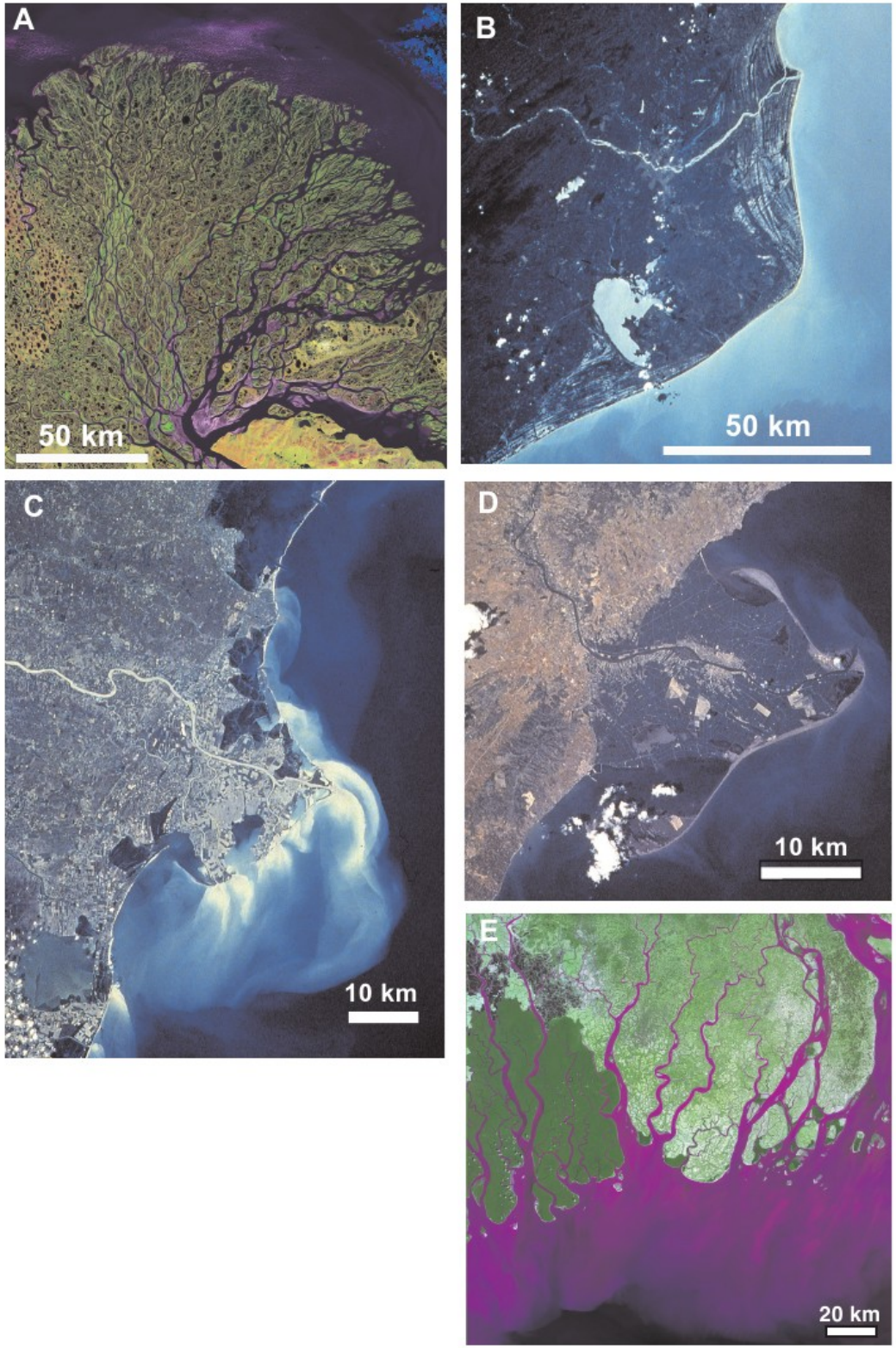


FIG. 18.—Comparison of distributary-channel branching patterns in a river-dominated versus wave-dominated deltaic coastline. A) River-dominated Lena River delta (Russian Arctic) shows numerous orders of branching with many tens of terminal distributary channels. B) Wave-dominated coastline associated with the Paraíba do Sul, Brazilian coast. C) Po delta, Italy. D) Ebro delta, Spain. Bifurcation is inhibited in wave-dominated deltas because the river is unable to prograde into the basin as rapidly. This effectively allows the river to maintain its grade, which in turn inhibits avulsion. E) Tide-dominated Ganges–Brahmaputra delta shows highly elongate channels. Photos courtesy of NASA.

Frente Deltaica:

- Barras de desembocadura

- Bifurcação de canais

- Retrabalhamento por ondas e maré

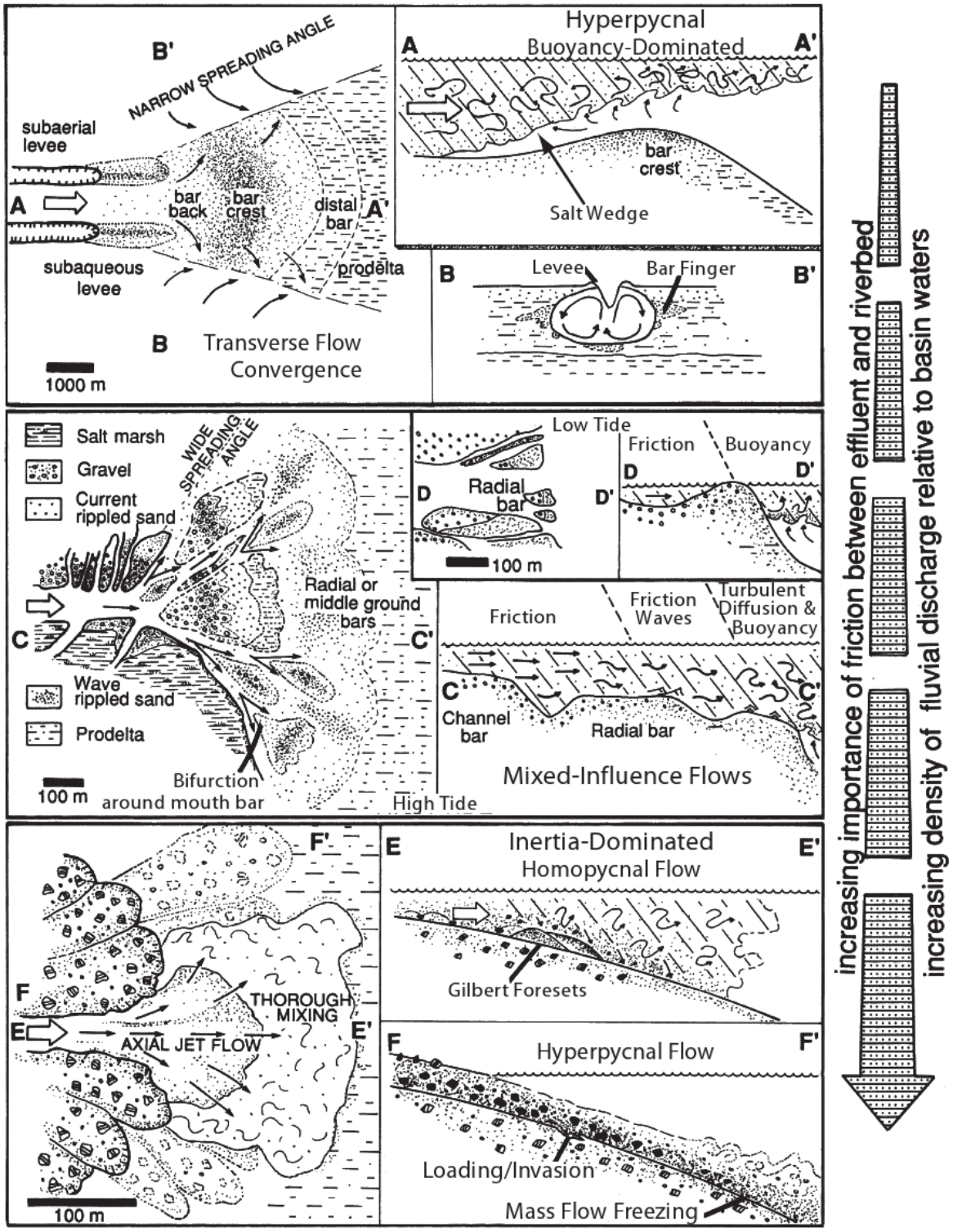
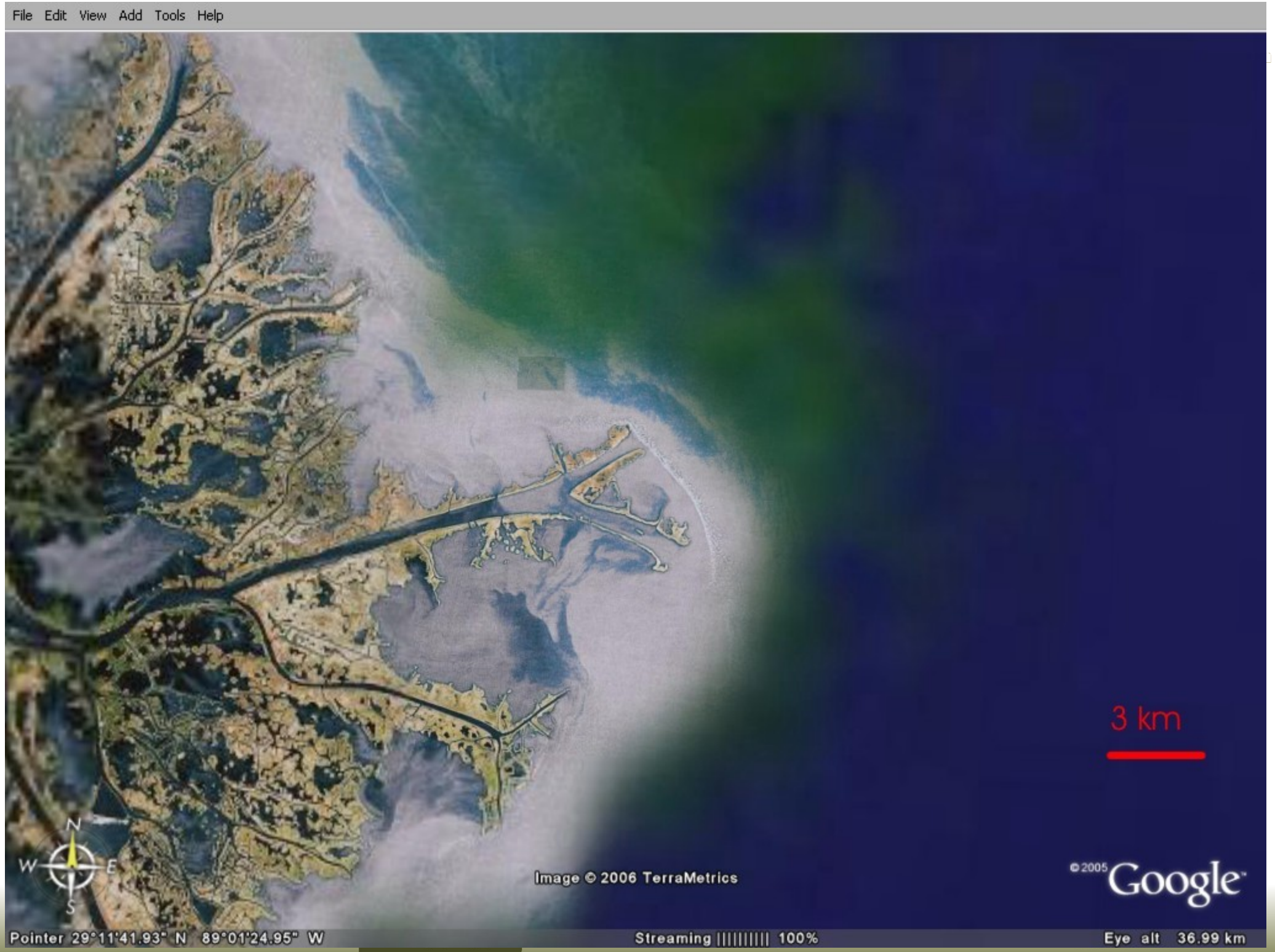


FIG. 10.—Examples of mouth-bar processes in river-dominated deltas (from Reading and Collinson, 1996, after Orton and Reading, 1993) incorporating ideas of Bates)1953), Wright (1977), and others. See text for discussion.

Fluxo hipopicnal – comum no mar. Cunha de água salgada entra nos canais-
Fluculação de argila e recobrimento de barras por finos em tração (com baixa decliviadade-
Heterolítica inclinada mesmo sem maré em barras de canal e desembocadura.

Fluxo hiperpicnal – em lagos ou no mar quando a concentração de sedimento em suspensão é alta (35 a 45 kg / m3).
Mesmo com concentrações de sedimento em suspensão baixas (1 a 5 kg / m3) pode
Ocorrer se o rio tem água mais fria que o oceano ou se entra em salobras.
Ocorre principalmente durante grandes cheias de rios pequenos.
Gera depósitos semelhantes a turbiditos, porém com fluxo de maior duração.

Fluxo homopicnal – é muito raro, pois quanquer contraste de densidade influencia o sistema.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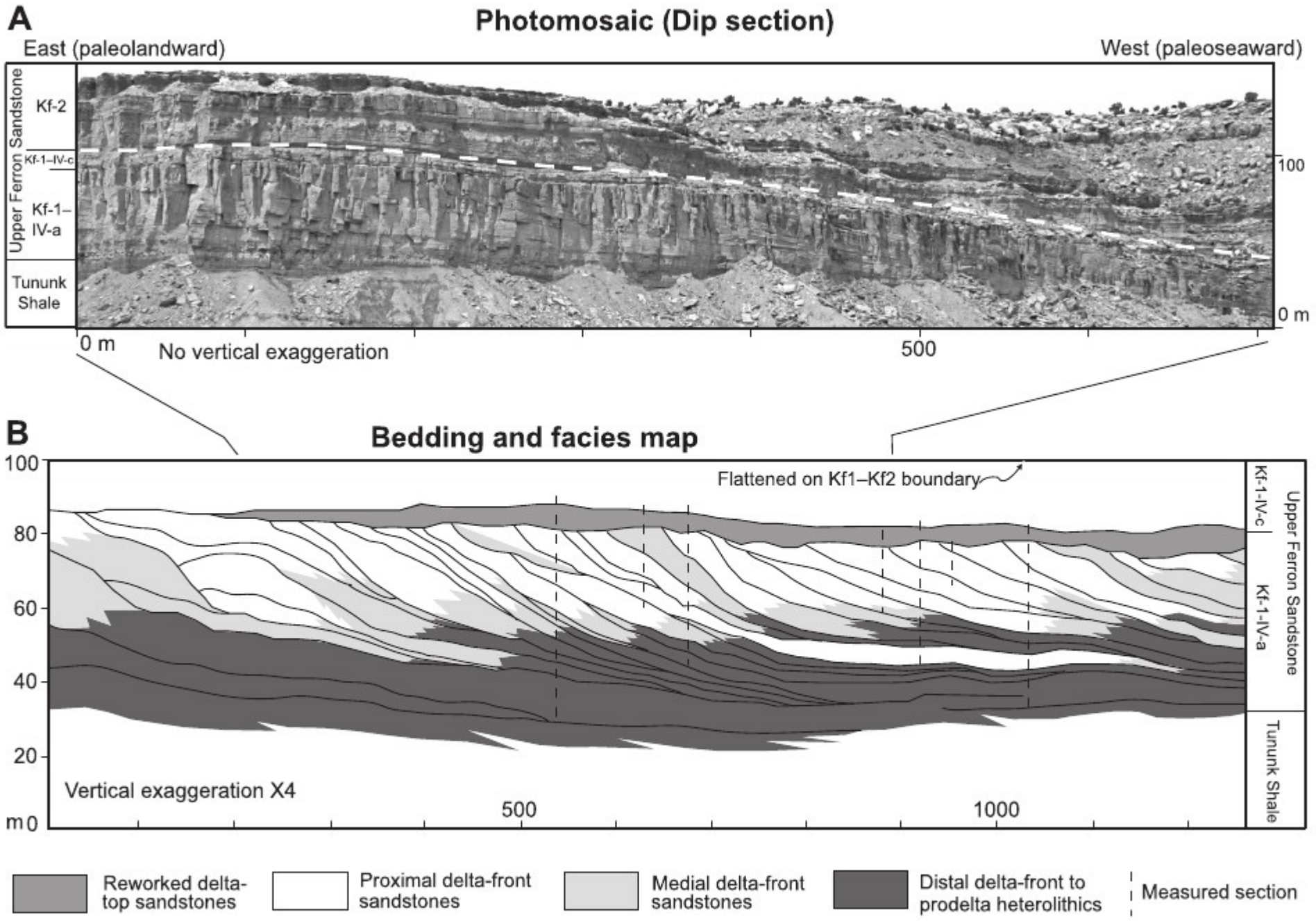


FIG. 40.—Inclined bedding (clinoforms) and facies in a river-dominated delta front of the Cretaceous Ferron sandstone member, Utah, U.S.A. **A)** Photomosaic of a cliff face. **B)** Bedding and facies geometry of the same cliff face (along depositional dip), Ivie Creek amphitheater, Emery County, Utah. The diagram shows prominent seaward-dipping clinoforms. From Gani and Bhattacharya (2005), modified after Anderson, P.B. et al. (2004) and Mattson (1997).

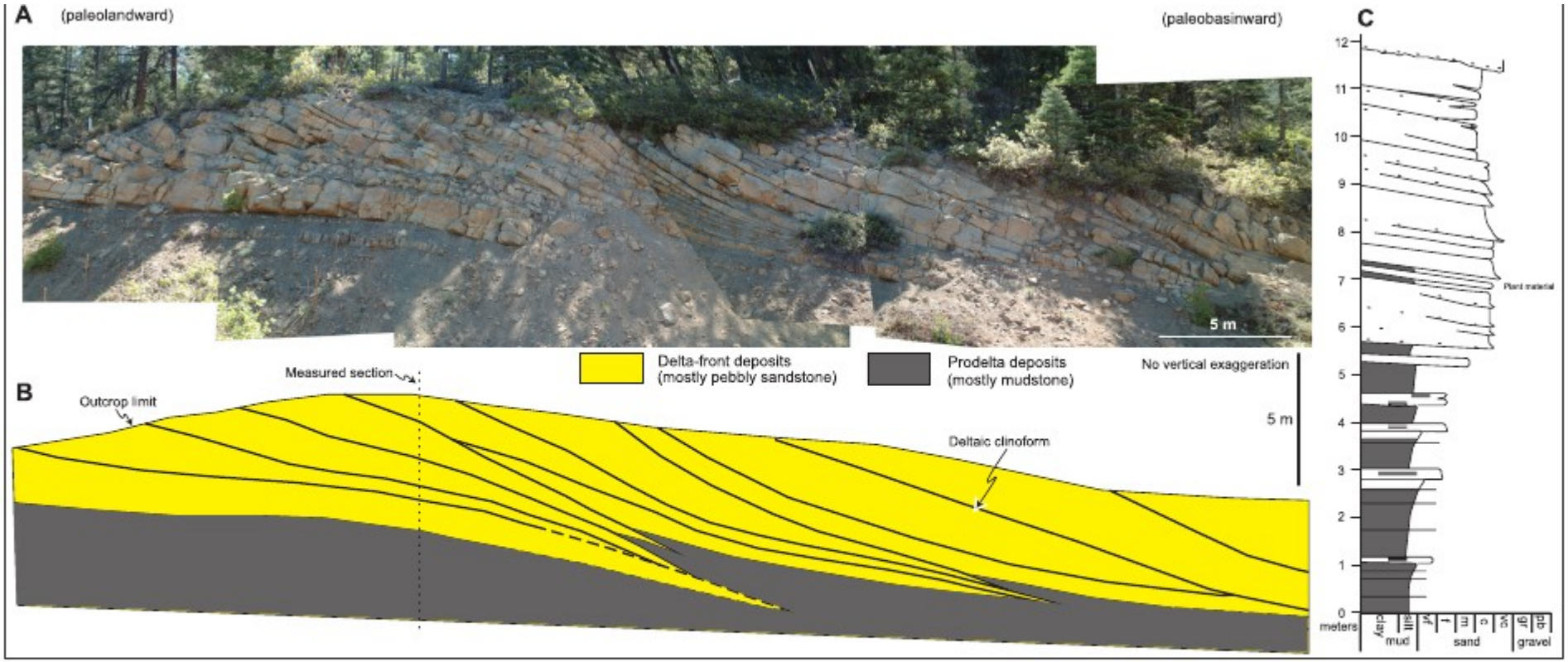


FIG. 41.—Details of facies interfingering at the base of a small-scale outcrop example of a gravelly, Pennsylvanian "Gilbert" delta, Taos Trough, New Mexico, U.S.A. **A)** Outcrop photomosaic. **B)** Line drawings of beddings with facies interpretation. Note that clinoforms are steeply dipping (average 13°). **C)** Lithologic column of this coarse-grained delta (position of the measured section is shown in Part B). From Gani and Bhattacharya (2005).

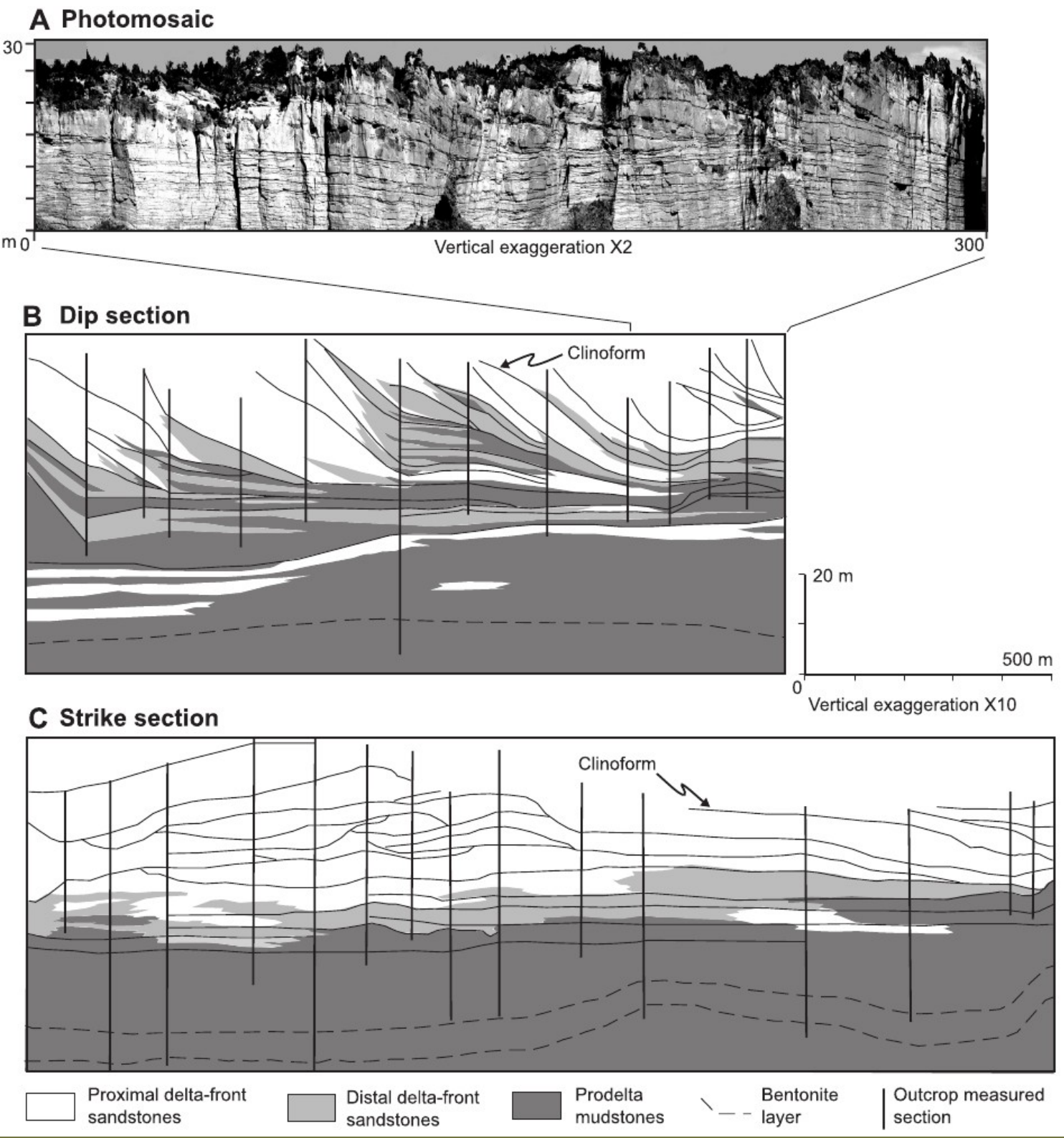


FIG. 42.—Outcrop example of complex internal architecture in the Cenomanian (Upper Cretaceous) tide-influenced river delta of the
Frewens Allomember, Frontier Formation, central Wyoming, U.S.A. Dip view (AB) of the prograding delta shows the seaward-dipping clinoforms, whereas in strike view (BC) these clinoforms show bidirectional downlap, forming a classical lens-shaped geometry. In both cases, muddy bottomset facies interfinger with the sandy foreset facies, forming a shazam-type facies boundary. Note that clinoform dip varies from 5° to 15°. Detailed facies shots and measured sections are shown in Figures 34 and 35 (modified from Willis et al., 1999).

FIG. 33.—Facies photos of wave-dominated shoreface of the Gallup Sandstone, New Mexico, U.S.A. **A)** Distance shot of wave-dominated shorefaces shows sand-dominated cliff section. **B)** Close-up of basal sandstones showing pervasive bioturbation. Large mud-rimmed burrow is *Asterosoma*. Smaller sand blebs in mud rim are *Chondrites*. **C)** Mud-pellet-lined *Ophiomorpha* burrows in cross-bedded shoreface sandstones in middle part of cliff. These suggest a wave-dominated shoreface characterized by the *Skolithos* ichnofacies. **D)** Bidirectional cross bedding in the upper shoreface.

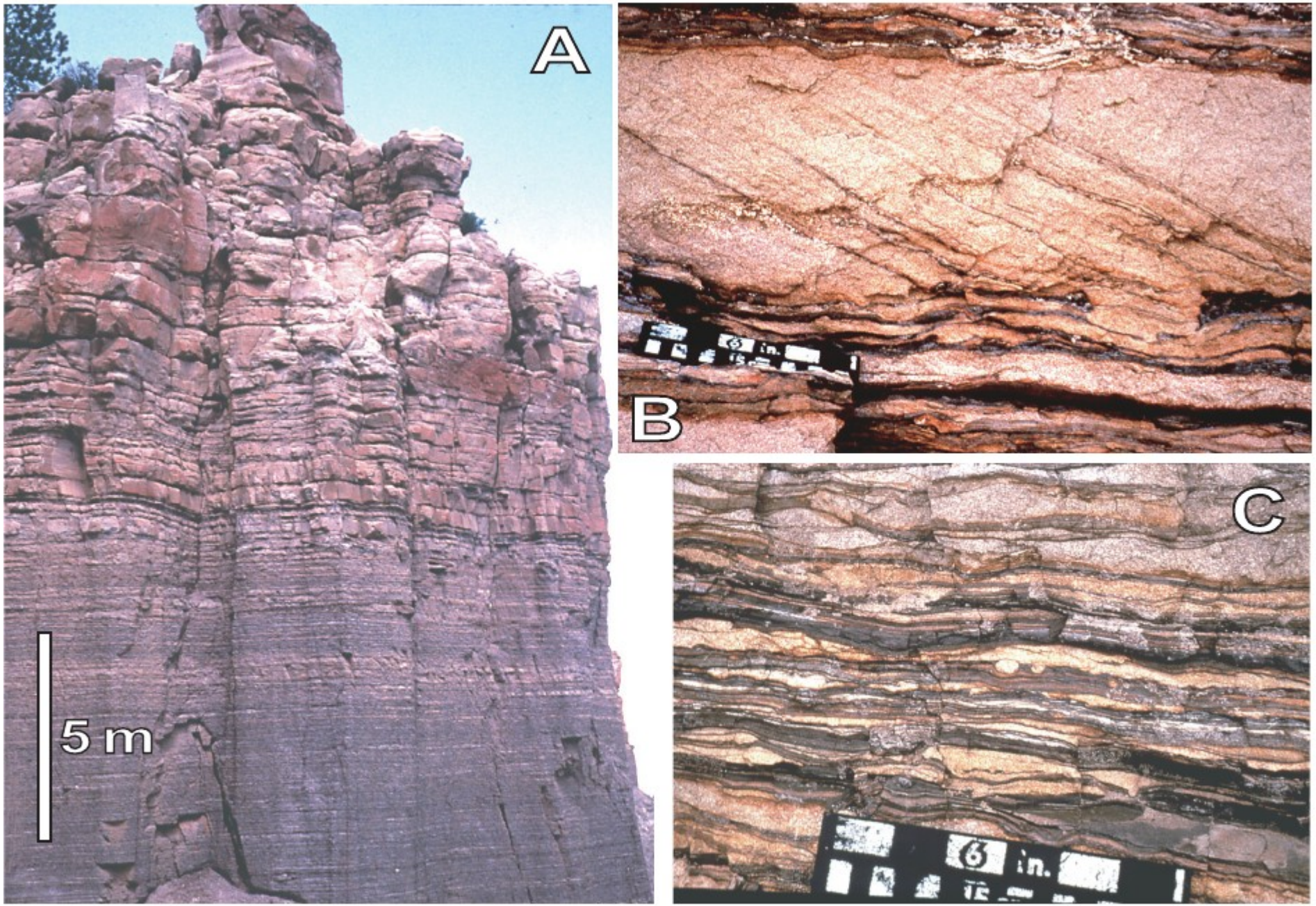


FIG. 35.—Tide-dominated delta front of the Cretaceous Frewens sandstone, Wyoming, U.S.A. **A)** Upward-coarsening facies succession (see measured section in Figure 34). **B)** Double mud drapes indicative of tidal modulation. **C)** Heterolithic, lightly burrowed subtidal prodelta facies at the base of the succession. Bedding architecture is shown in Figure 42.

Prodelta:

- Decantação de finos

- Aporte de areia por correntes de turbidez

Tipos de deltas:

- Deltas dominados por rios (pouco retrabalhamento por processos costeiros)

- Deltas dominados por ondas

-Deltas dominados por marés

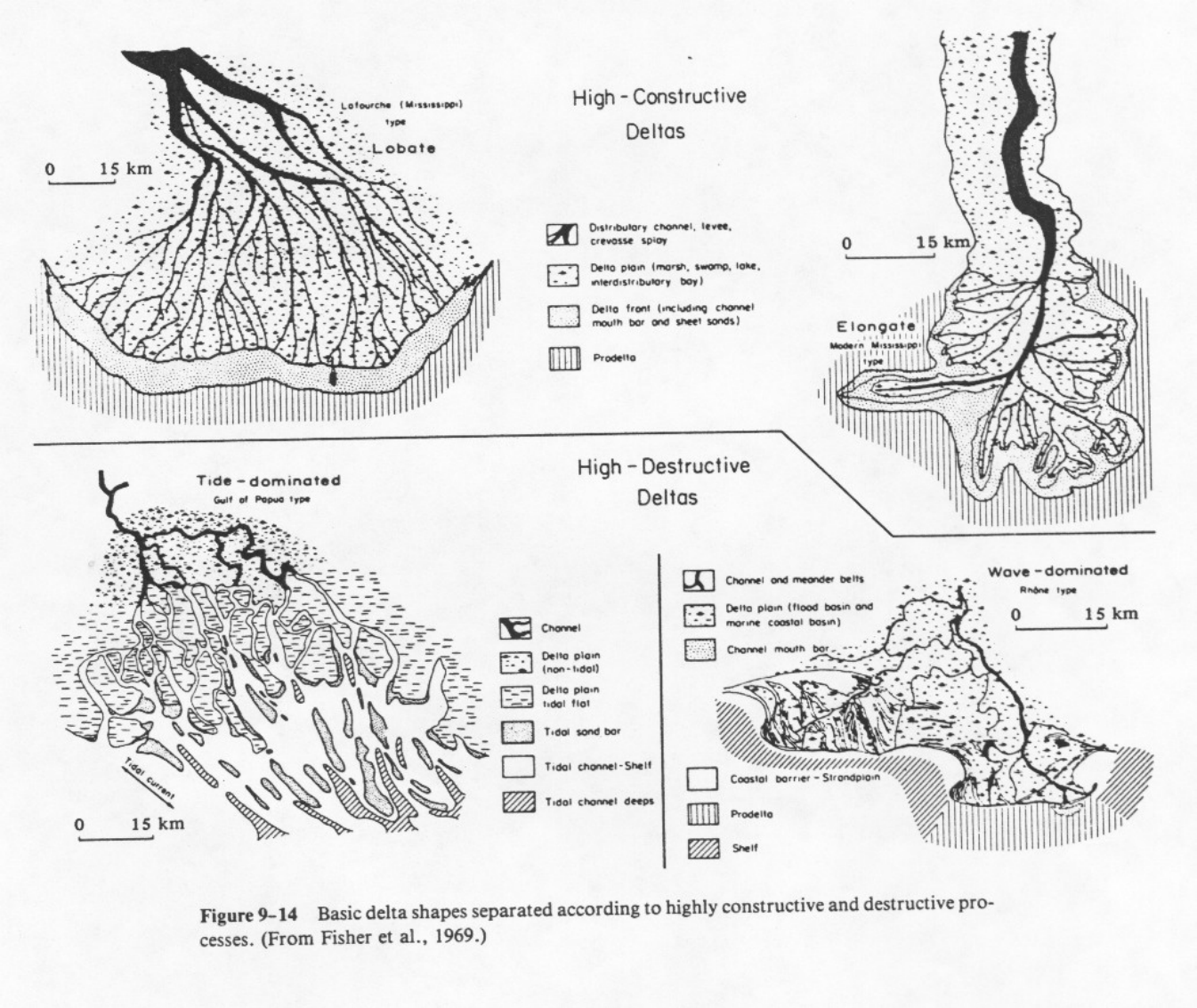
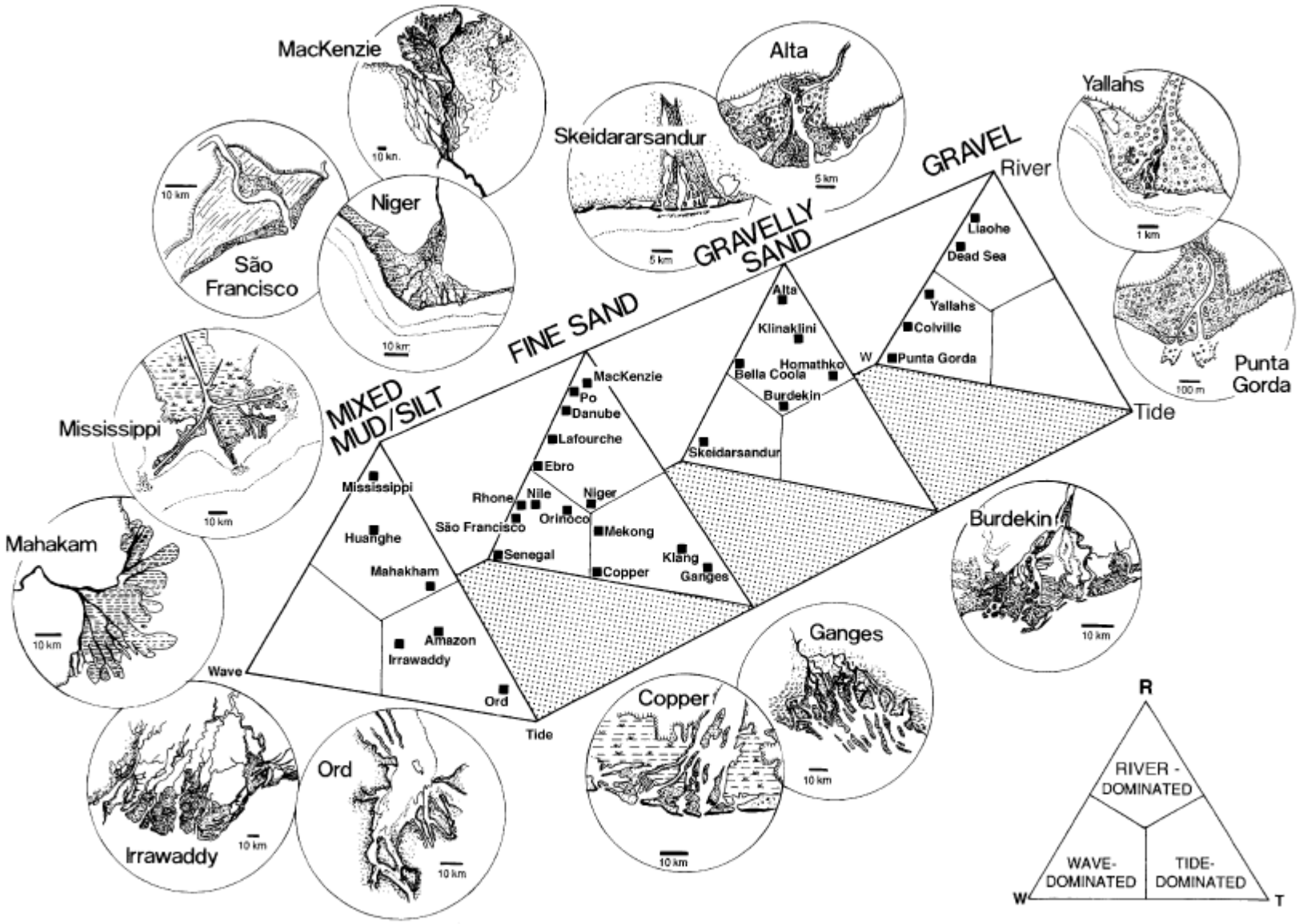


Figure 9–14 Basic delta shapes separated according to highly constructive and destructive processes. (From Fisher et al., 1969.)



g. 21.—Delta triangle of Galloway (1975) is extended to include sediment caliber as a fundamental control (from Reading and Collinson, 1996, after Orton and Reading, 1993).

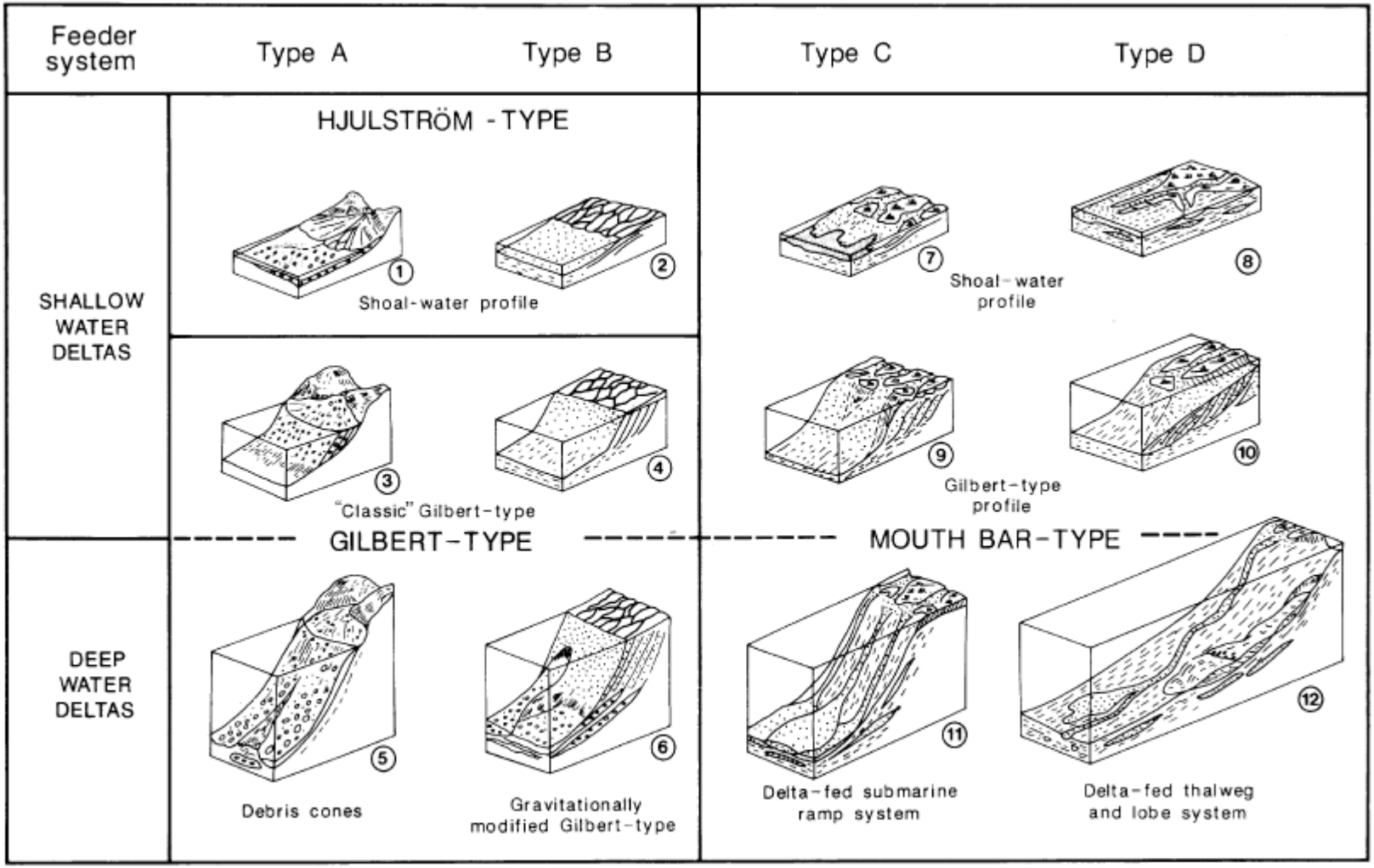


FIG. 22.—Classification of coarse-grained delta types incorporating type of feeder system, water depth, and type of mouth-bar process (from Reading and Collinson, 1996; after Postma, 1990).

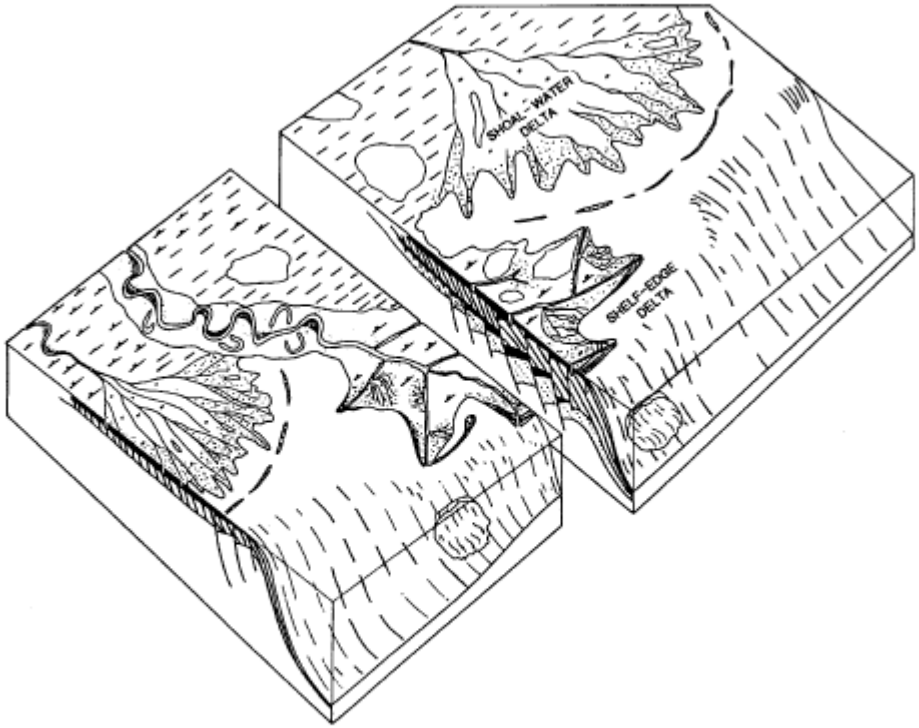
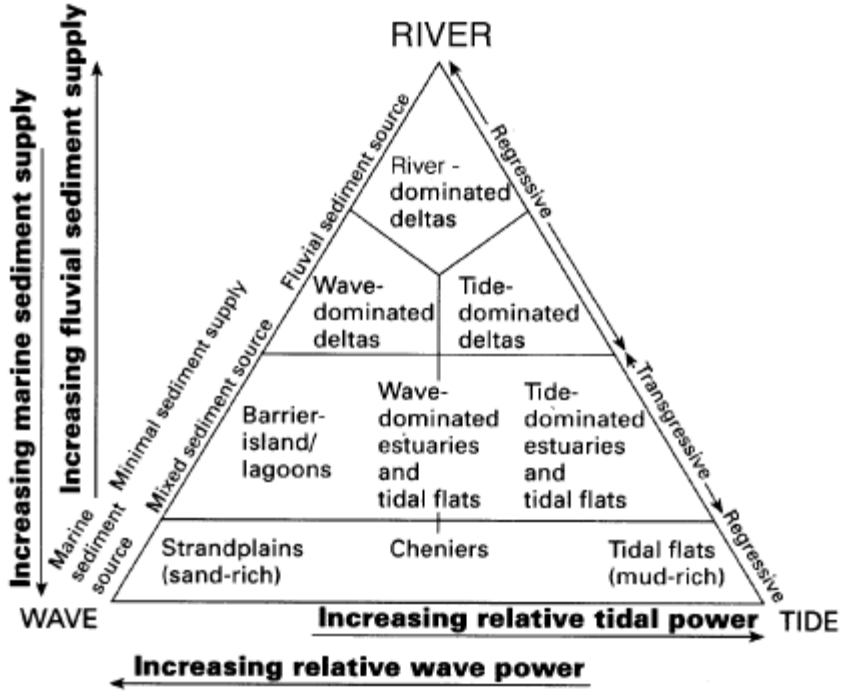


FIG. 24.—Block diagram contrasting lobate shoal-water (or shelf-phase) deltas and shelf-edge deltas. Note thickening of facies across growth faults in the shelf-edge delta (From Bhattacharya and Walker, 1992; after Edwards, 1981).



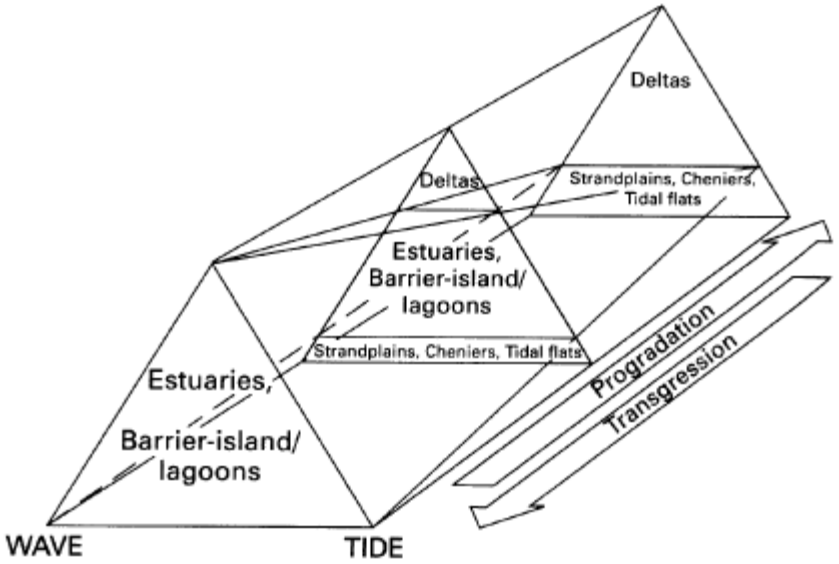
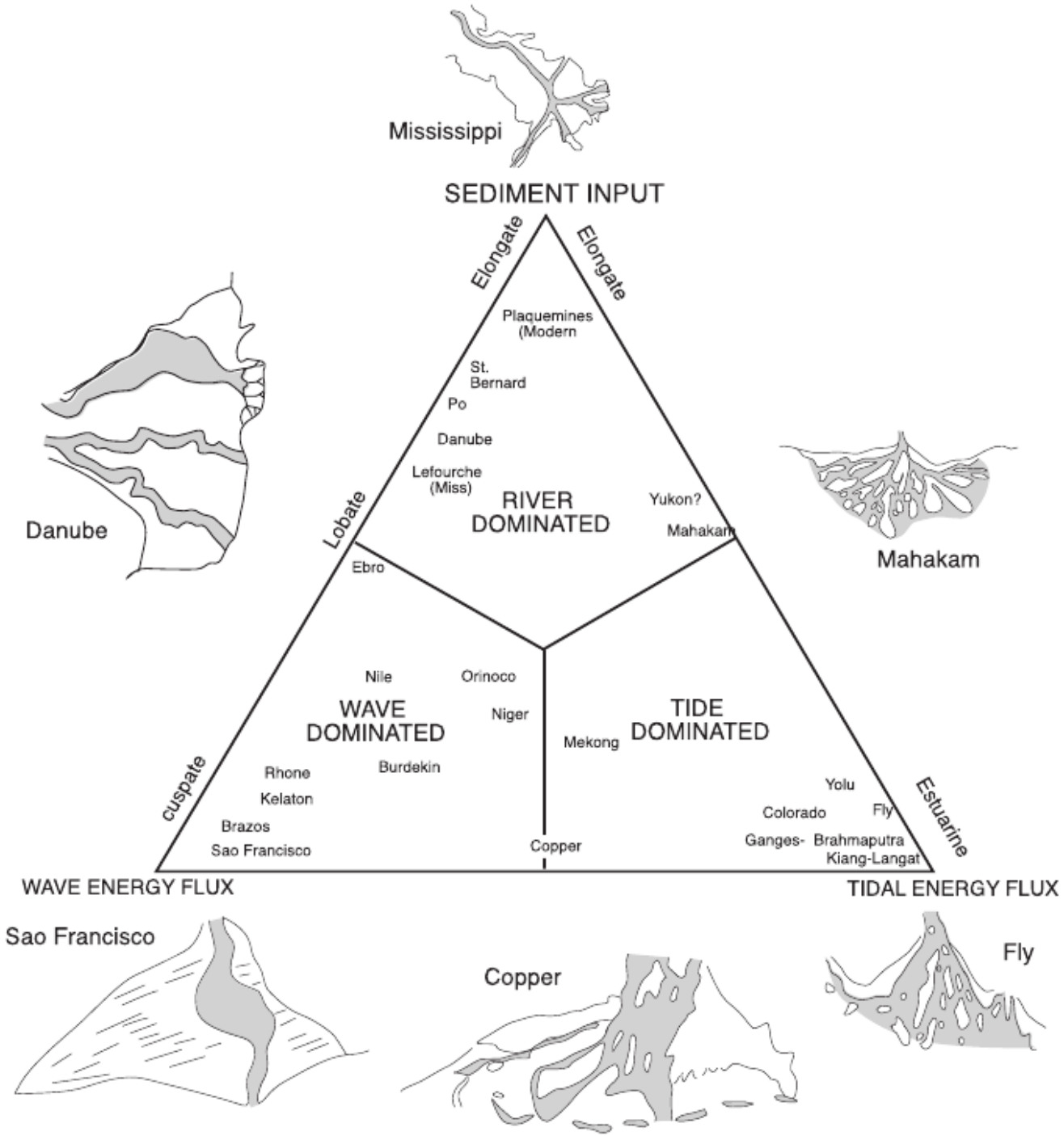


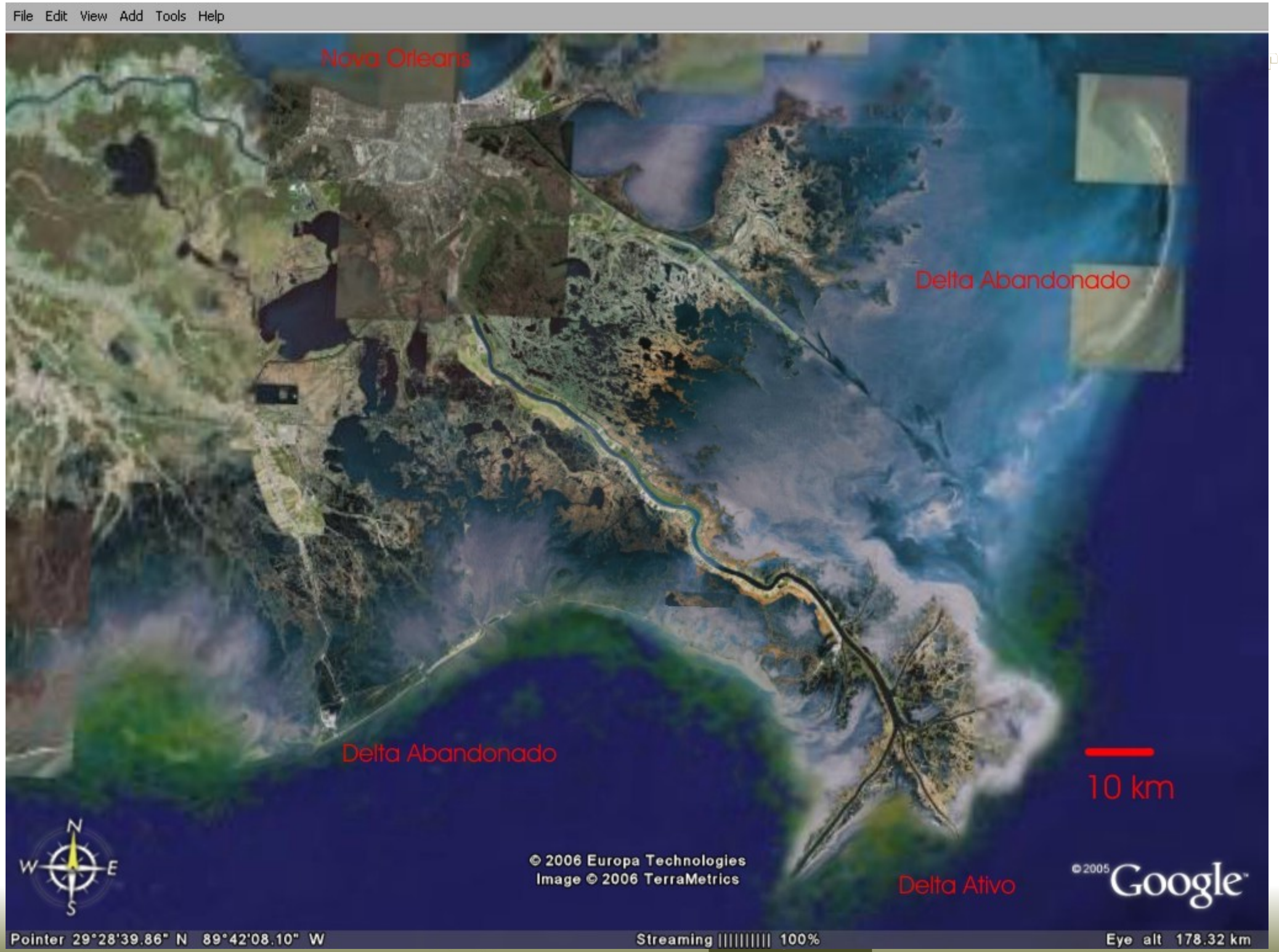
FIG. 23.—Delta triangle of Galloway (1975) as extended by Dalrymple et al. (1992) to reflect changes in sediment supply (from Reading and Collinson, 1996)



. 5.—Tripartite classification of deltas, into river-, wave-, and tide- dominated end members (Galloway, 1975). Tide-dominated end members are noted as being "estuarine". This prompted Walker (1992) to abandon the concept of a tide-influenced delta. Also note that the São Francisco and Brazos deltas are considered as type examples of wave-dominated end members.

Deltas Dominados por rios

- Ex: Mississipi
- -Processos importantes: progradação de barras de desembocadura e “crevasse splay” em baías interdistributários.
- -Estruturas geradas por ondas são raras.
- -Altíssima taxa de deposição.
- -Pelitos de prodelta com grau de bioturbação variável.
- -Deformação sin-sedimentar freqüente.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Streaming 100%
Eye alt 178.32 km

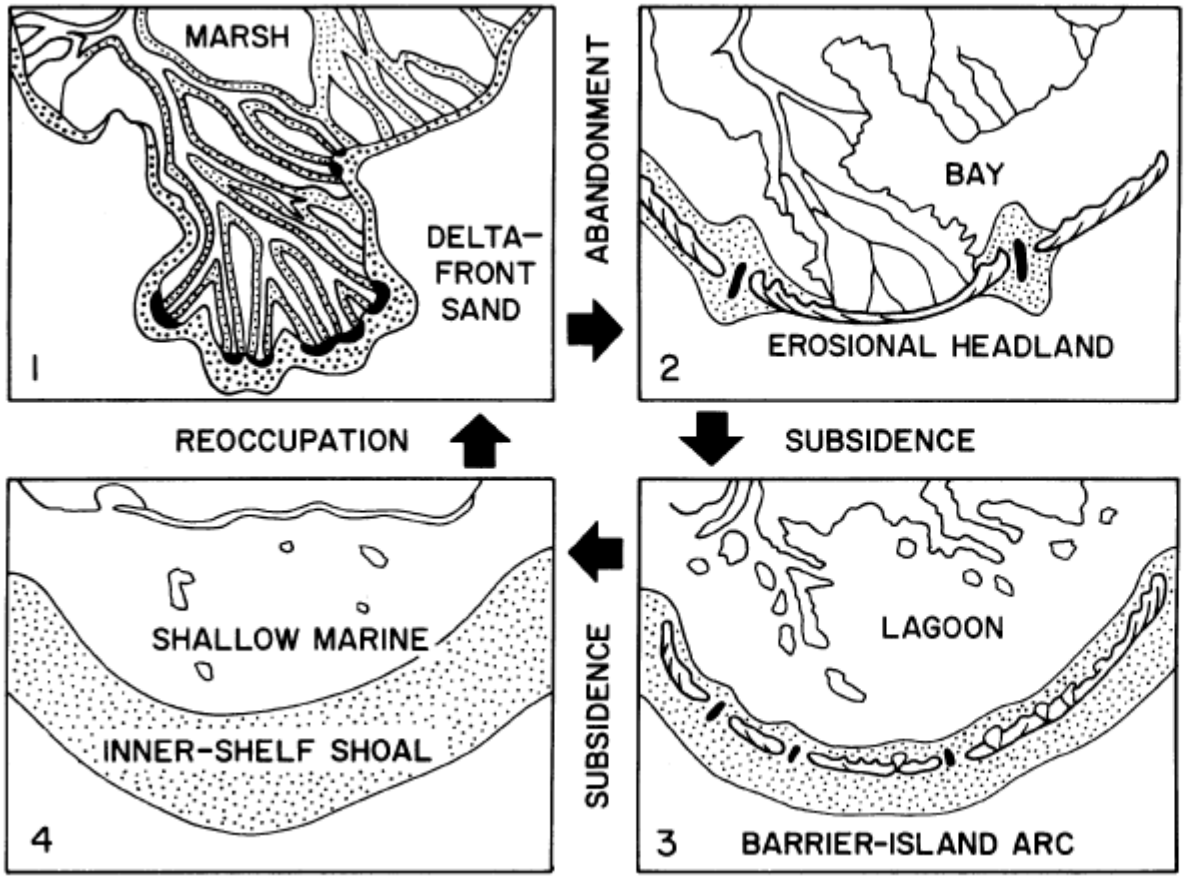

FIG. 7.—Evolution of Mississippi delta lobes from progradation to abandonment (from Boyd et al., 1989). Delta goes through an initial cycle of progradation, during which it shows a river-dominated character. As it is abandoned, it forms into a barrier-lagoon system. The barrier is ultimately drowned to form a relict shelf shoal.

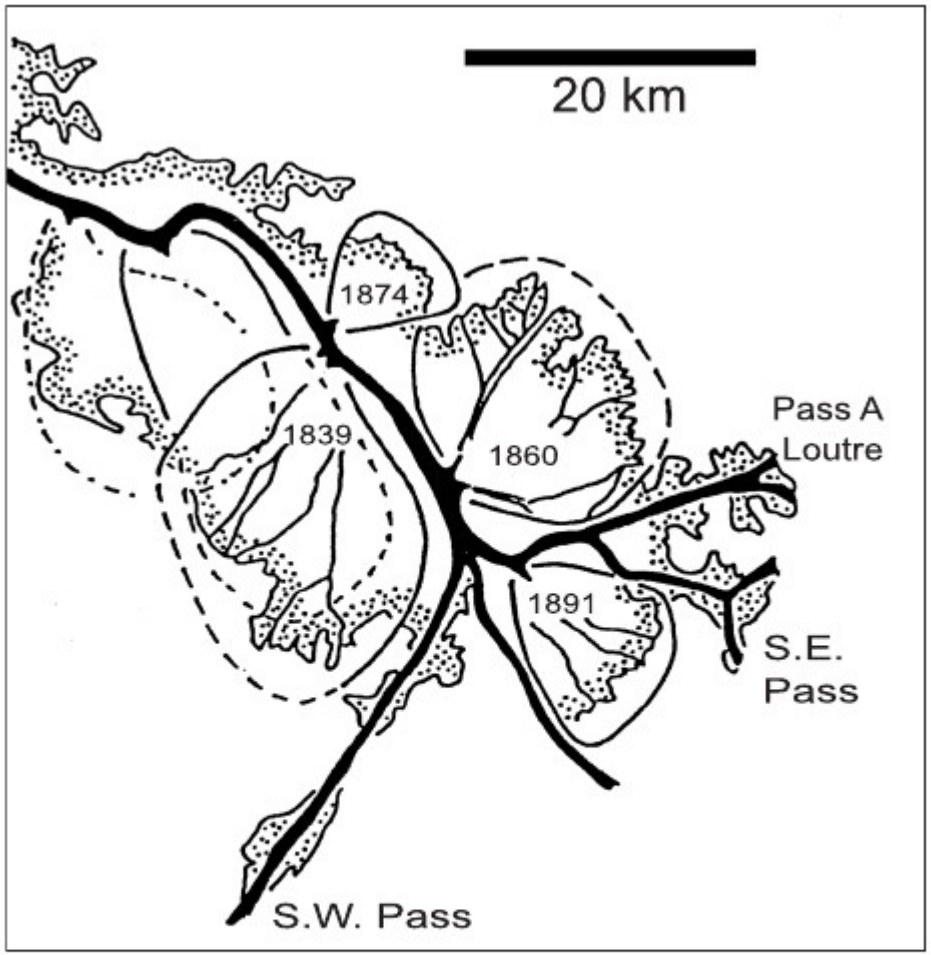

FIG. 8.—Infilling of interdistributary bays by historically dated crevasse "subdeltas" in the modern Mississippi birdfoot delta. Note the large variation in scale of deltas and distributary channels. At least three orders of branching can be discerned (from Bhattacharya and Walker, 1992; simplified from Coleman and Gagliano, 1964).

- Deltas dominados por ondas

- Ex: Nilo
- - Formam barras de areia paralelas à costa.
- - Abundância de estruturas sedimentares geradas por onda.
- - Taxa de sedimentação menor.
- - Pelitos de prodelta intensamente bioturbados.

- - Pouca deformação sin-sedimentar.

Delta do Nilo


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Streaming 100%
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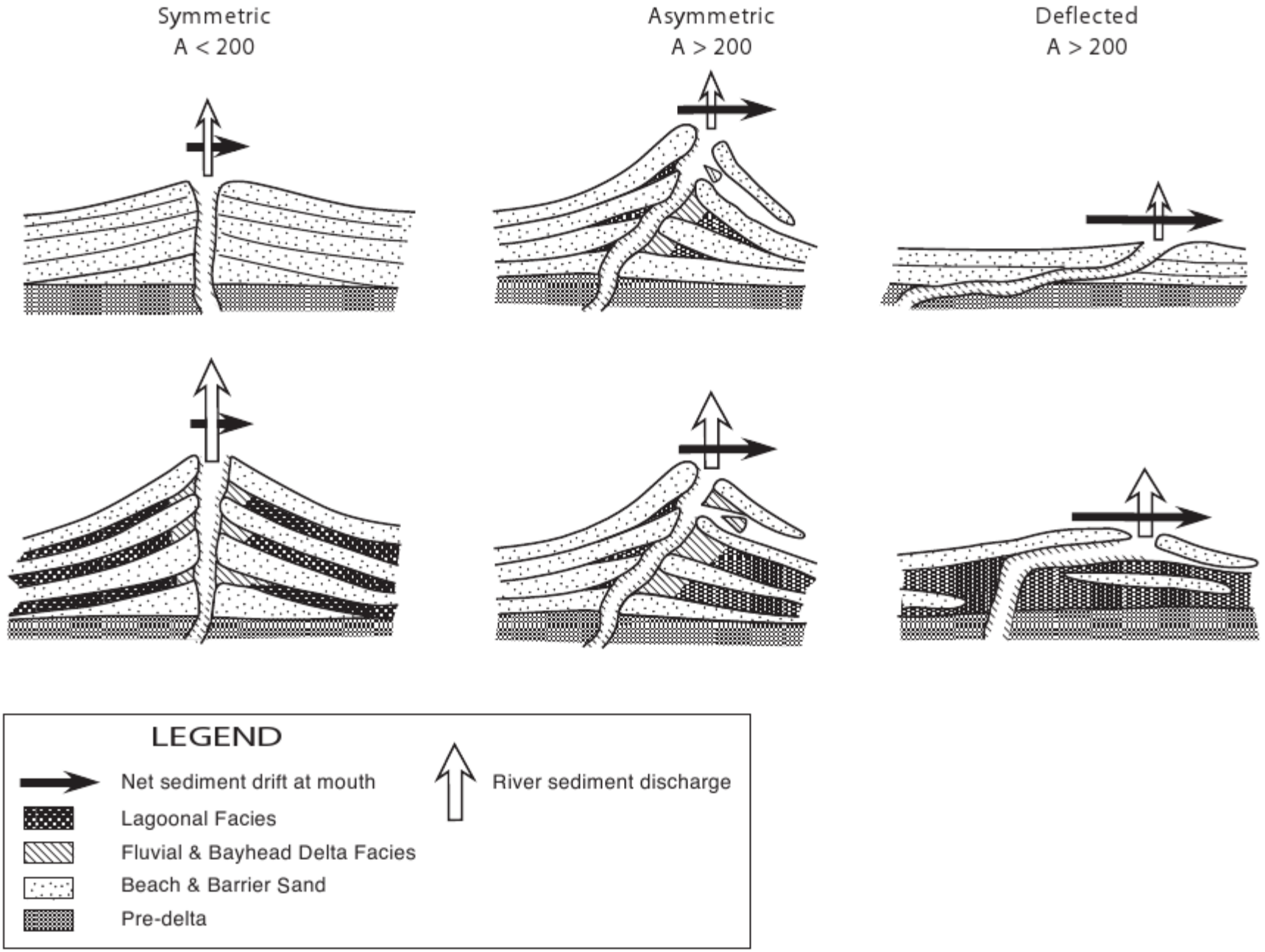
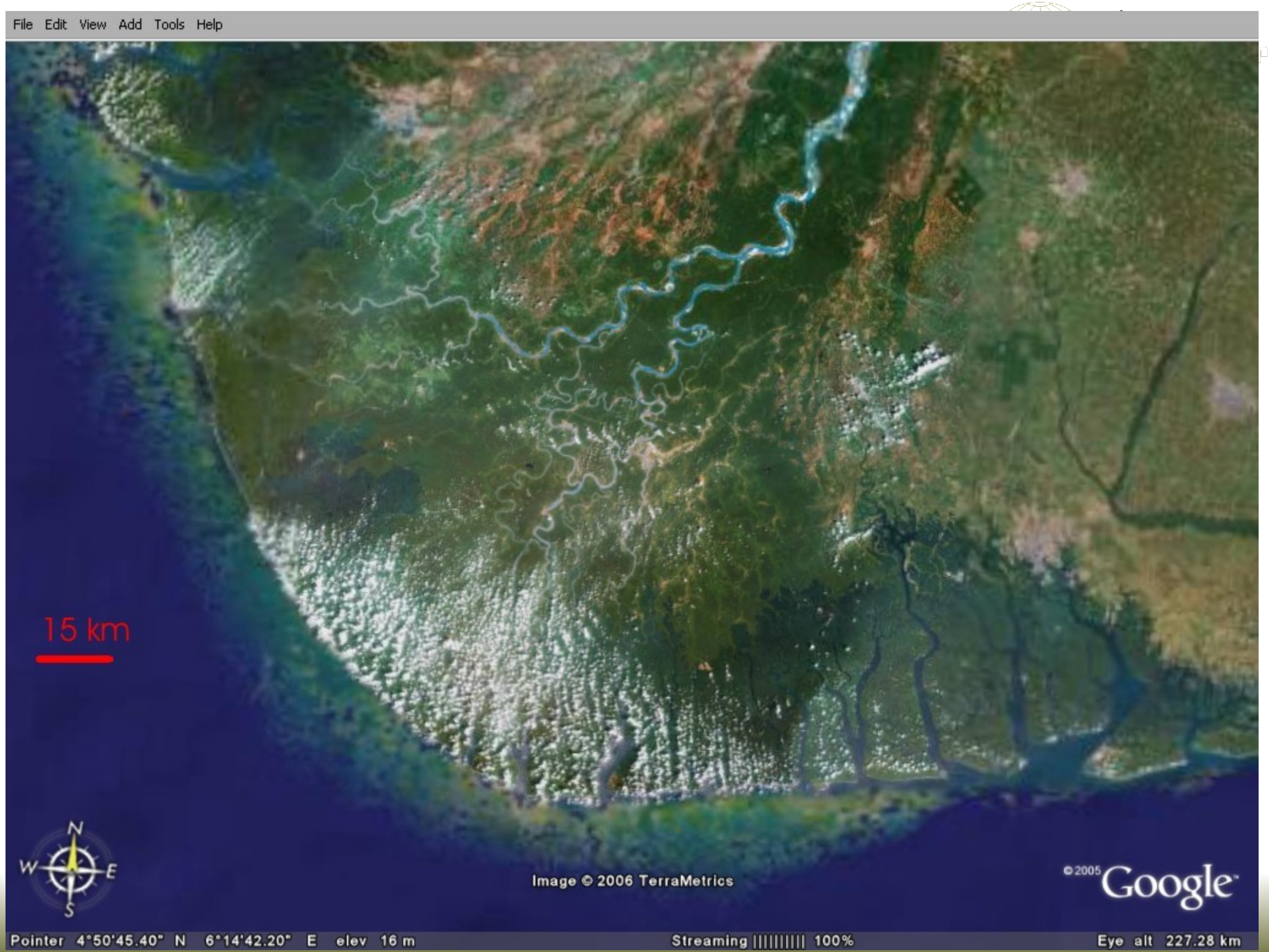


FIG. 6.—Morphology of wave-influenced deltas. Top row represents lower fluvial discharge compared to bottom row. River plume acts as a groyne that traps sediment updrift (after Bhattacharya and Giosan, 2003). Asymmetry index represents the ratio of fluvial sediment discharge to alongshore sediment transport rate.

- Deltas dominados por marés

- Ex: Rio Niger
- - Formam barras segmentadas por canais de maré.
- - Sedimentos arenosos se concentram nos canais distributários e nas barras de desembocadura modificadas pela maré.
- - Zona de prodelta pode receber sedimentos arenosos.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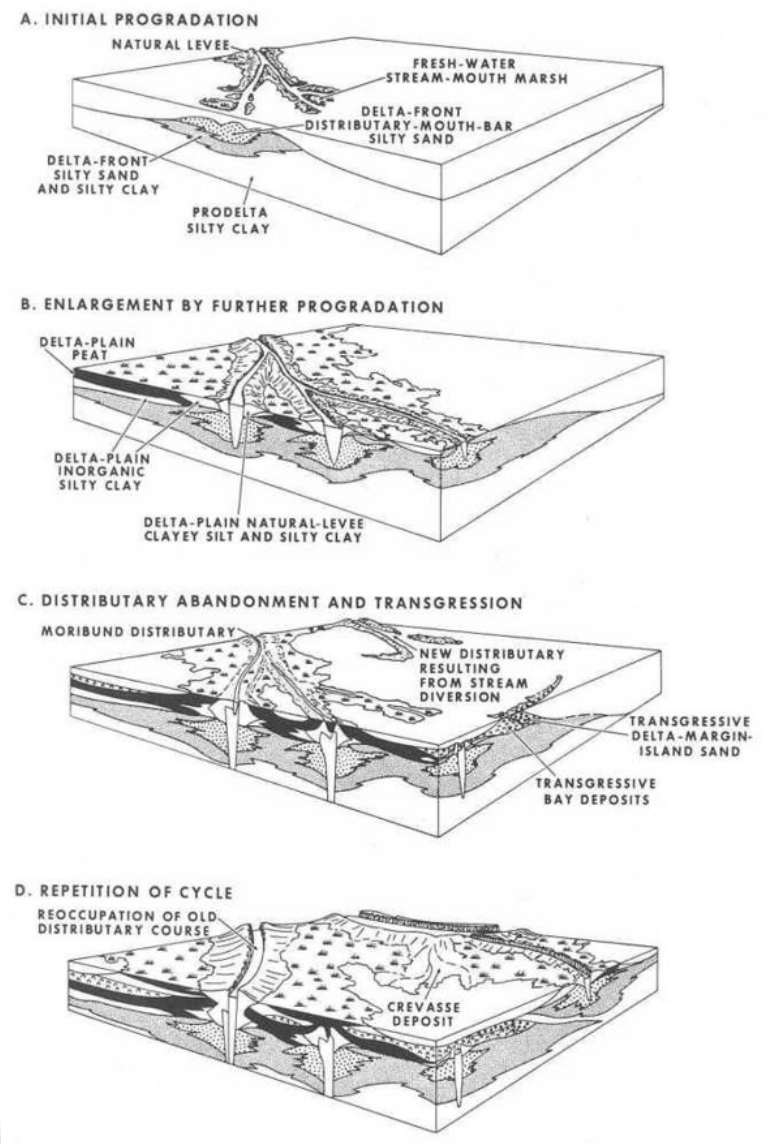
Streaming 100%
Eye alt 227.28 km

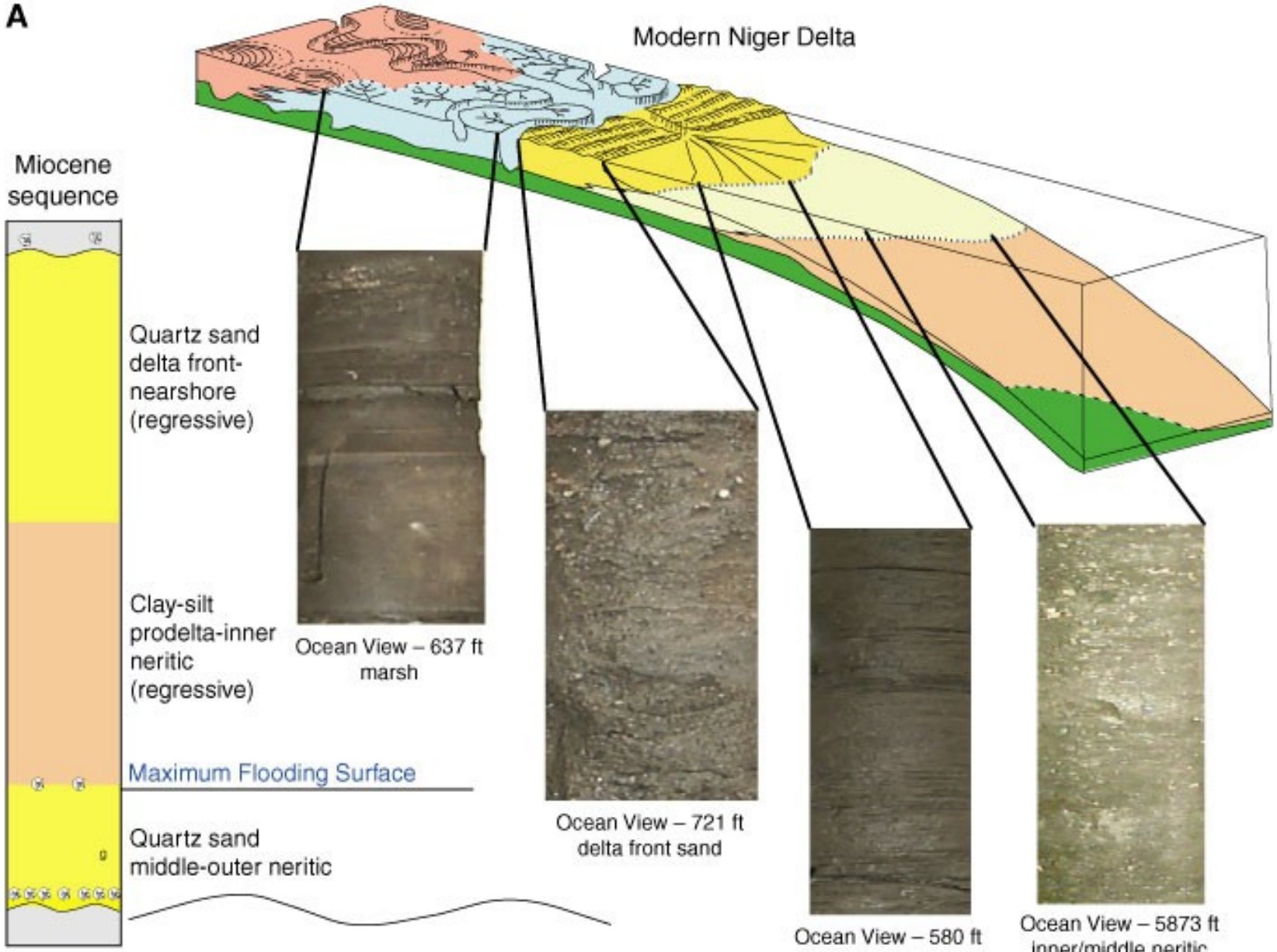
Progradação deltaica e modelo de fácies



Lei de Walther

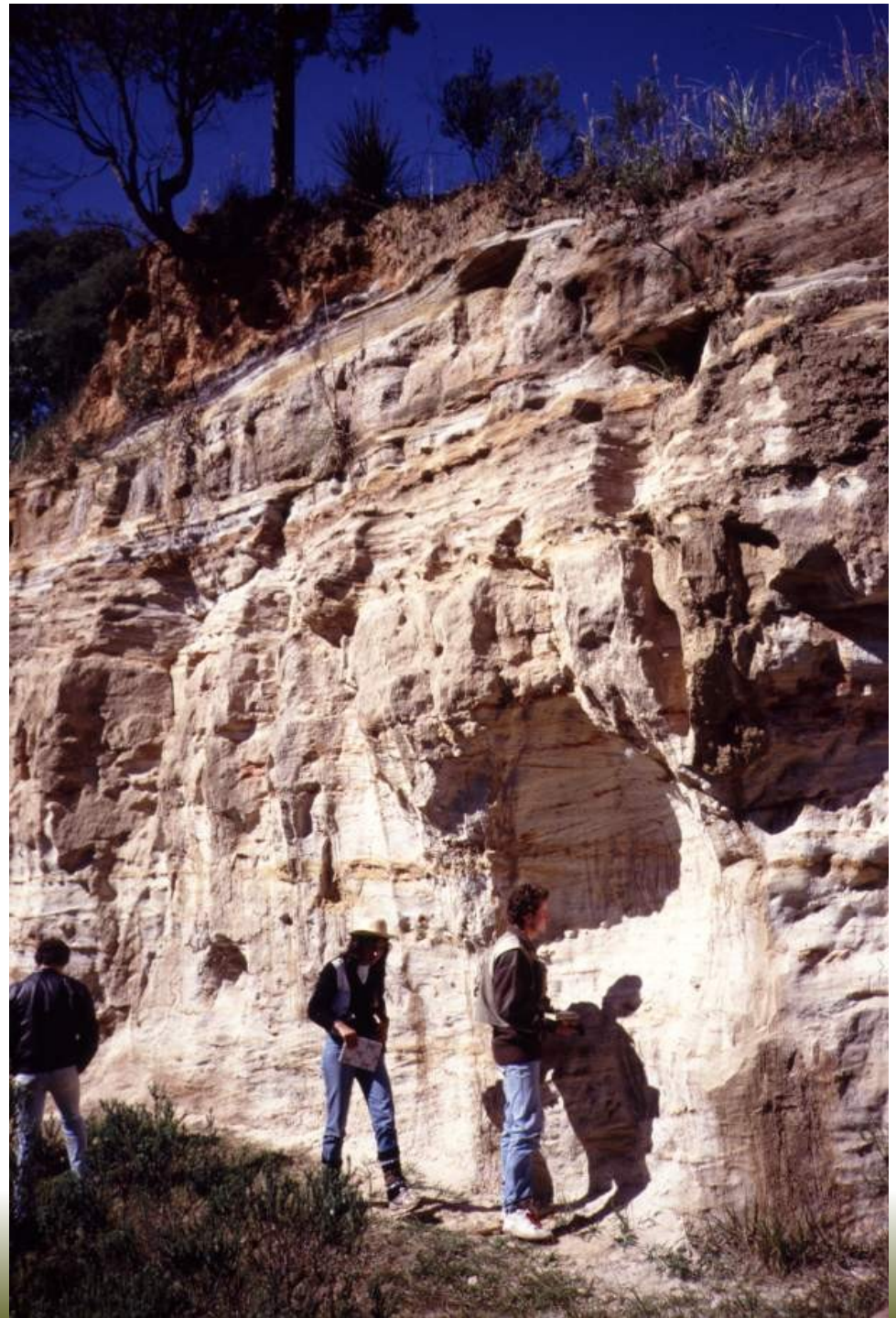
- - “Apenas sedimentos lateralmente adjacentes podem ser superpostos verticalmente sem estarem separados por discordâncias” (Walther, 1894).

- Qual a implicação da lei de Walther?



Miocene deltaic-influenced facies successions, NJ

Depósitos de frente deltaica da Fm. Rio Bonito



Depósitos de frente deltaica

Depósitos de prodelta