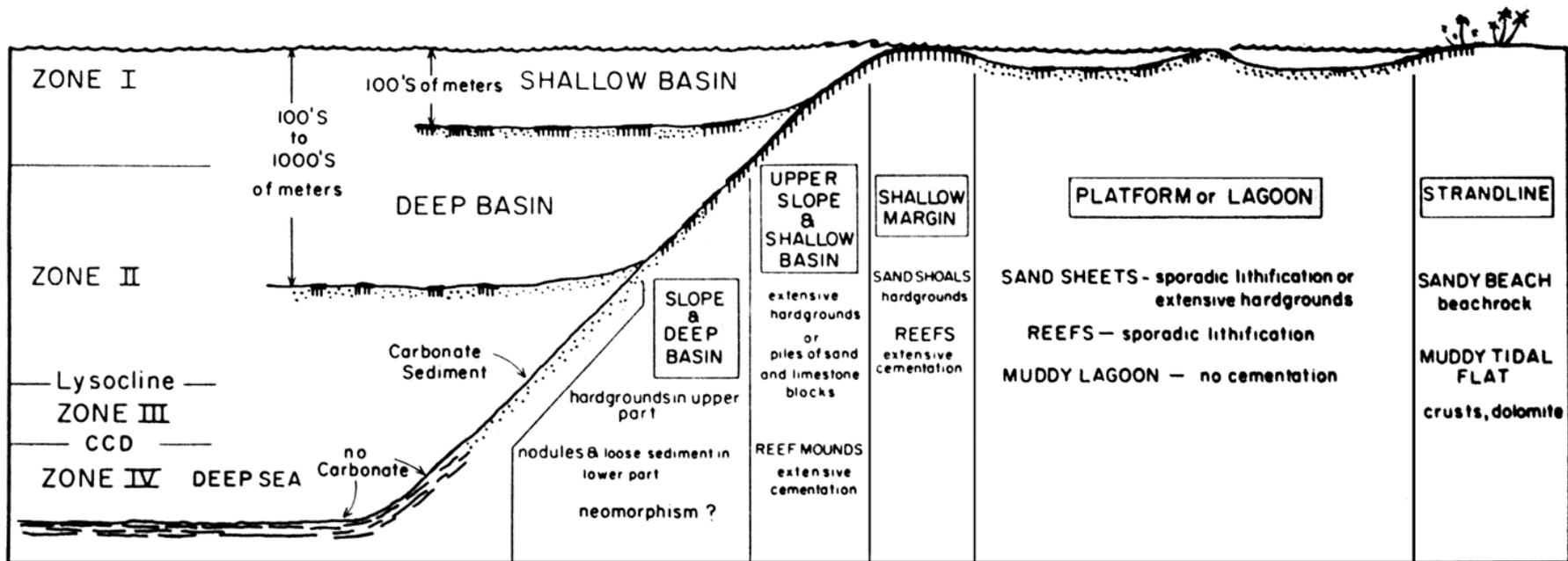


Plataformas carbonáticas e ambientes evaporíticos

AREAS OF MODERN CARBONATE DEPOSITION



Depositional Setting	Type of Deposit
Basin and slope	Pelagic sediments Turbidites and debris flows
Platform margin	Reefs and organic buildups Sand shoals
Platform interior	Epeiric sea, lagoon or bay Tidal flats
Terrestrial	Dunes, lakes, cave deposits, soils, fanglomerates



After James, 1984

Figure 5 The locations of seafloor precipitation on a shallow carbonate platform and in adjacent

deep-water settings. In all of these habitats, most sediments are unlithified.

Principais acumulações carbonáticas atuais:

- Carbonatos oceânicos pelágicos: cocólitos (algas), foraminíferos e pterópodes (gastrópodes pequenos).
- Plataformas subtropicais e tropicais: Corais, algas e moluscos. $T > 15^{\circ}\text{C}$ e salinidades normais. Não suportam salinidades elevadas.
- Plataformas temperadas: moluscos foraminíferos algas vermelhas e briozoários. Baixas taxas de acumulação.

Tipos de acumulações carbonáticas

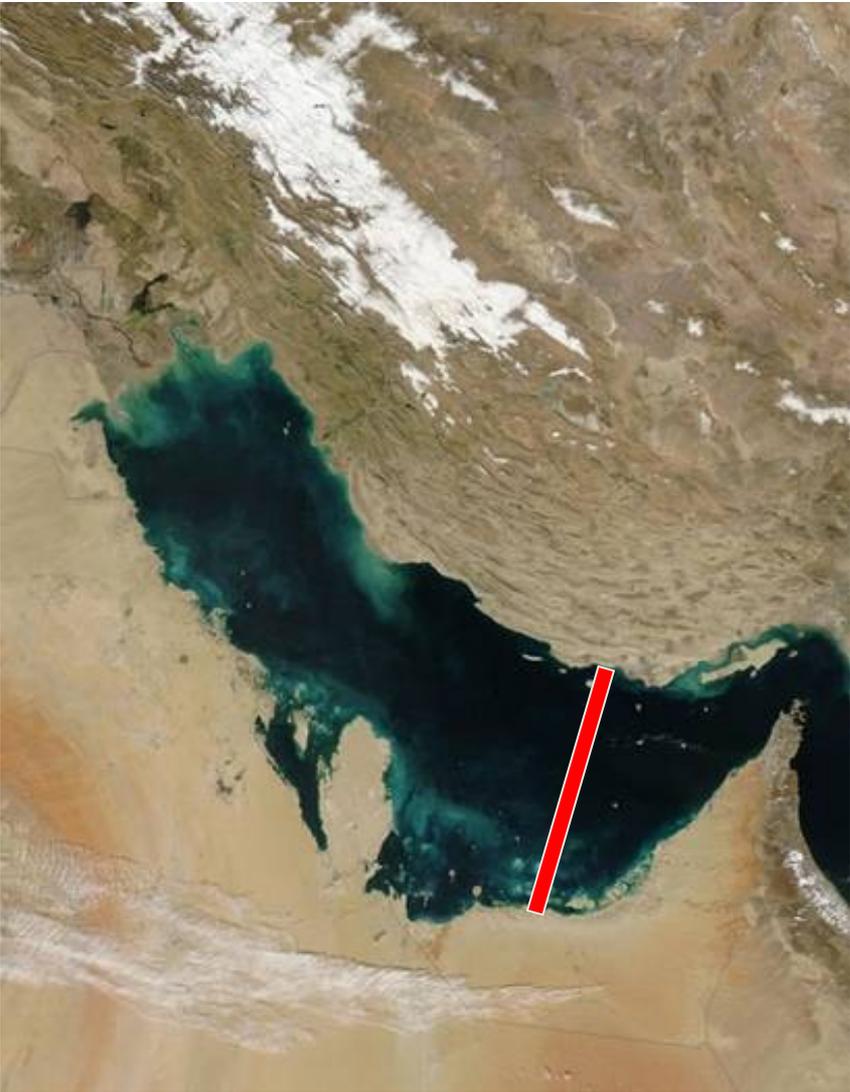
- Plataformas Carbonáticas (*carbonate platform*):

Grande edifício formado pela acumulação de sedimento em uma área subsidente. A maioria dessas estruturas possui um topo plano e laterais íngremes, podendo acumular alguns km de espessura em áreas de muitas centenas de km².

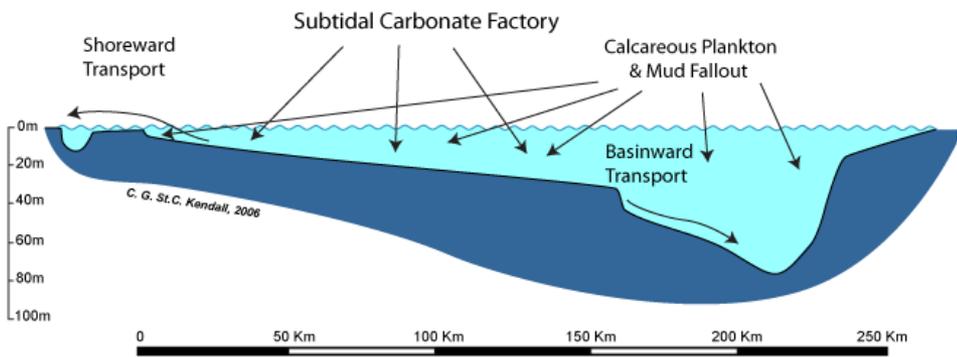
Plataformas senso estrito (*carbonate shelf*) - é uma plataforma ligada a uma área continental, que é uma fonte potencial de terrígenos, matéria orgânica e nutrientes.

Plataforma epicratônica - grandes crátons cobertos por águas rasas com deposição carbonática - sem análogo moderno.

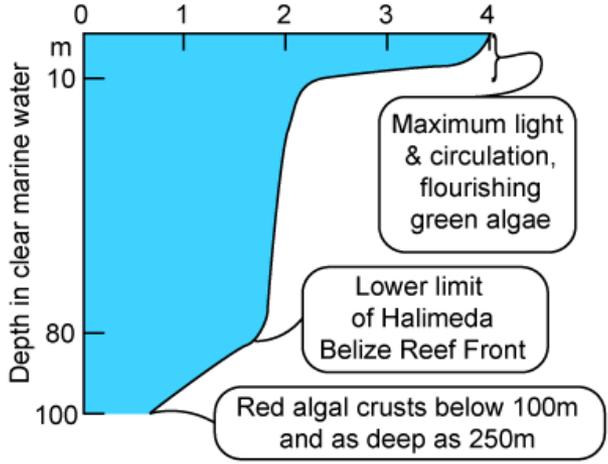
Banco carbonático - plataforma isolada e cercada por águas oceânicas profundas, sem fonte de terrígenos.



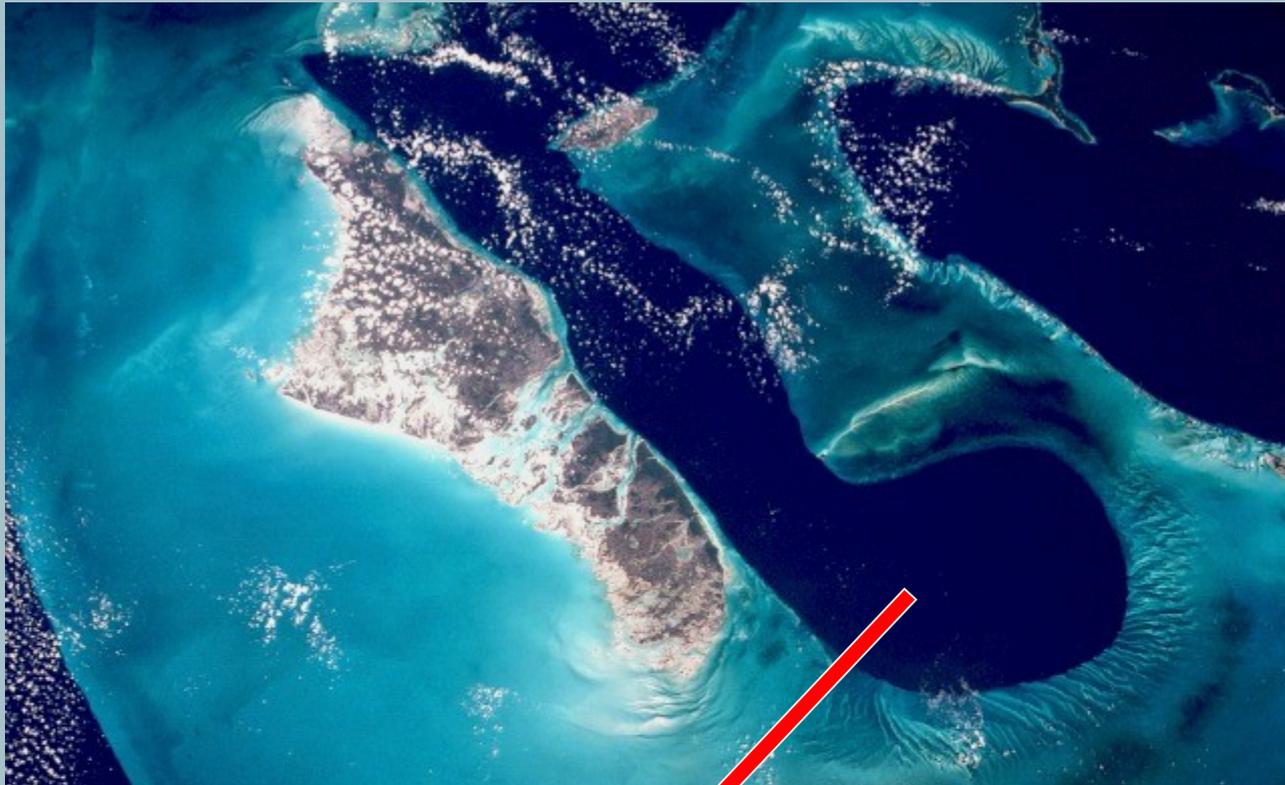
Principle Zones of Carbonate Production & Accumulation In Persian Gulf



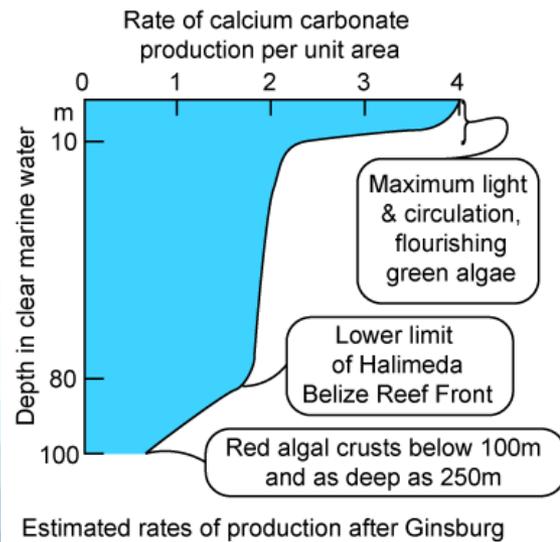
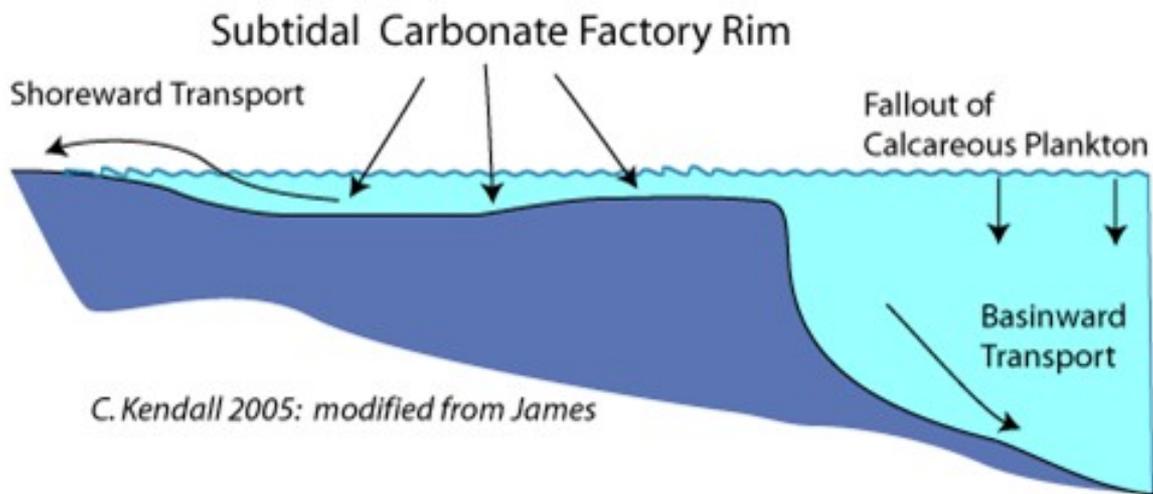
Rate of calcium carbonate production per unit area



Estimated rates of production after Ginsburg



Principal Zones of Carbonate Production and Accumulation





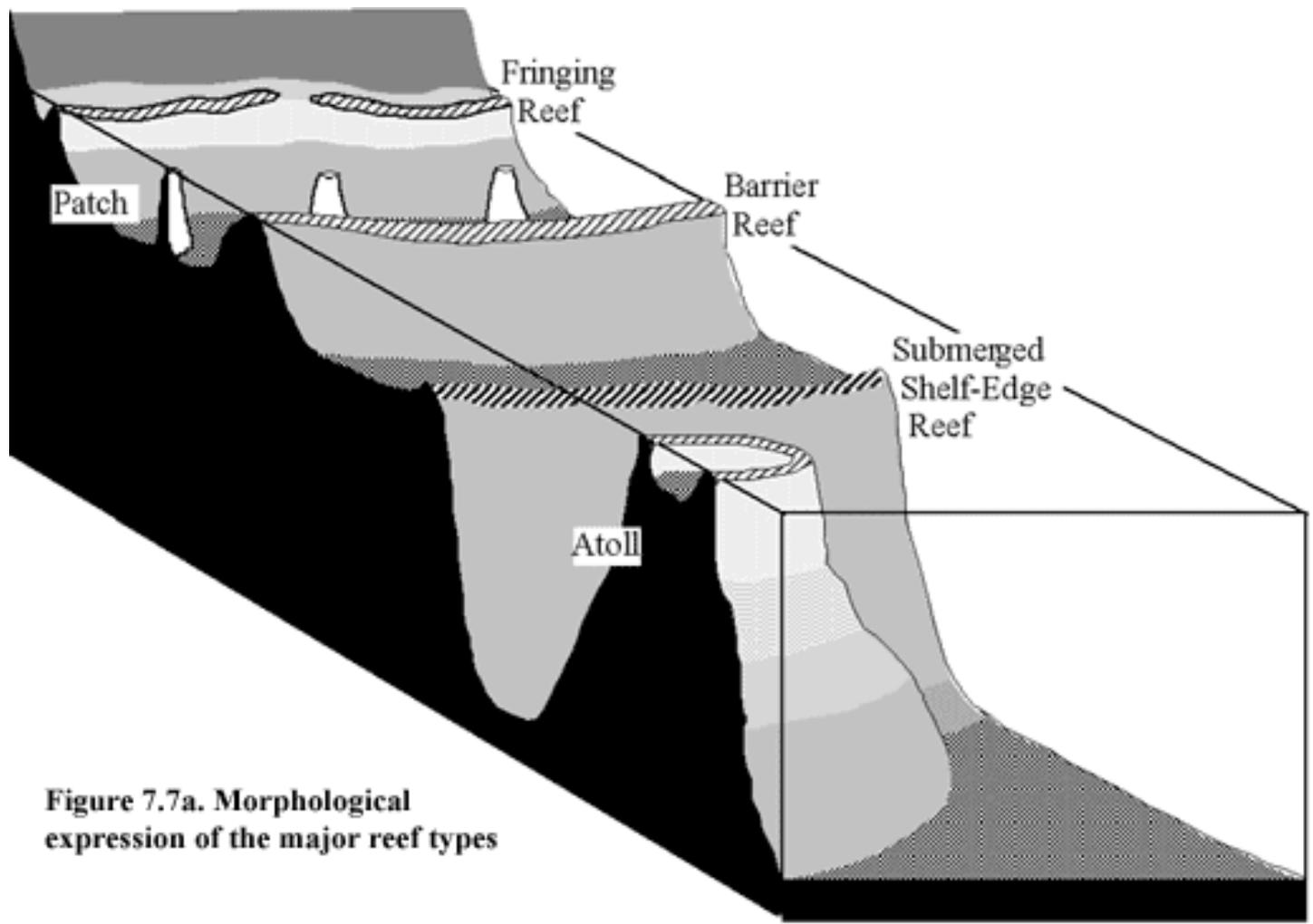


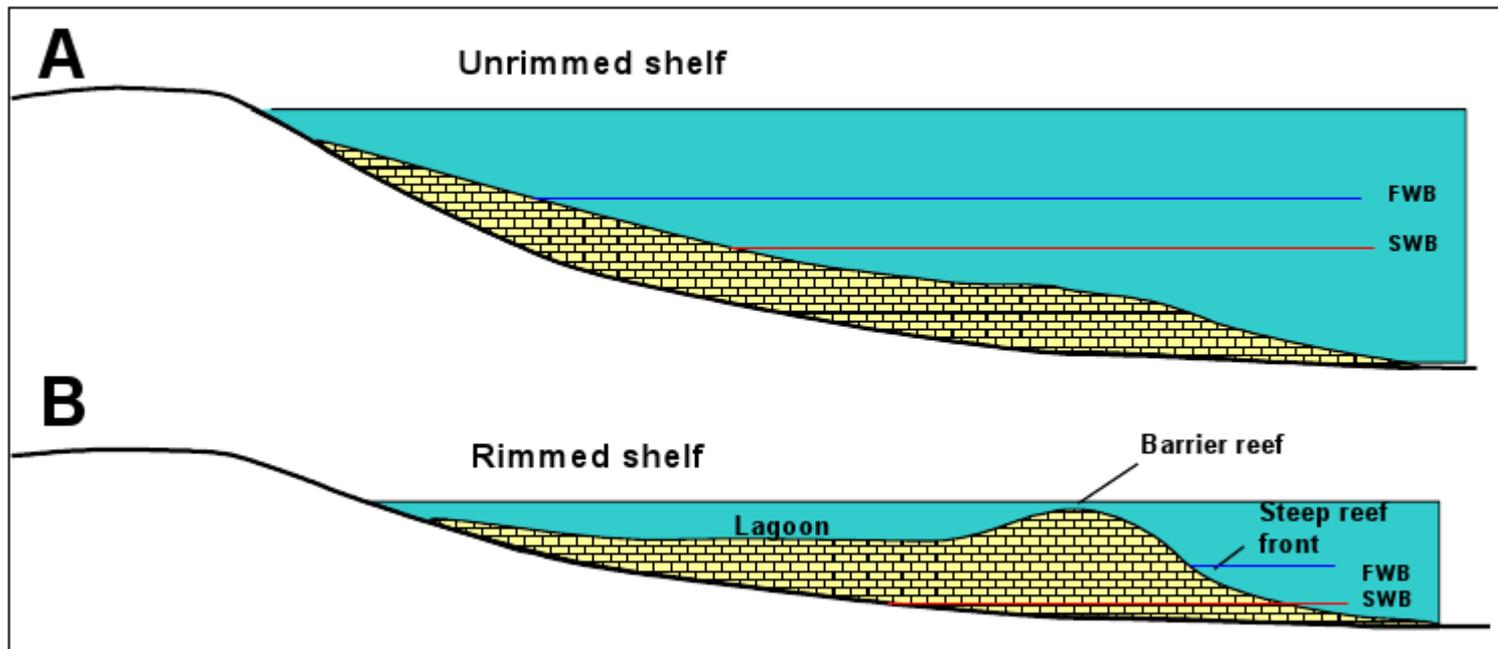
Figure 7.7a. Morphological expression of the major reef types

O principal controle sobre as fácies sedimentares e geometrias de grande escala em plataformas carbonáticas é a natureza de suas bordas.

- Plataformas barradas possuem recifes ou barras de areia carbonática, contínuos ou segmentados, em suas margens. Essas barreiras absorvem as ondas oceânicas e limitam a circulação de água para a zona interna, caracterizada como uma laguna ou plataforma rasa.

- Plataformas abertas não possuem tais barreiras, sendo caracterizadas por perfis em rampa, com retrabalhamento intenso do sedimento de águas rasas por ondas e correntes de maré.

- Bacias profundas - acumulações significativas de carbonatos de águas profundas ocorrem somente a partir do Jurássico - aparecimento de microorganismos pelágicos carbonáticos (algas verdes, foraminíferos plantônicos e gastrópodes microscópicos).



average water depth across bank is about 10 m

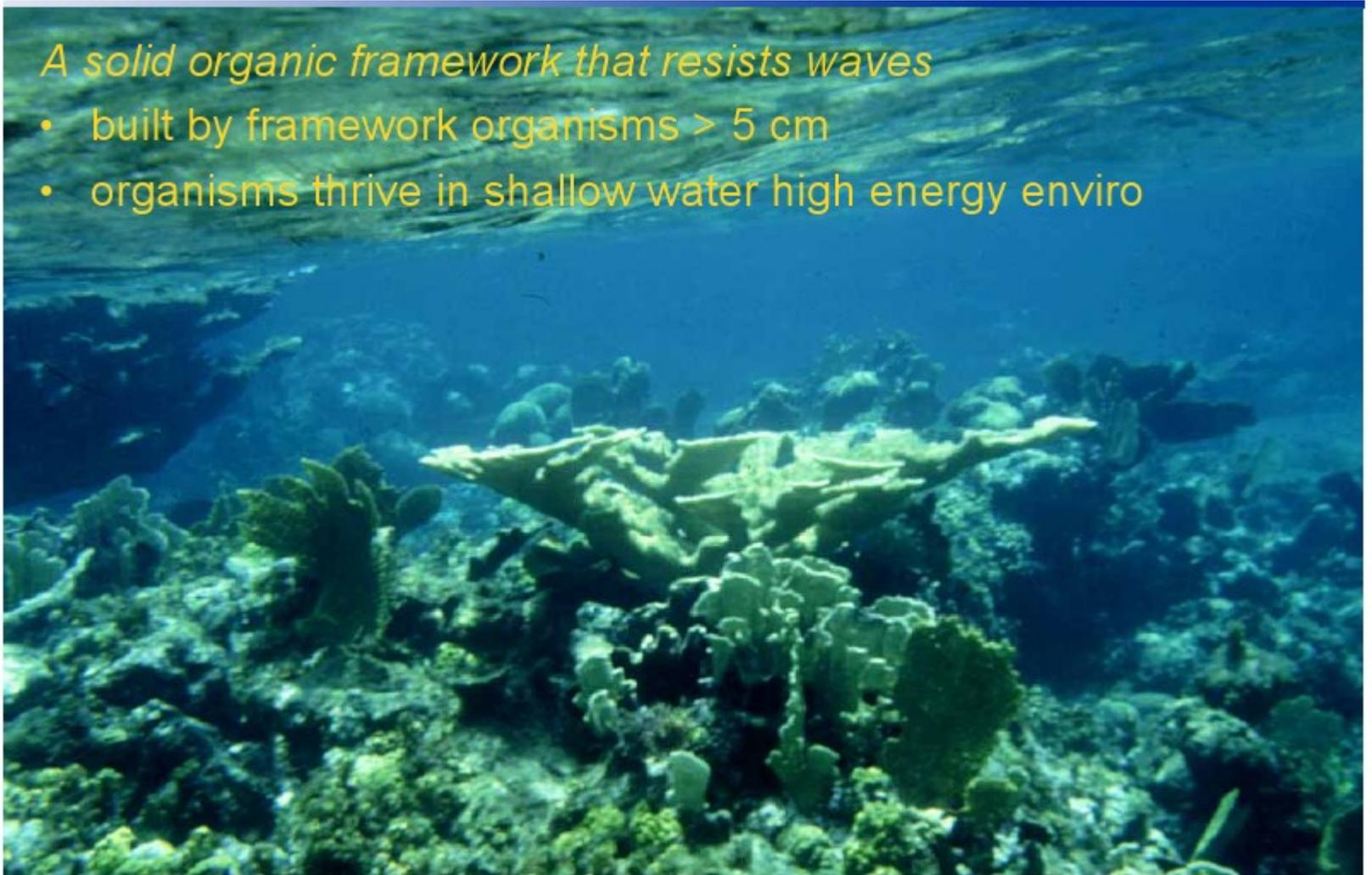






A solid organic framework that resists waves

- built by framework organisms > 5 cm
- organisms thrive in shallow water high energy enviro





(1986).

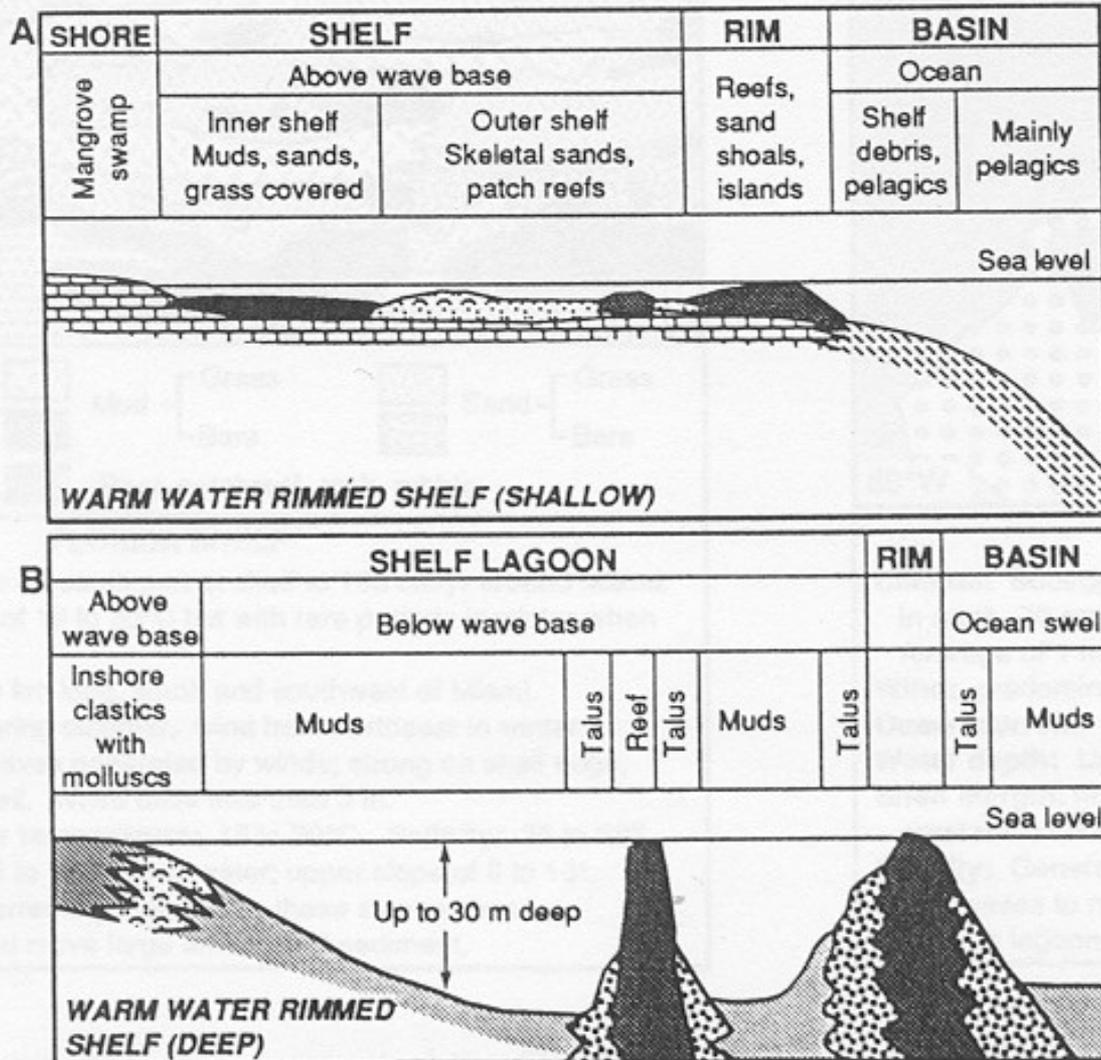


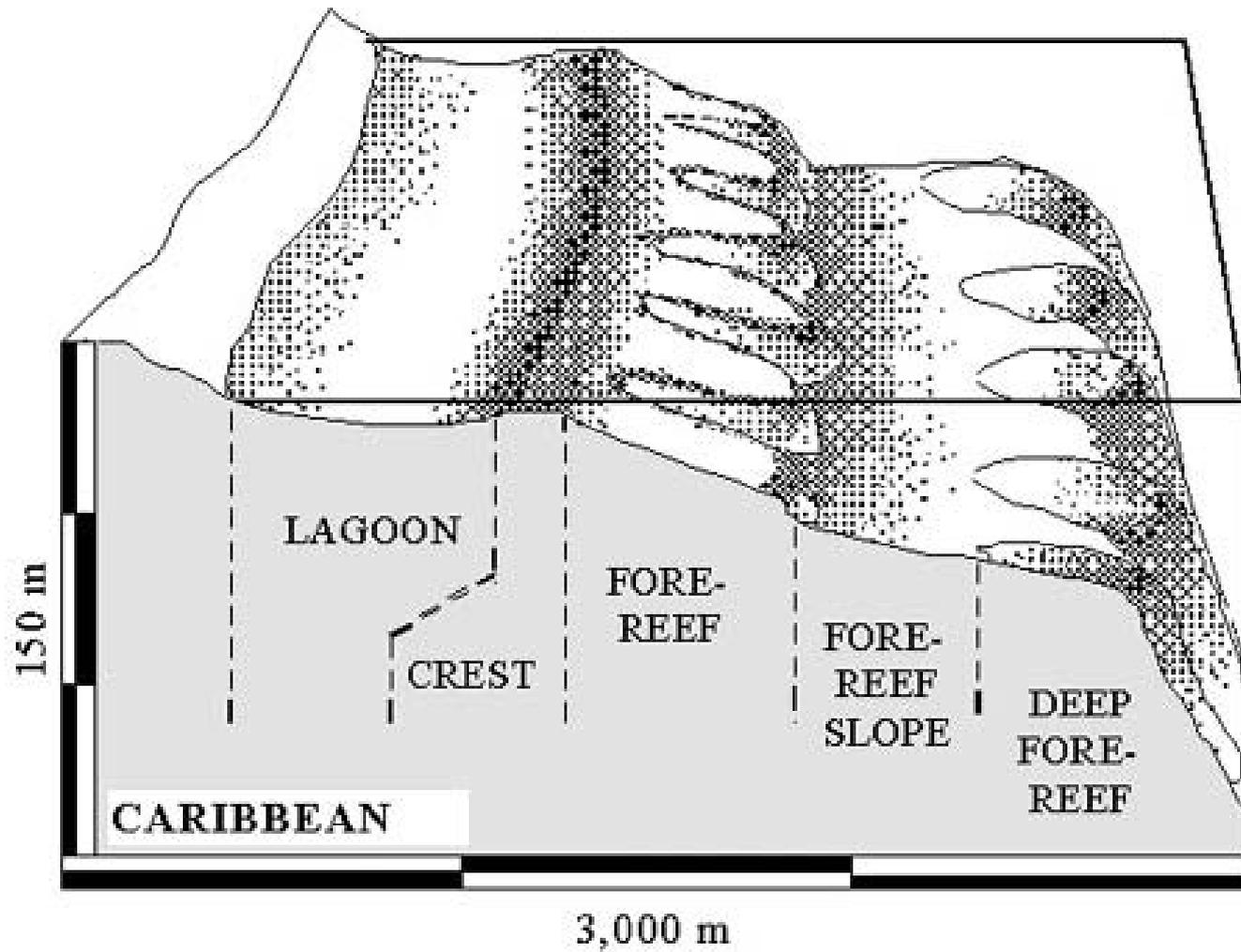
Figure 20 Facies models for warm water (A) and cool water (B) rimmed shelves. The latter is modified from Sellwood (1986).



Sedimento carbonático autóctone biogênico:

Recifes





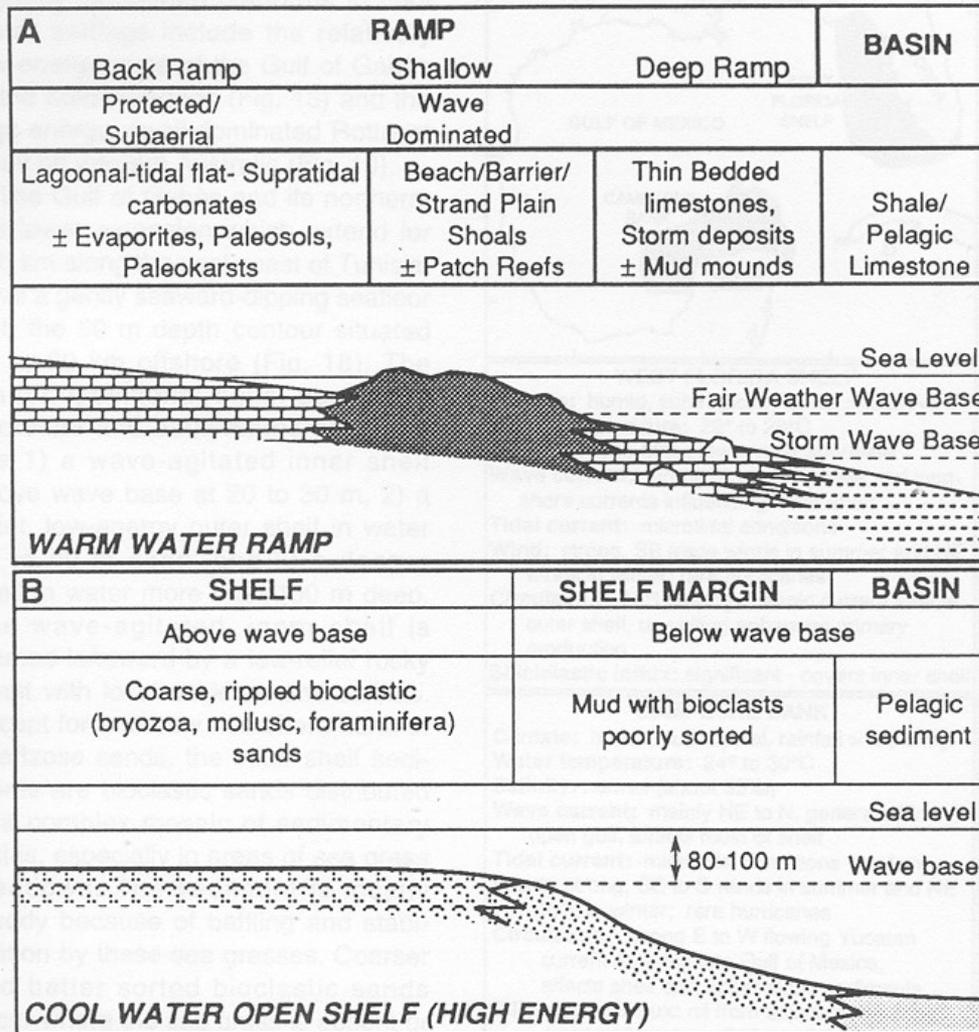


Figure 15 Facies models for unrimmed shelves (A) warm water ramps, and (B) cool water open unrimmed shelf (high energy).

plataforma interior
lamas, areias -
recobrimento por
macroalgas

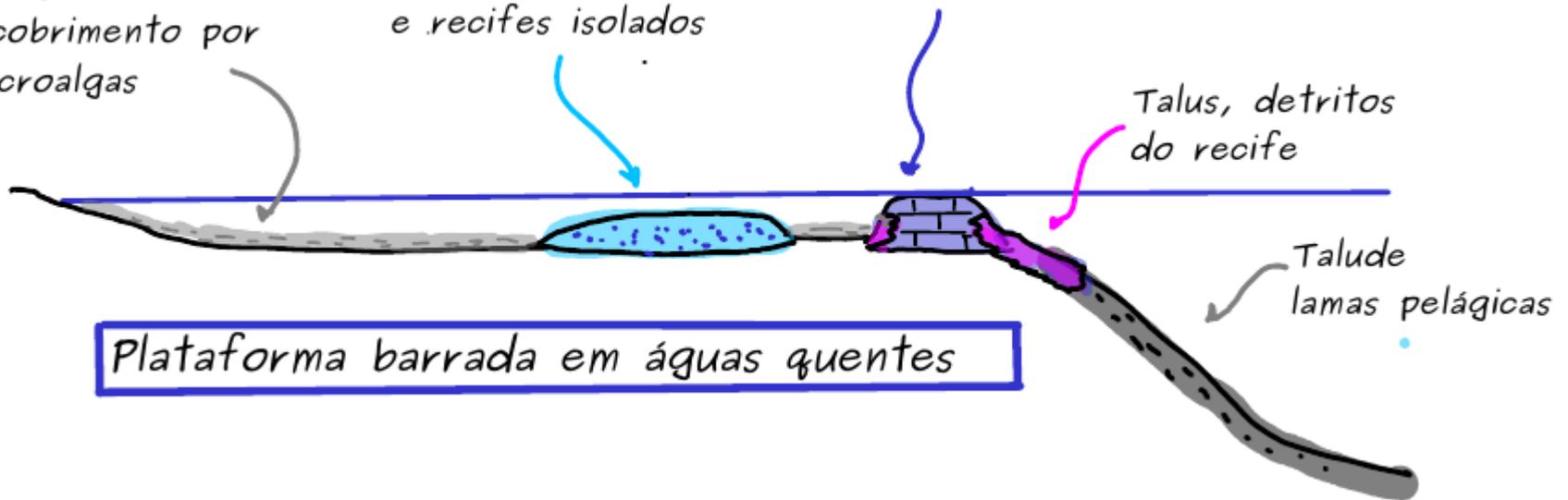
plataforma exterior
areias esqueléticas
e recifes isolados

Margem da plataforma
Recifes, bancos arenosos

Talus, detritos
do recife

Talude
lamas pelágicas

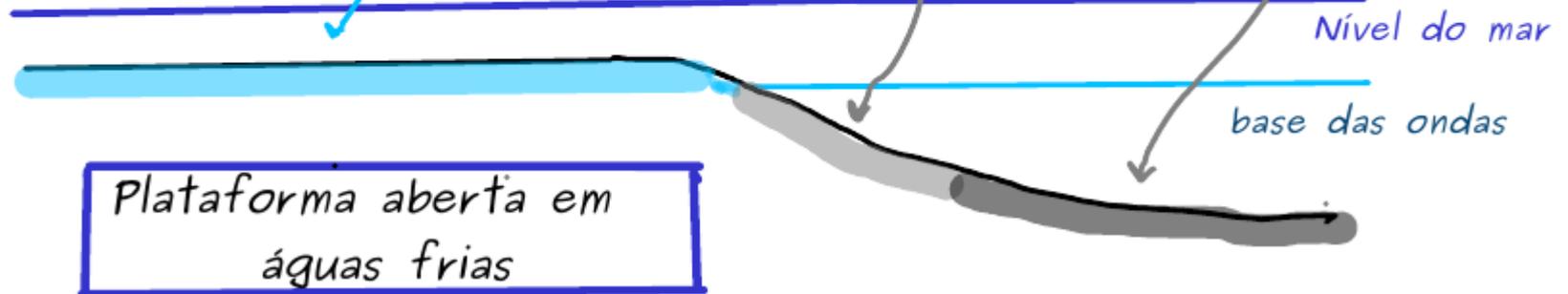
Plataforma barrada em águas quentes



Areias esqueléticas
(Briozoários, Moluscos e
Foraminíferos)

Lamas com bioclastos

Lamas carbonáticas
de offshore



Plataforma aberta em
águas frias



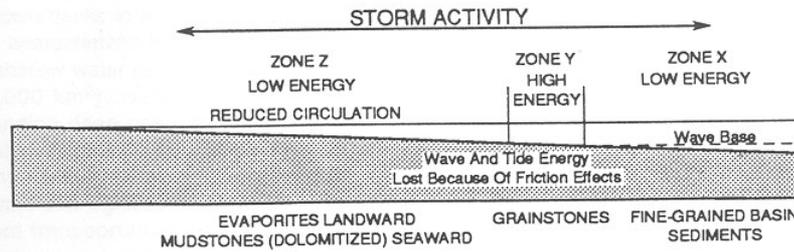


Figure 23 Facies model for an epeiric shelf (from Irwin, 1965).

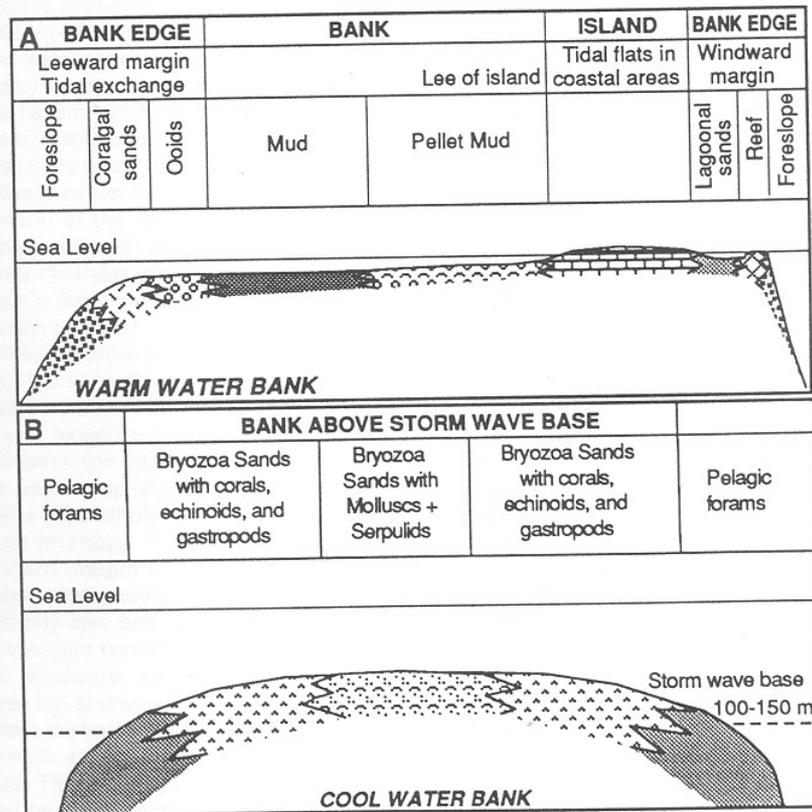
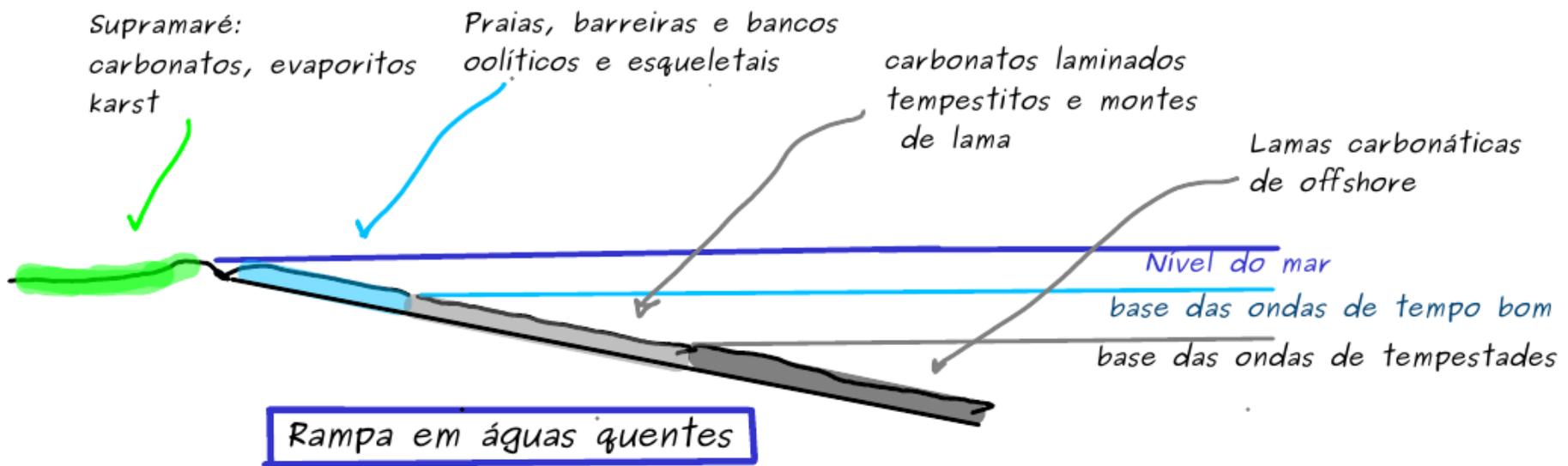


Figure 24 Facies models for carbonates on warm water (A) and cool water (B) banks.





lagoon

reef crest

SEPM

Atol



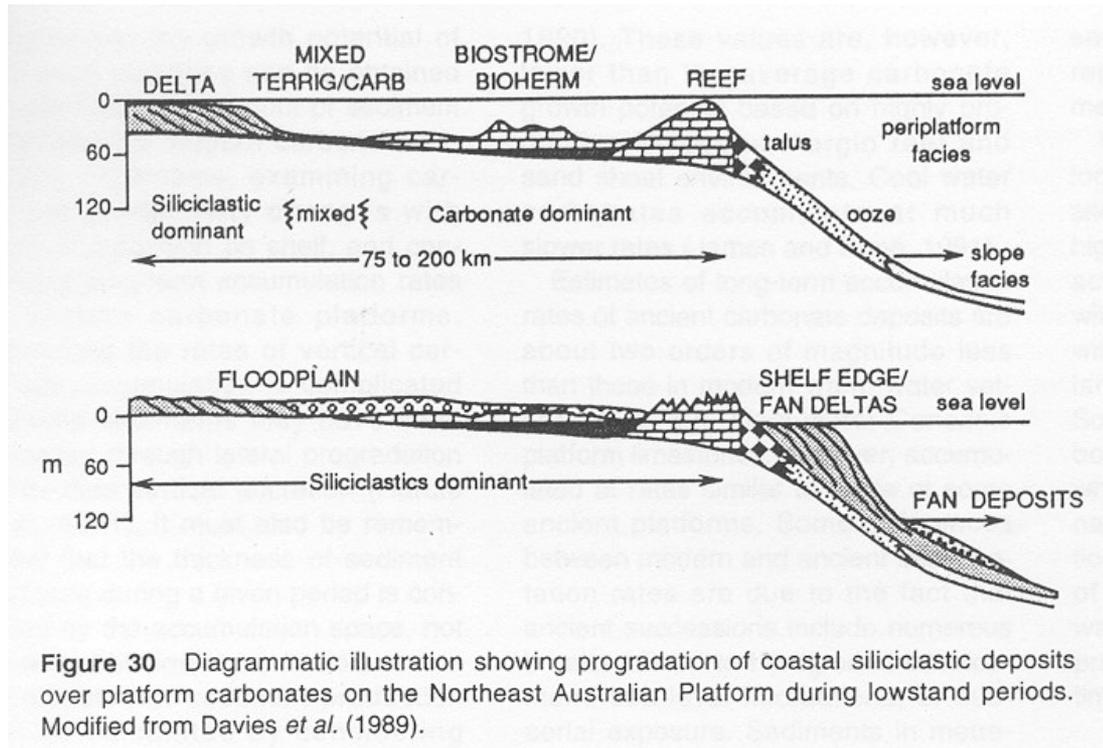


Figure 30 Diagrammatic illustration showing progradation of coastal siliciclastic deposits over platform carbonates on the Northeast Australian Platform during lowstand periods. Modified from Davies *et al.* (1989).

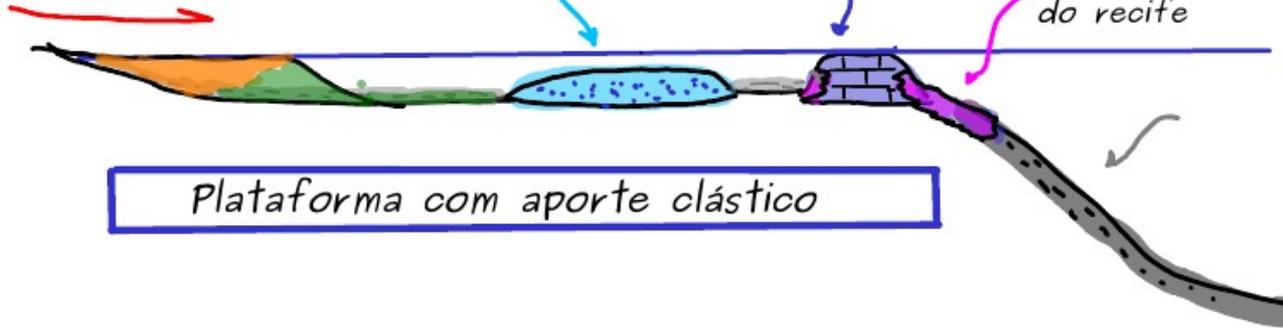
Delta terrígeno na laguna

plataforma exterior
areias esqueléticas
e recifes isolados

Margem da plataforma
Recifes, bancos arenosos

aporte terrígeno

Talus, detritos
do recife



Plataforma com aporte clástico

erosão e "bypass"
de sedimentos
terrígenos

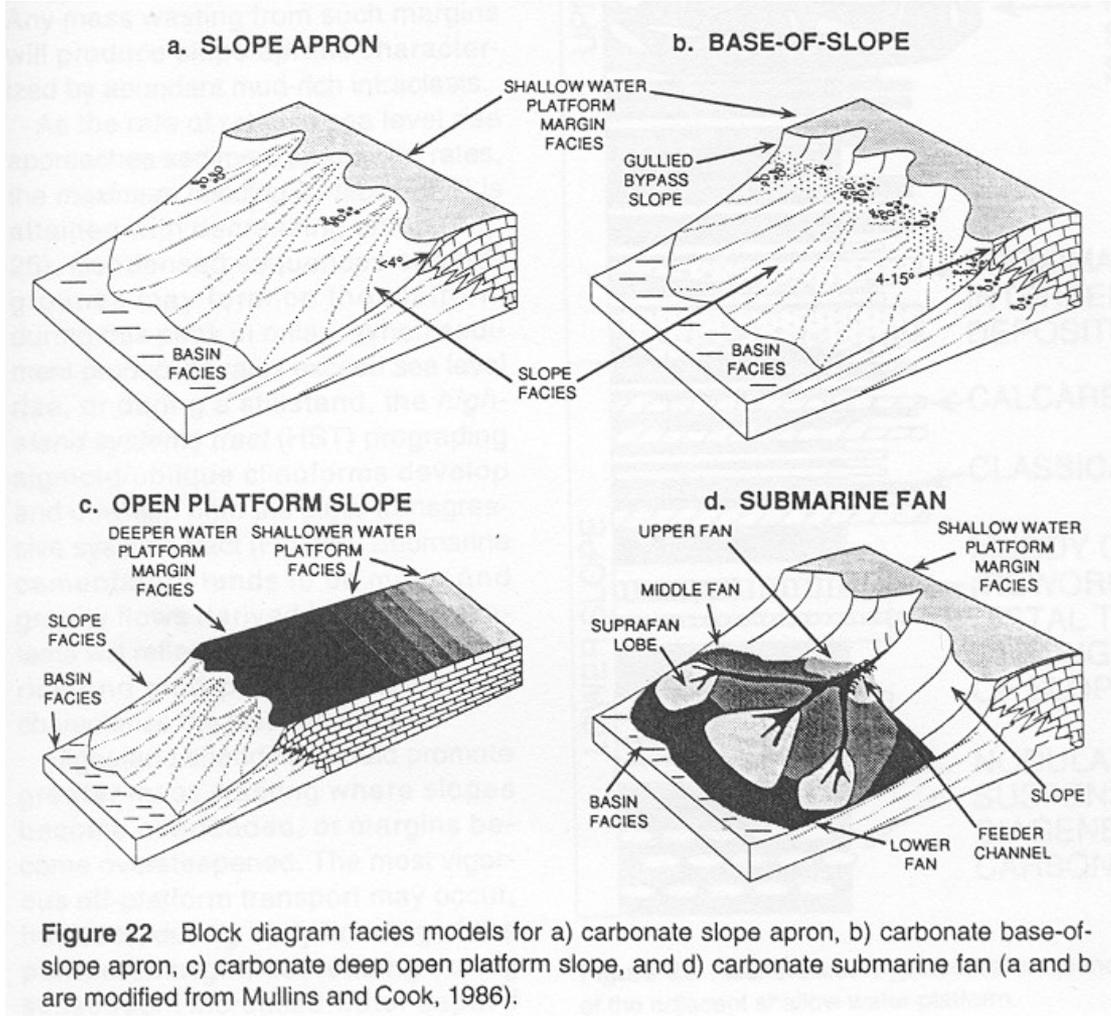
dissolução
e relevo kástico

progradação
terrígena

queda do
N.M. ↓



Queda do N.M. - crise na fábrica

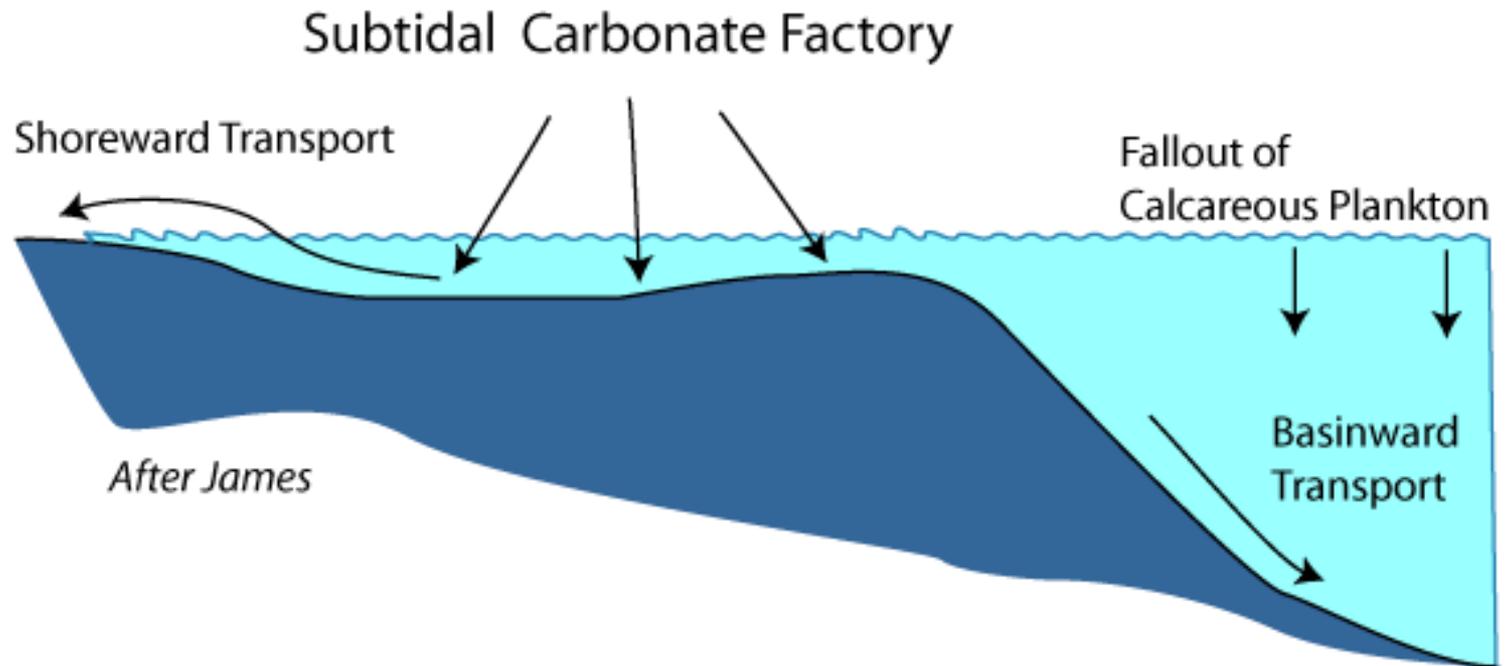


Tipos de sedimentos carbonáticos biogênicos:

- Autóctones

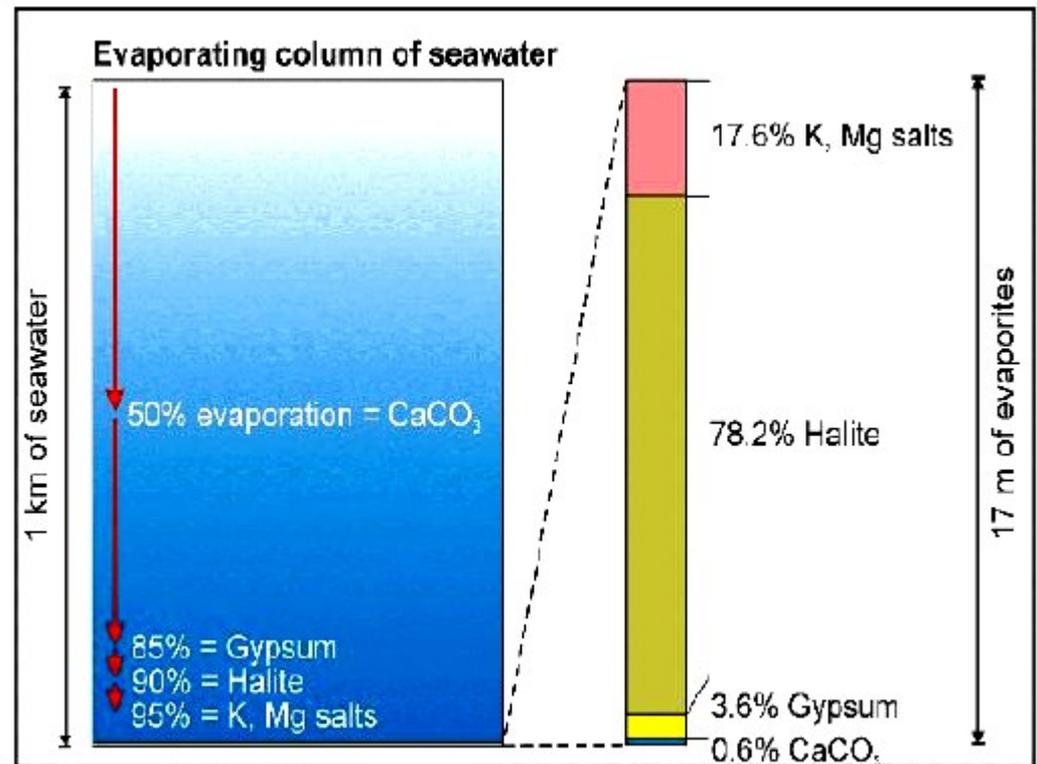
- Alóctones

Principal Zones of Carbonate Production and Accumulation



Sedimentos químicos:

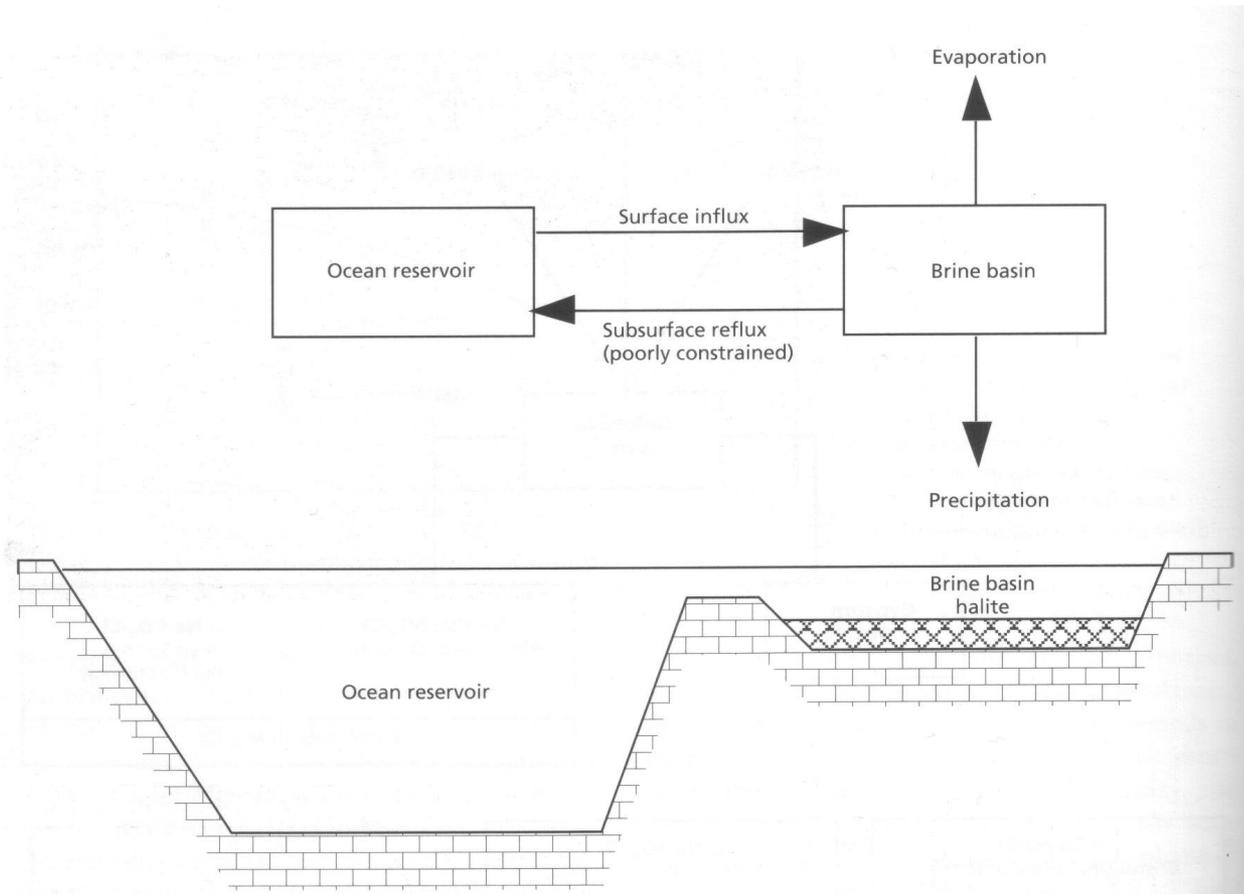
- Carbonatos
- Cloretos
- Sulfatos

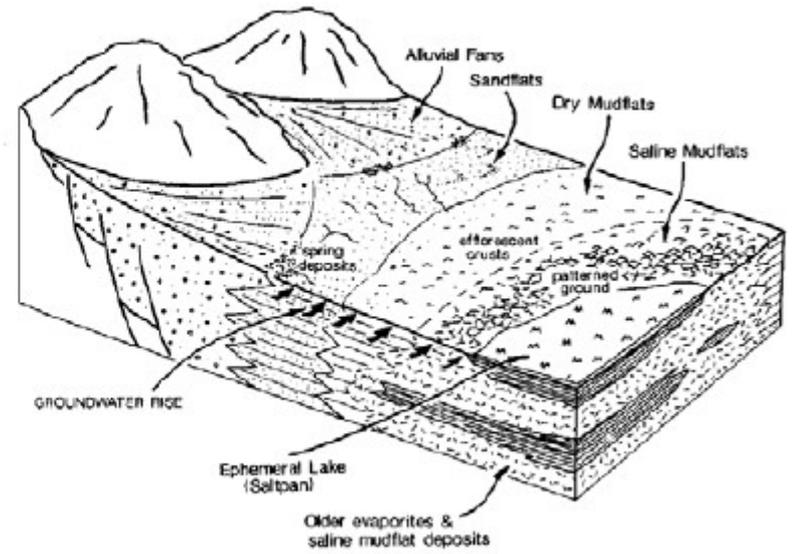


Carbonatos químicos

- Precipitação de aragonita em baías restritas com déficit hídrico.
- Marés brancas do mar morto

Evaporitos: condições de formação



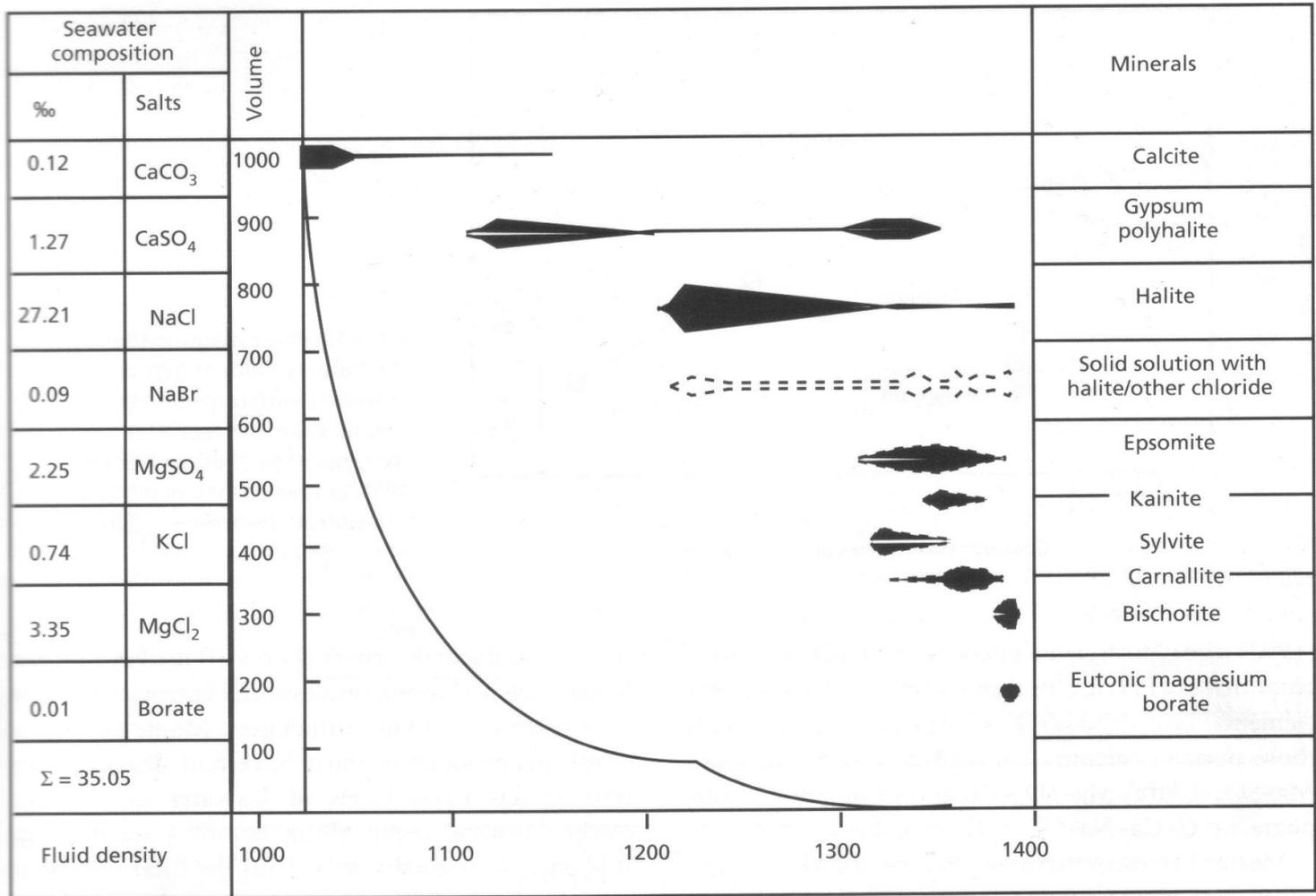


Principais minerais evaporíticos

Mineral	Formula	IAP	K
Halite	NaCl	0.12	38
Gypsum	$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$	4.6×10^{-6}	2.5×10^{-5}
Anhydrite	CaSO_4	4.6×10^{-6}	4.2×10^{-5}
Sylvite	KCl		
Kieserite	$\text{MgSO}_4 \cdot \text{H}_2\text{O}$		
Carnallite	$\text{KMgCl}_3 \cdot 6\text{H}_2\text{O}$		
Polyhalite	$\text{K}_2\text{MgCa}_2(\text{SO}_4)_4 \cdot 2\text{H}_2\text{O}$		

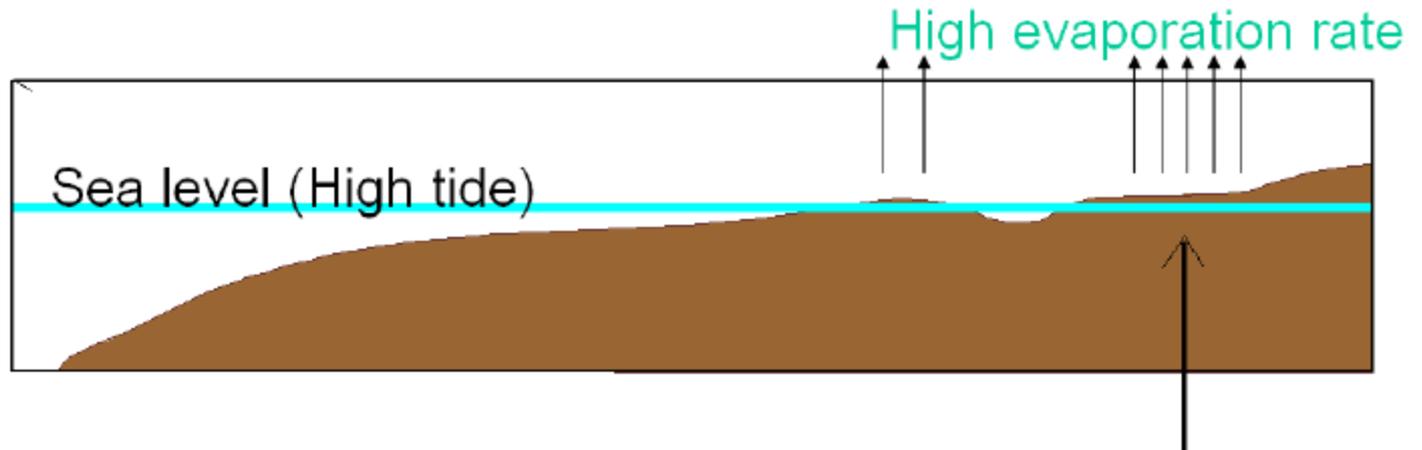


Seqüência de precipitação de evaporitos

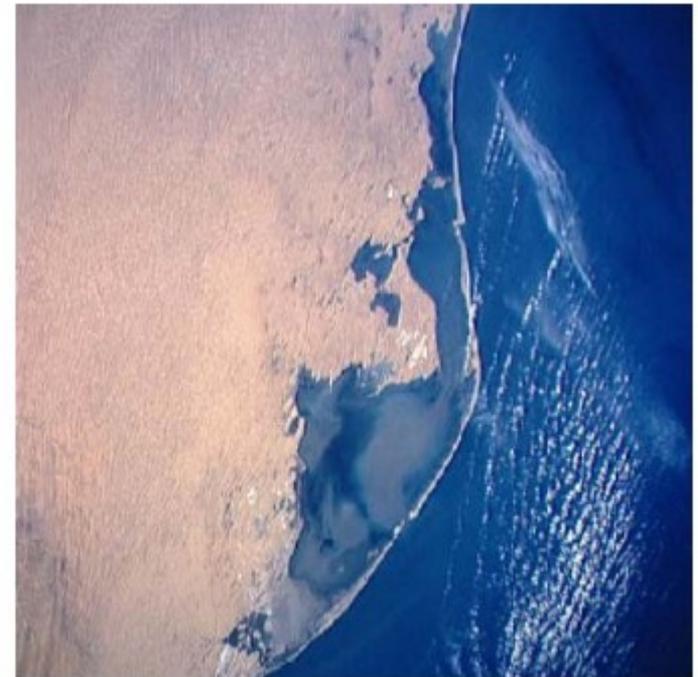


- Anidrita: transformação eodiagenética de gipsita (cinética química e pressão de soterramento)

- Grandes acumulações de sais no tempo geológico: Permiano do norte da Europa, abertura do Atlântico.



Evaporitos de planícies de
Marés



Bardiwil salt marsh, Egypt

Esteiras microbianas em sabkhas costeiras: Halófilos

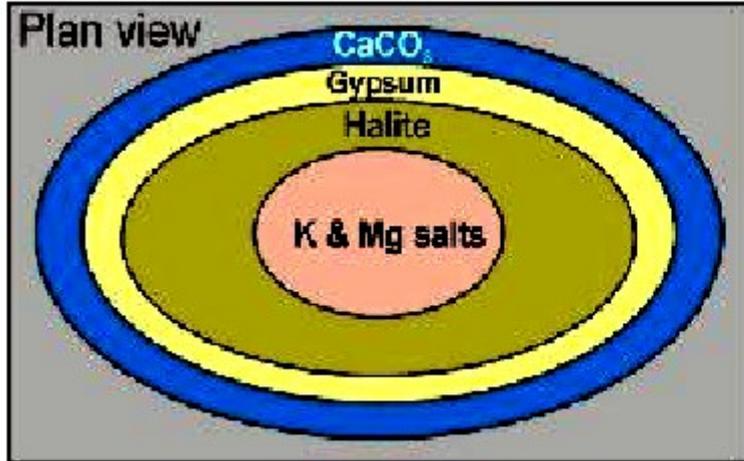


Intercalações de carbonatos bio-induzidos e gipsita evaporítica

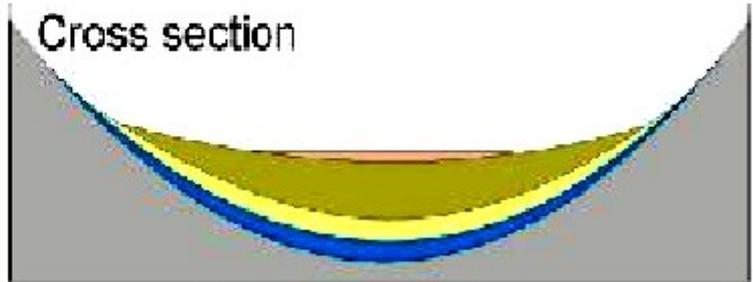


Evaporitos Lacustres

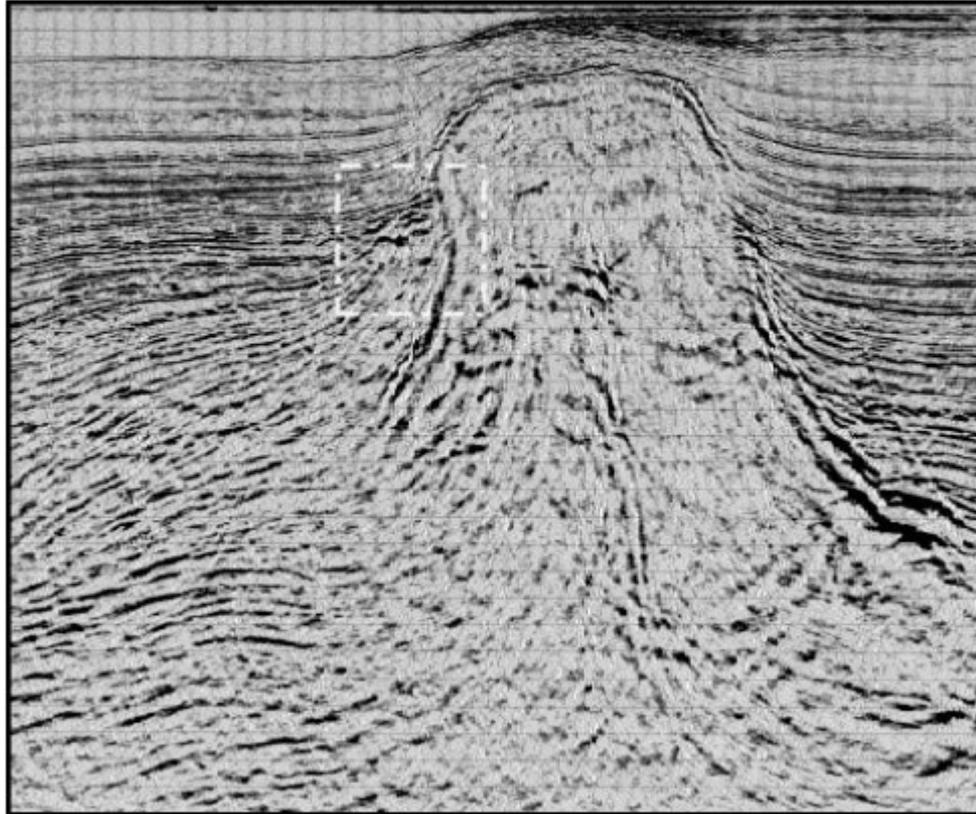




Idealised diagram of the 'bullseye' pattern characteristic of salt lakes



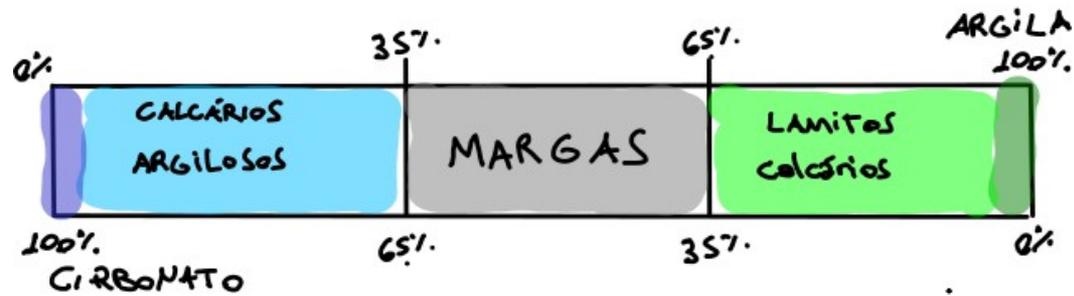
Domos Salinos



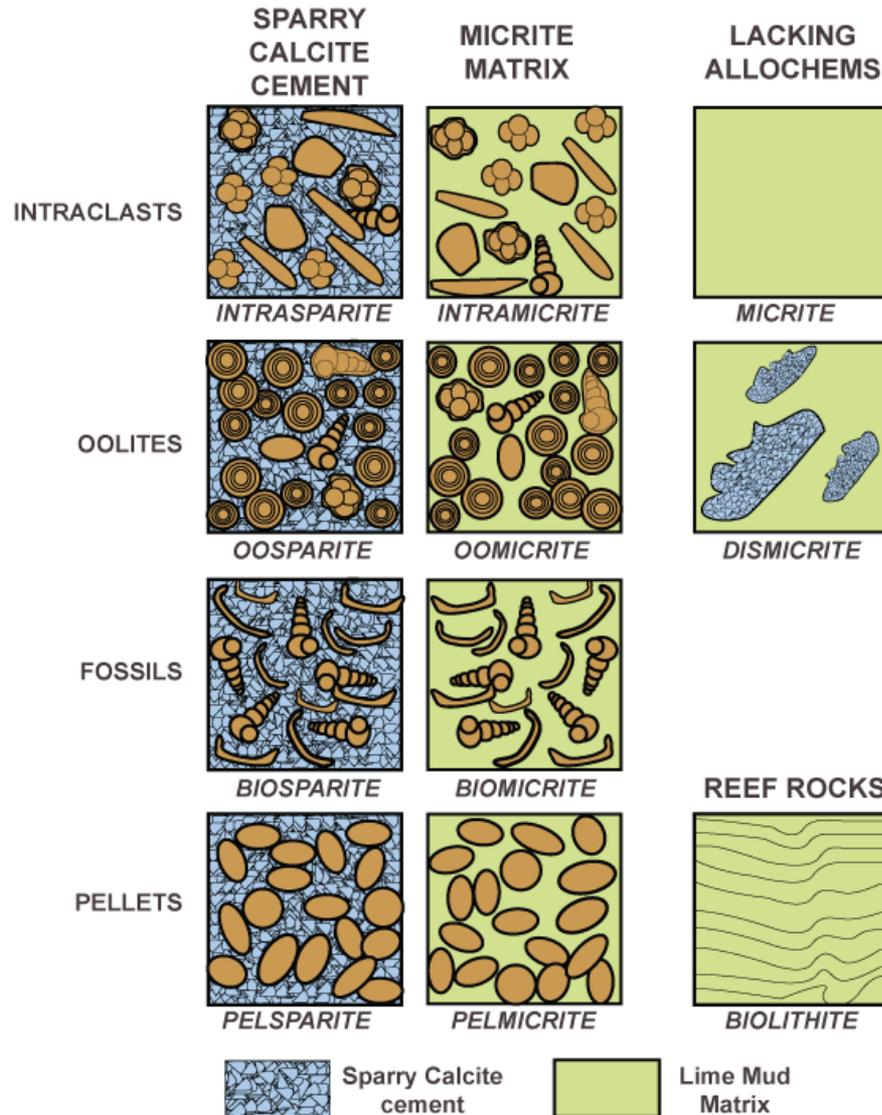
Calcários

Dolomitos

Margas

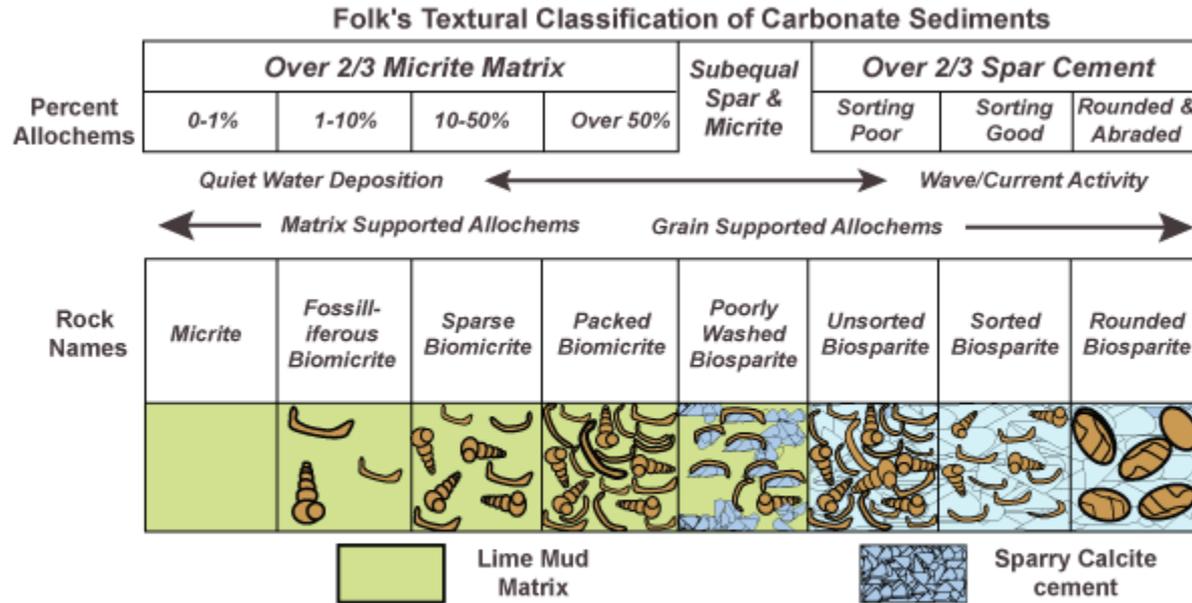


Classificação de Folk



C.G.St.C. Kendall, 2005 (after Folk 1959)

Classificação de Folk

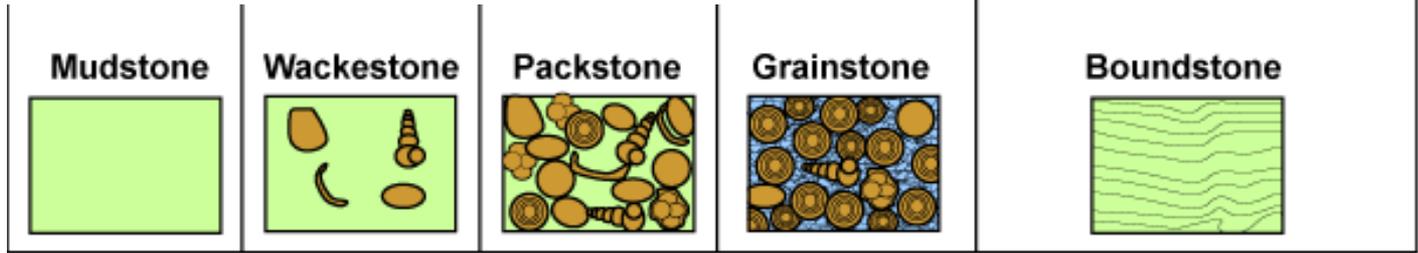


C.G.St.C. Kendall, 2005 (after Folk 1959)

Classificação de Dunham adaptada

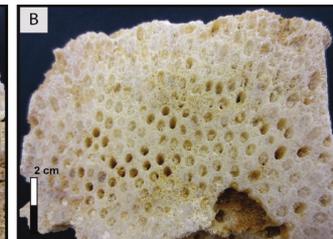
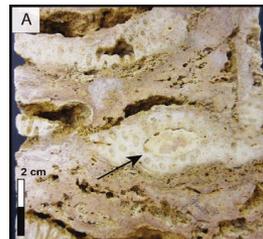
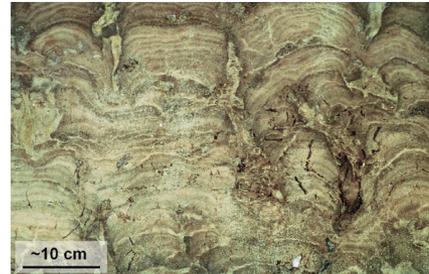
Textura Depositional			
Suportado pela matriz	Grãos < 10%	Calci-mudstone	
	Grãos > 10%	Wackestone	Grãos > 2 mm Floatstone
Suportado pelos grãos do arcabouço	Matriz > 1%	Packstone	
	Matriz < 1%	Grainstone	Grãos > 2 mm Rudstone

Original components bound together at deposition. Intergrown skeletal material, lamination contrary to gravity, or cavities floored by sediment, roofed over by organic material but too large to be interstices



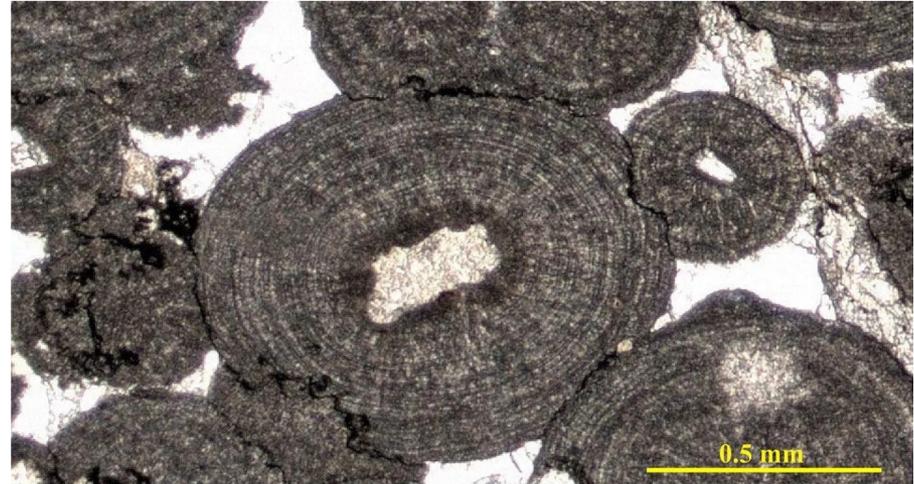
Classificação de Dunham adaptada (Wright, 1992)

Textura Biogênica - "in situ"	
Organismos encrustam ou aglutinam carbonato	Bindstone
Organismos arripionam carbonato hidráulicamente	Bafflestone
Partes rígidas de organismos	Framestone



Baseado em
Wright, V.P. (1992) *Sed. Geol.* 76:177-185

Textura Diagenética		
Não obliterante	Cimento é o principal componente	Cementstone
	Muitos contatos de grãos são estilólitos	Condensed Grainstone
	A maioria dos contatos de grãos são estilólitos	Fitted Grainstone
Obliterante	Cristais >10 µm	Sparstone
	Cristais <10 µm	Microsparstone



Pressure solution and interpenetration of some Carboniferous calcite ooids. Plane polarized light.

Image credit: An expanded part of GNS Petlab Database P83183f by N. Mortimer, https://pet.gns.cri.nz/result_list.jsp