Modern Carbonate Depositional Systems

- Carbonate Platforms
  - – general term for a thick sequence of mostly shallow-water carbonates
  - – Rimmed Shelf
    - South Florida
    - Belize
  - –Ramp
    - Trucial Coast, Arabian Sea
    - Shark Bay, Australia
  - – Epeiric platform
    - absent in modern
  - – Isolated Platform
    - Bahamas
  - – Drowned Platform
    - Blake Plateau, SE US

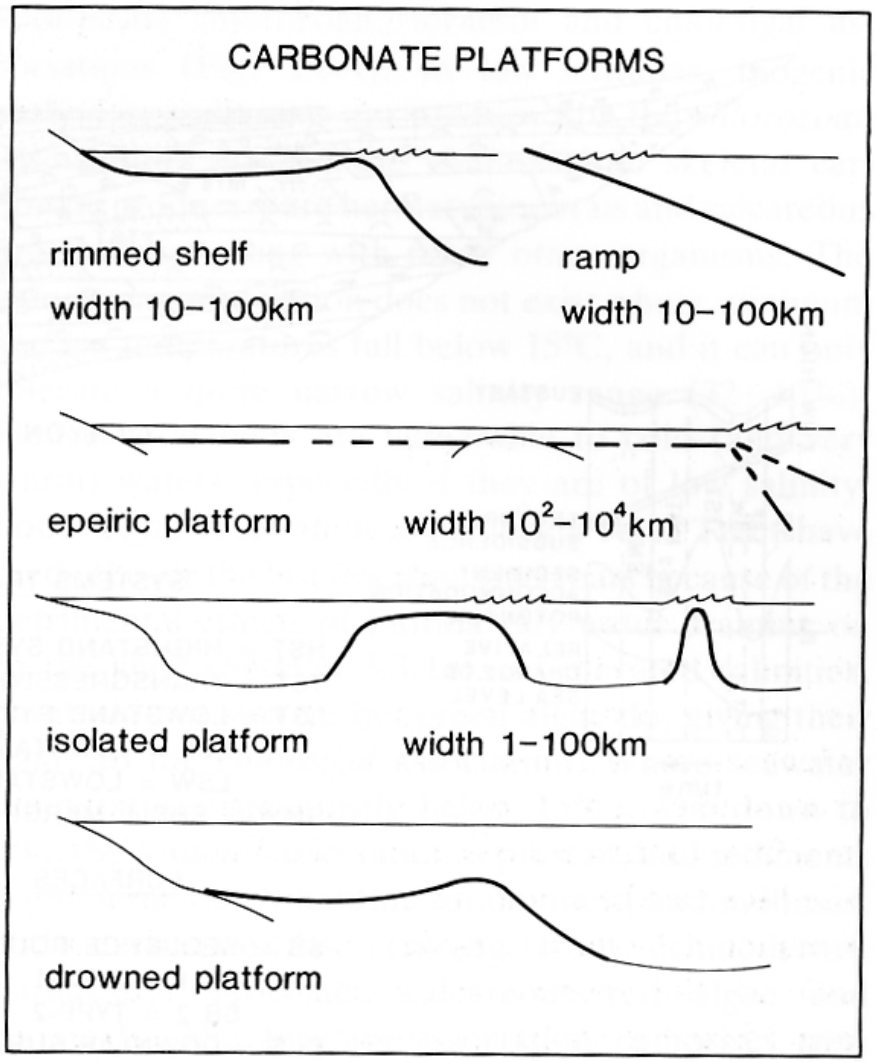
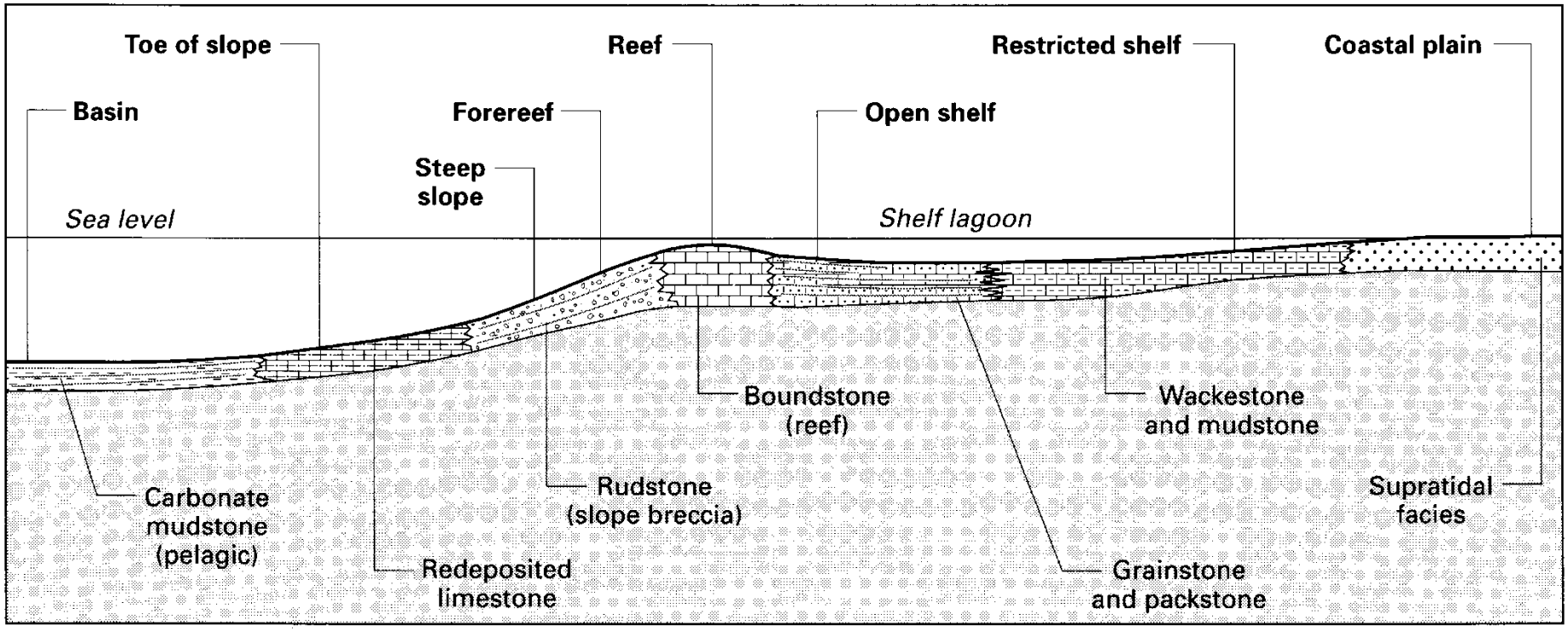
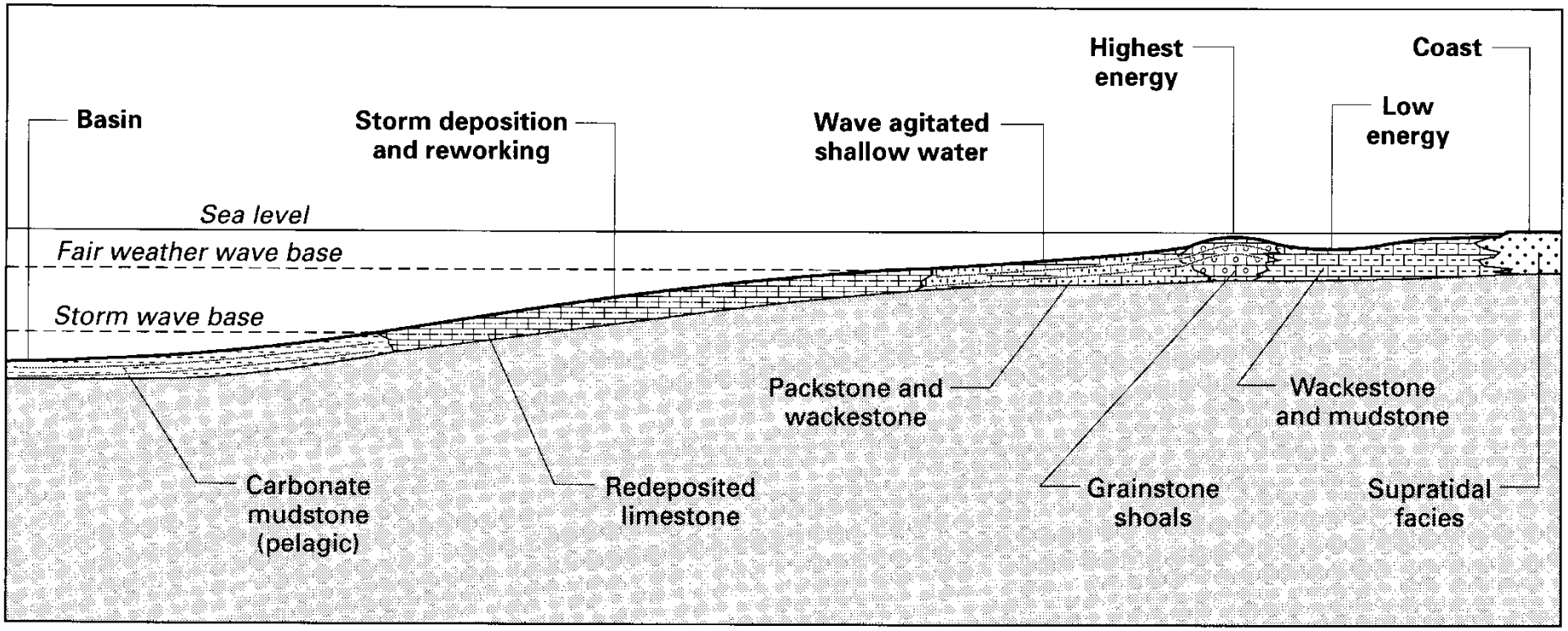


Fig. 2.1 *Carbonate platforms, sketches of the main categories.*

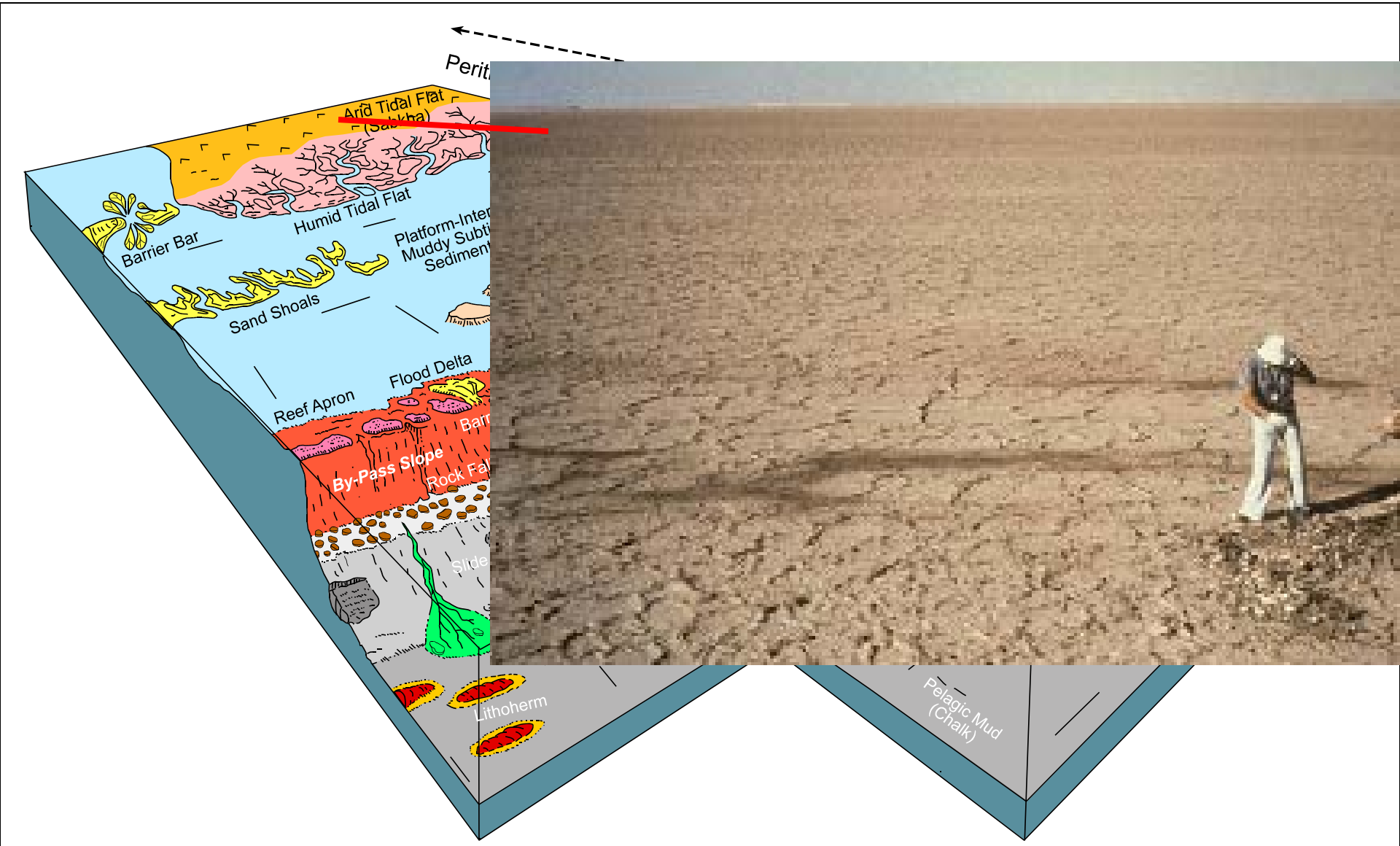
Carbonate Platform



Carbonate Ramp



General Carbonate Platform Model



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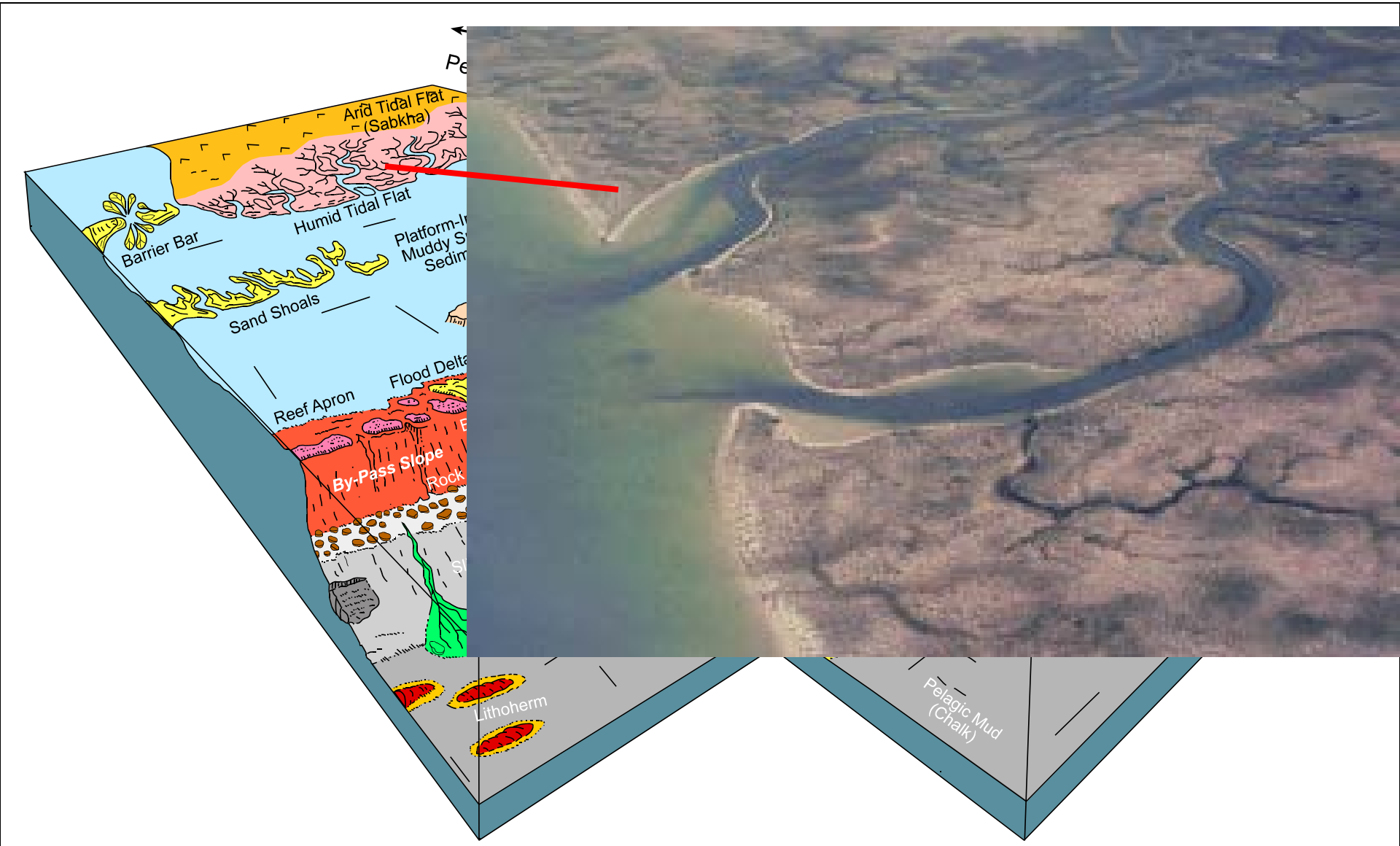

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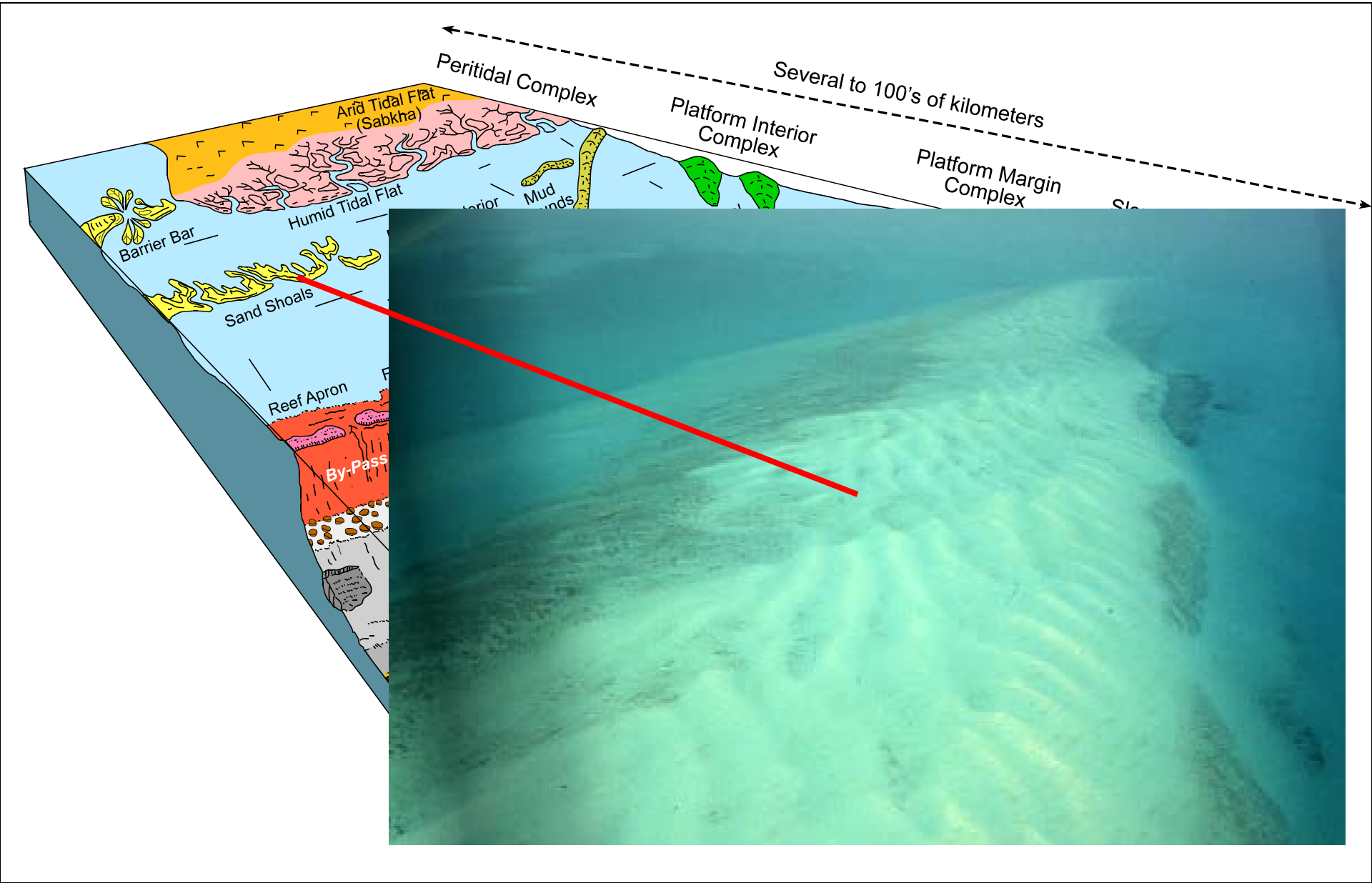

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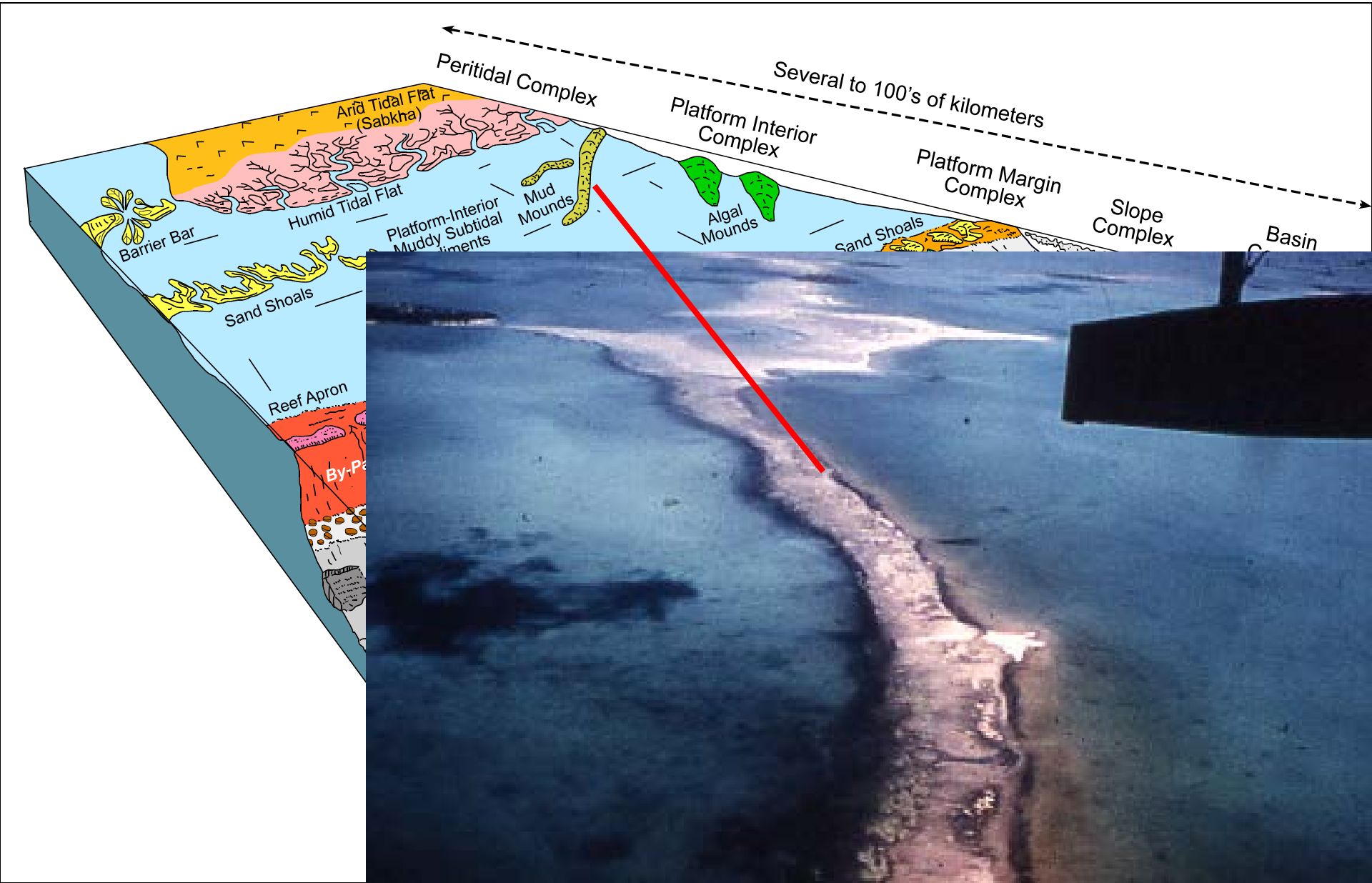

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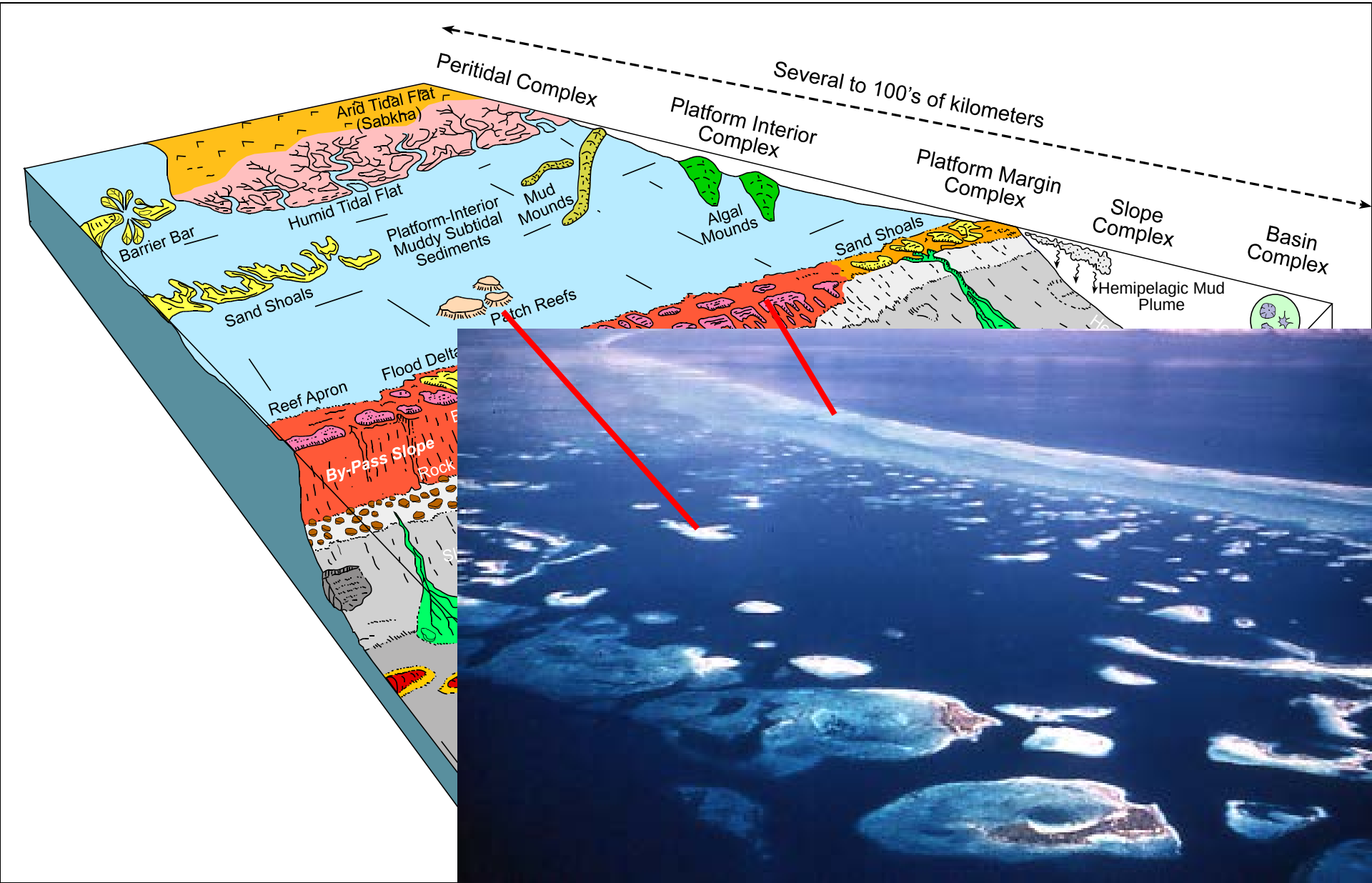

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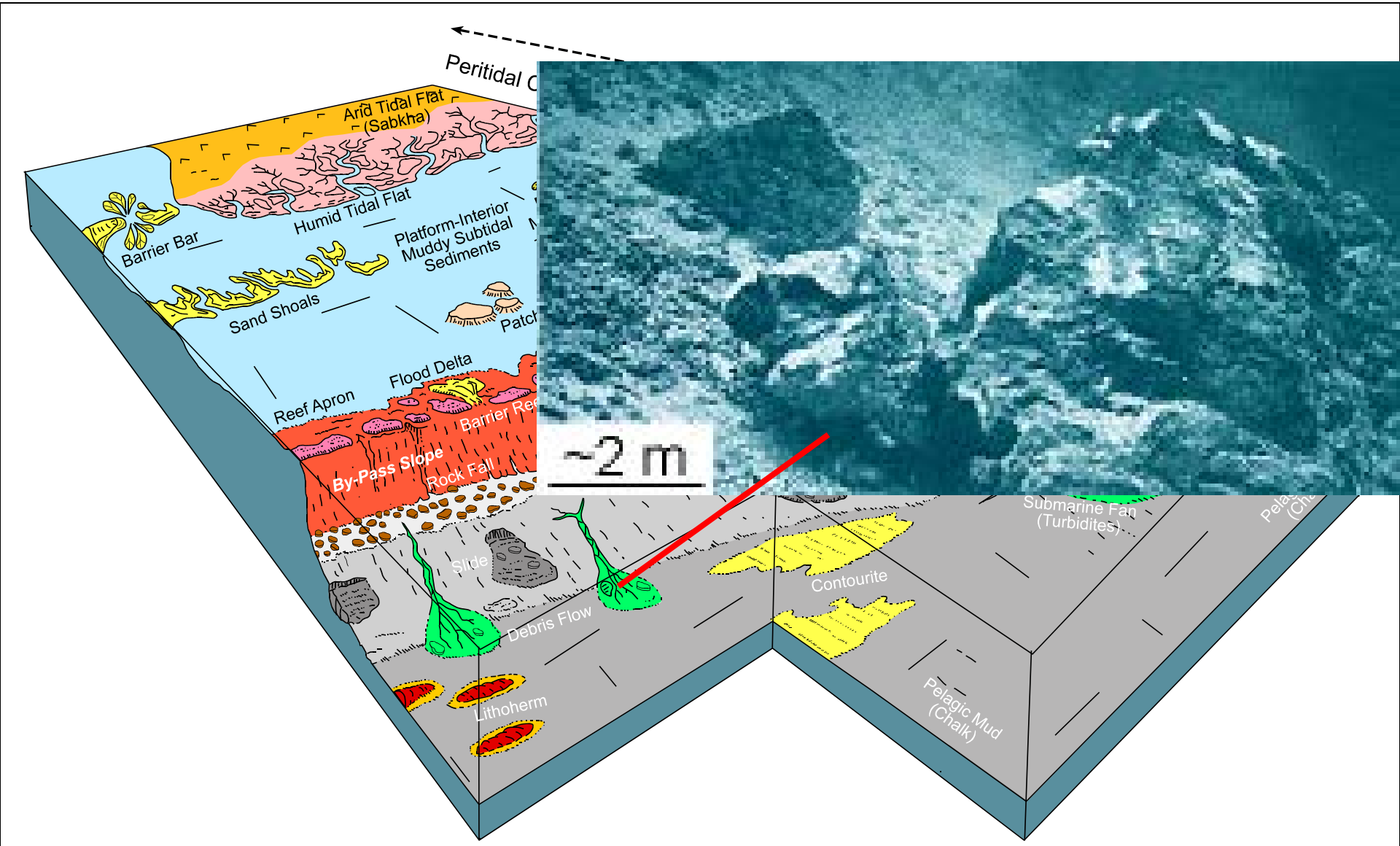

Interpretation of Depositional Environment

- Fossil assemblage
  - Platform interior, restricted (elevated salinity)
    - Low diversity
    - Stromatolites, algal mats
    - Other green algae
  - Mid platform- open shallow shelf
    - High diversity
    - Fauna is age-dependent, but brachs, bivalves, crinoids, bryozoans, various green algae, corals, all common
  - Platform margin – reef system
    - Corals, stromatoporoids, green and red algae, rudist clams, sponges, highly dependent on age, in Precambrian, stromatolites
    - High diversity index, large size, organisms that show attachment
    - Massive highly calcified structures for wave resistance

Interpretation of Depositional Environment

- Fossil assemblage
  - Fore-slope
    - Brachs, crinoids dominant, platy stromatoporoids or corals in maximizing light penetration
    - Some fusulinid or other forams, commonly transported
  - Basin – Only delicate forms, brachs, others, that can live in muddy substrate, some increase in pelagic fall-out

Interpretation of Depositional Environment

- Non-skeletal allochems
  - Peloids
    - Not too good for any specific setting, occur widely by local generation and also get transported
  - Ooids are a critical energy indicator.
    - high-energy shelf margin
    - Tidal currents
    - Mixing of hypersaline platform-top water with open ocean water
  - Pisolites – two general types
    - Soil pisolites indicating exposure, erosion, and rainfall
    - Depositional formation in marine vadose zone associated with teepee formation
  - Mechanical clasts, intraclasts – two different scenarios
    - Ripped up mud-cracked tidal flat
    - Rip-up flat-pebble conglomerates from storm-generated erosion on the shelf
  - Aggregate grains or grapestone
    - Low-energy subtidal shelf

Interpretation of Depositional Environment

- Depositional texture
  - Grainstone – high-energy
    - Two types, massive burrowed and cross-stratified, with xstrat type being higher energy
  - Grain-dominated packstone –
    - Typically a good indicator of mixed environment, probably a grainstone that was shifted into a lower energy environment and then burrowed to get mud mixed in
  - Mud-dominated rocks, packstones, wackestones
    - Lower energy settings, large range of water depths, from subtidal lagoons and tidal flats to outer shelf, slope, and toe-of-slope
  - Mudstones occur at opposite ends of spectrum
    - Mudstones common in tidal flats where too restricted for fossils or other burrowing forms
    - Mudstones occur in deep water basinal settings

Interpretation of Depositional Environment

- Sedimentary Structures
  - Tidal flat
    - Current laminations, algal lamination, mud cracks, rip-up clasts, low-relief stromatolites
  - Shelf
    - Cross-bedded sands, storm deposits, burrowing
  - Reef
    - Few sed structures, massive framestones, early marine cement
  - Slope
    - Soft sed. Folds, breccia deposits, graded bedding, turbidites
  - Basin
    - Thin bedded mudstone, fine mm-lamination, absence of burrowing

Accommodation Continuum