Biogenic Activity and Geomorphology

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Biogenic Activity and Geomorphology

- ❖ Influence of landforms on distribution of organisms
- ❖ Influence of organisms on the development of landforms

Bidirectional

- ❖ Effects of geomorphology on organisms
- ❖ Effects of organisms on geomorphology

Effects of organisms on geomorphology

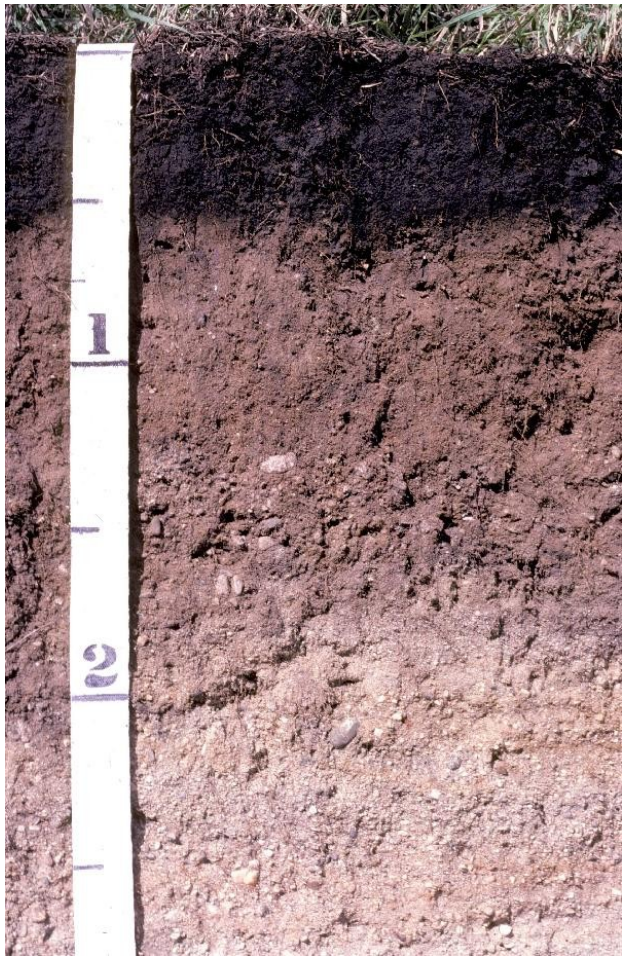
- Animals
  - Modification of landform
  - Direct agents of sediment movement

Prying action of animals

- Animals and insects like ants make deep holes in the crust and initiate process of denudation.
- Human action- querying and blasting.
- Soil erosion- sheeting

Effects of organisms on geomorphic processes

- Weathering
  - Provides nutrients to plants, microbes
  - Organisms secrete weathering compounds (acids, enzymes)
  - Roots break up particles
  - Oxidation of the atmosphere
- Organisms influence the development of ‘overburden’



10.7 BIOTIC WEATHERING

Biotic weathering is carried out by plants, animals and man.

(a) Plants

Plants contribute to both mechanical and chemical weathering. The roots of t plants penetrate into the joints of the rocks. They grow longer and thicker. In th manner they exert pressure on the rocks and the rock joints are thereby enlarg and break into smaller fragments.

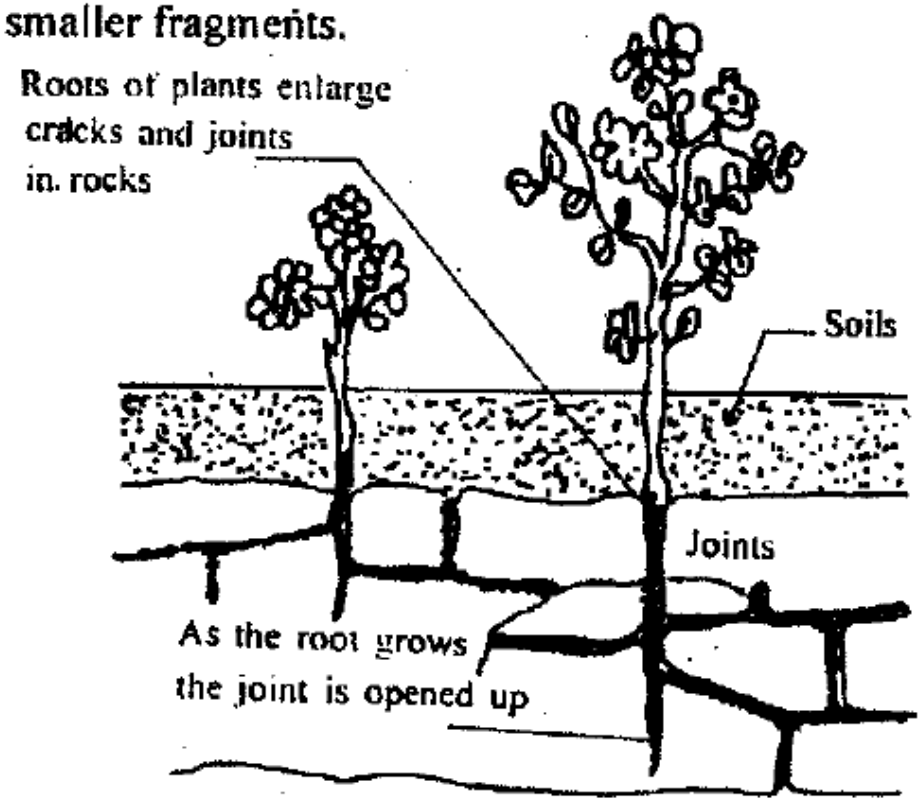


Fig 10.4 Effect of Vegetation on Rocks

(b) Animals

Burrowing animals like earthworms, rats, rabbits, termites and ants break-down the rocks. These disintegrated rocks can easily be eroded or removed by wind etc. Hooves of animals break the soil and thus assist soil erosion. The role of earthworms and termites is of special significance. According to scientists, there is a possibility of occurrence of about 1,50,000 earthworms in an acre and they can convert 10 to 15 tonnes of rock mass into good soil and bring it to the surface.

(c) Man

Human beings play a very important role in weathering of various rocks. Man breaks a large amount of rocks in the course of his activities, like agriculture, construction of houses, roads etc. He quarries for mining minerals, Thus helps in weathering by breaking, weakening and loosening the rocks.

* Biotic agents like plants, animals and man also contribute to physical and chemical weathering.

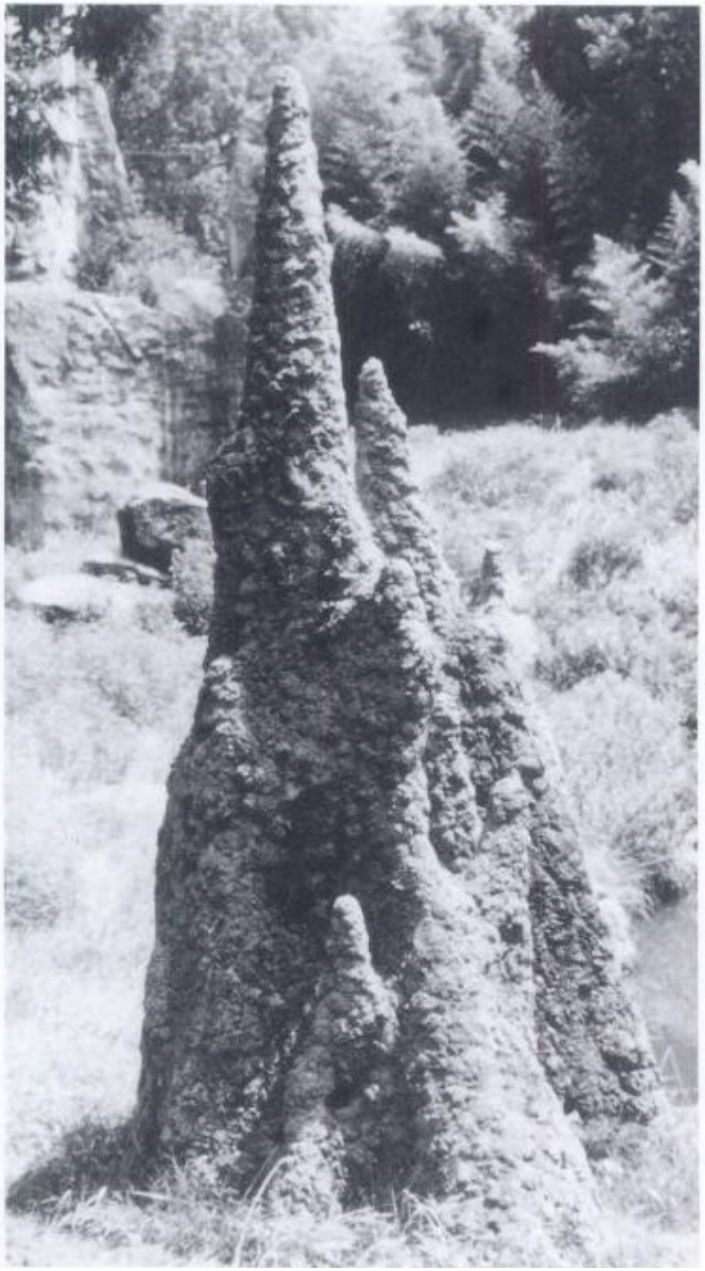
Prying action of plants

ROOT WEDGING

Figure 2.3. The tarantula (*Rhechostica hentzi*), a burrowing arachnid, is common in the southwestern United States and northern Mexico; near Chaco Canyon, northwestern New Mexico.

Figure 2.4. A crayfish chimney on the floodplain of the Roanoke River, eastern North Carolina. Lens-cap diameter is 49 mm.

burrowing



Termites

As Goudie (1988) pointed out, termite mounds or hills (Fig. 2.2) are the most impressive manifestation of termite activity; indeed, a termite mound graced the cover of Viles's (1988d) book. Termite mounds appear in the fossil record at least as far back as the Miocene (Bown and Laza 1990). Termites are distributed in most climatic zones warmer than those of tundra regions, but they reach their greatest visibility in the tropical environment.

Effects of organisms on geomorphology

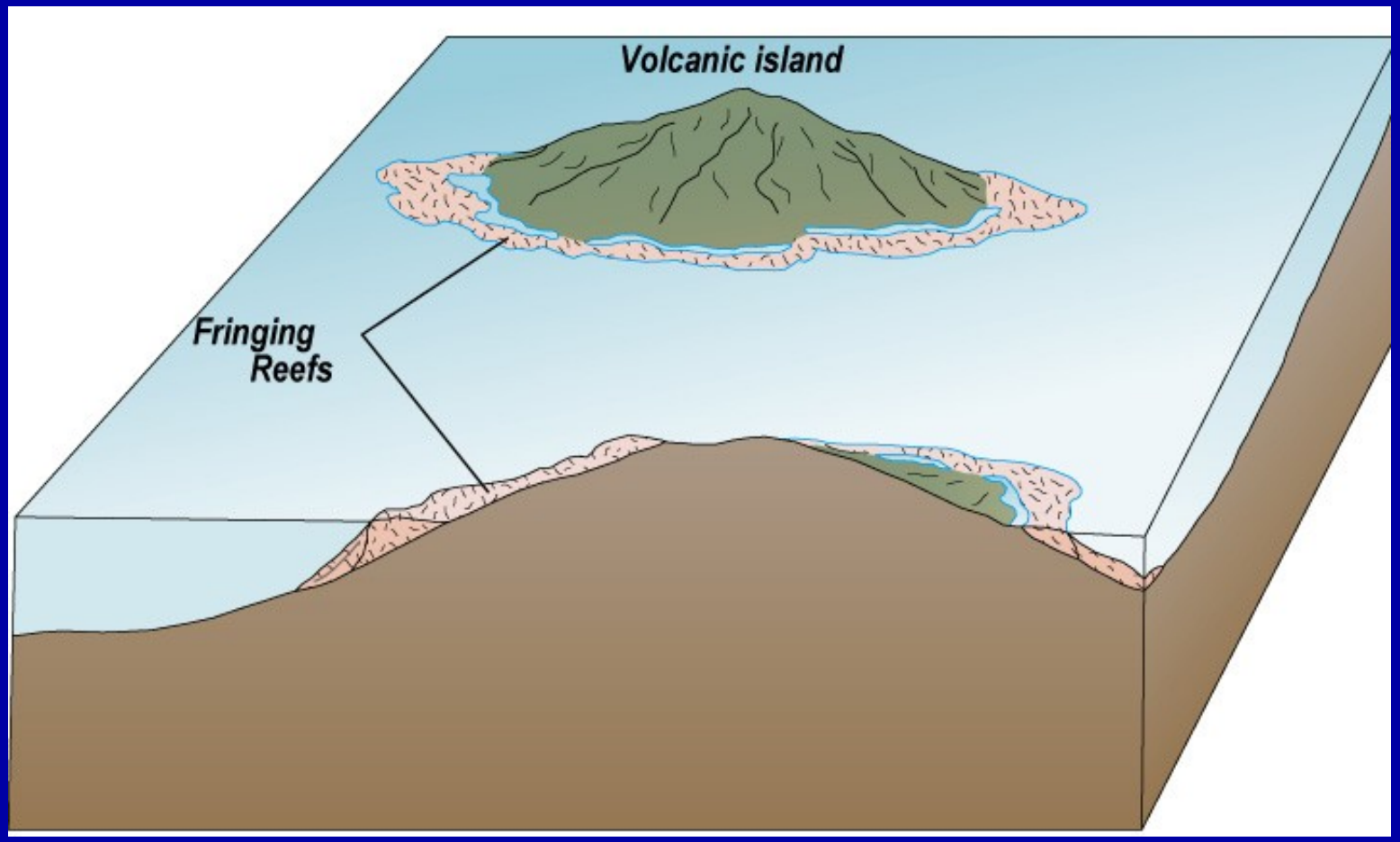
ORGANISMS AND THEIR ACTION

Polyps live in 150 - 200’ deep water and when water has more $caco_3$ and the temperature is above 68 degree, these organisms segregate and build reefs which finally grow into Islands

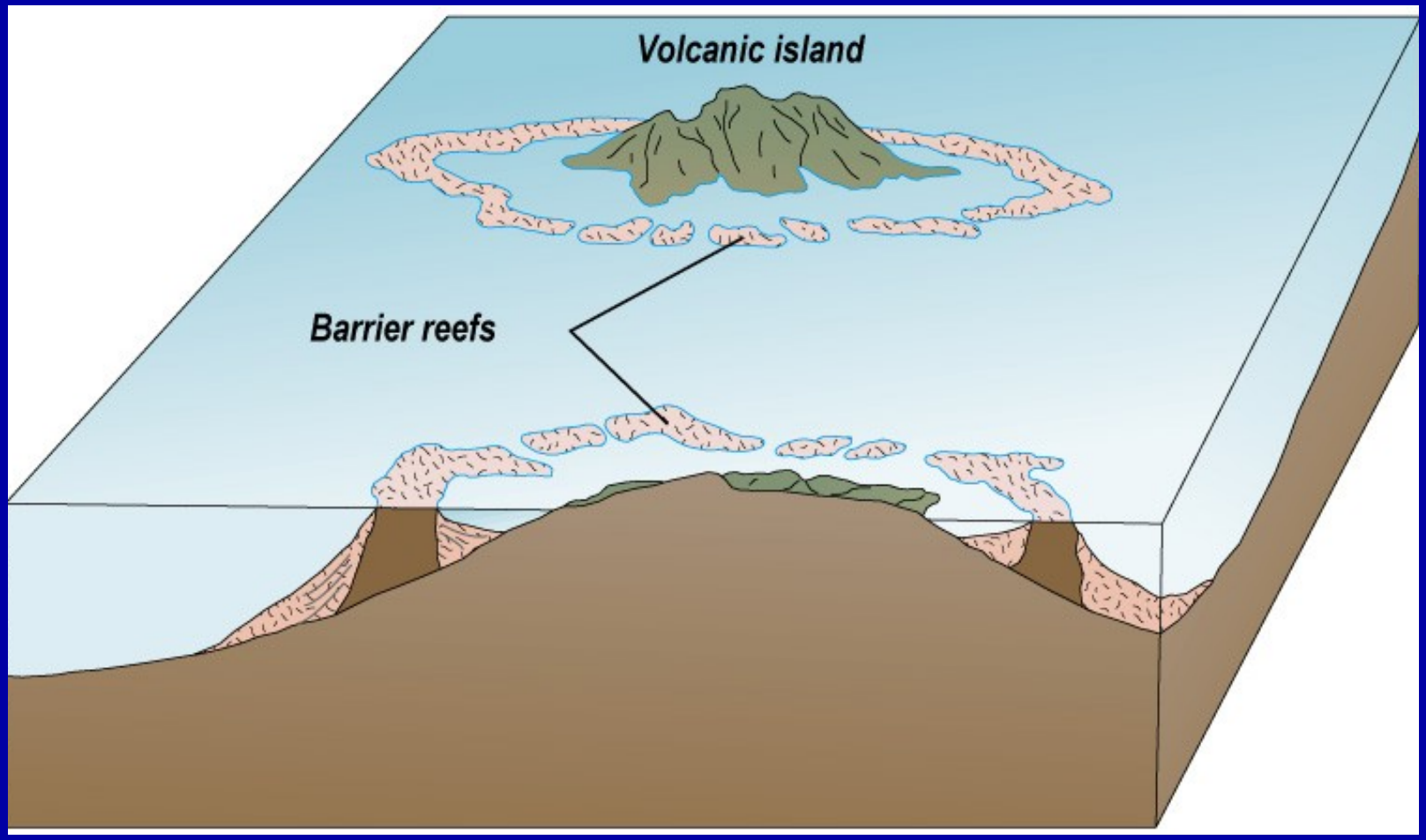
- **Fringing reef**
  - A coral reef built out laterally from the shore, forming a broad bench; slightly below the sea level.
- **Barrier reef**
  - A prominent ridge of coral that roughly parallels the coastline but lies offshore, with the shallow lagoon between the reefs and the coasts.
- **Atoll**
  - Coral reef in the shape of a ring or partial ring that encloses a lagoon that had formally surrounded a volcano, but that volcano has since sunk below surface.

Coral reef

Fringing reef



Barrier reef



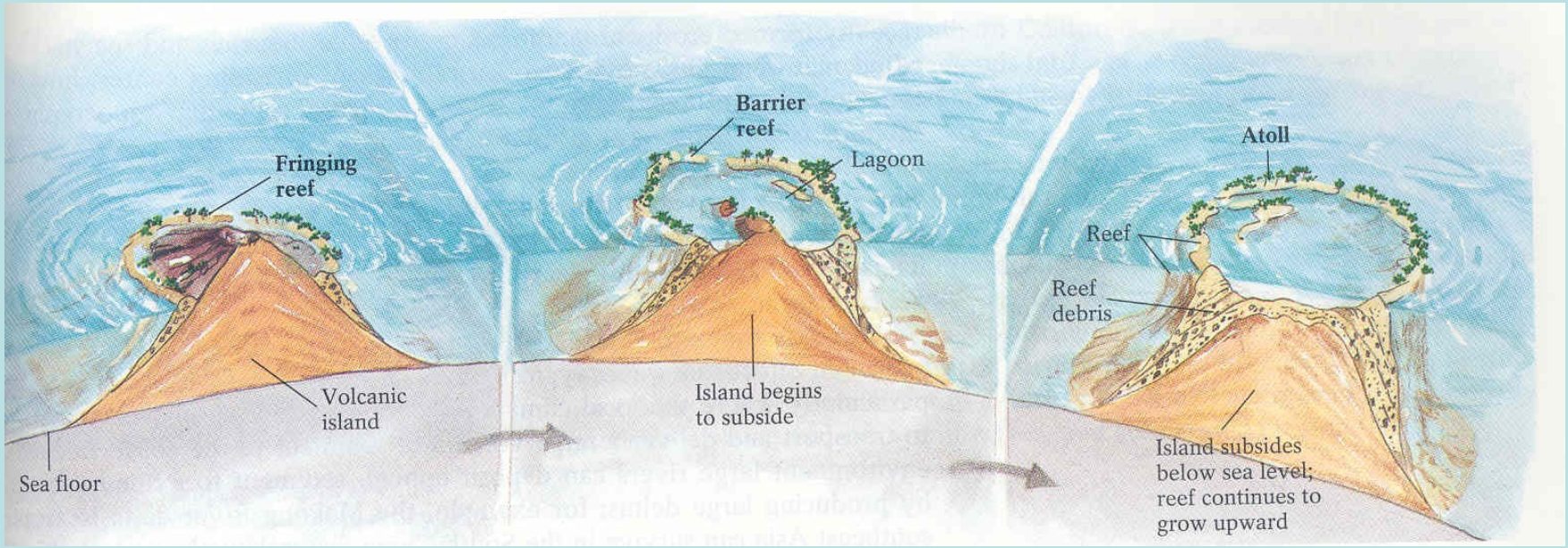
Atoll

The Evolution of Carbonate (coral) reefs

FRINGING REEFS : adjacent to the volcanic Islands

BARRIER REEFS: Lagoon between Island and Reef

ATOLL: Circular coral reef with central lagoon

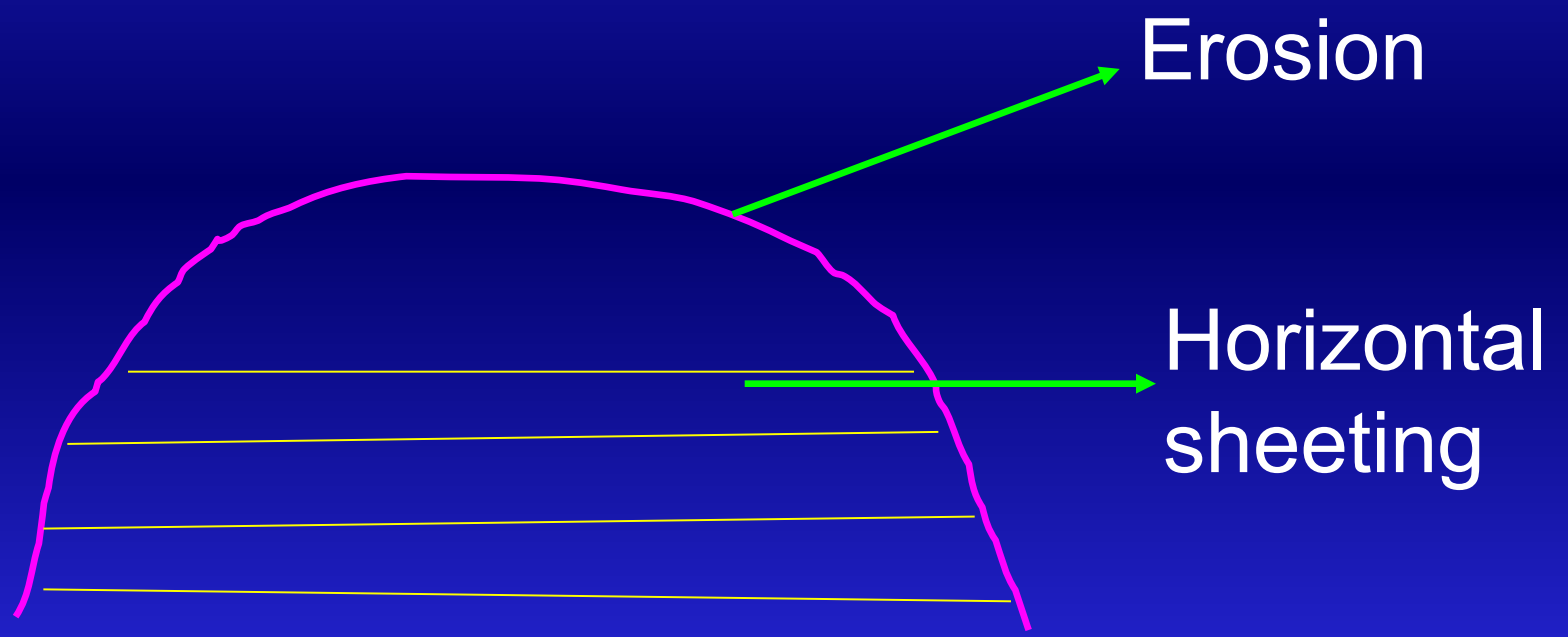


Channel Modifications

Humans often decide that a stream should flow along a specified path for such reasons as flood control, enhancement of drainage, control of erosion, increasing access to the floodplain for development, or improvement of the appearance of the channel. Such channel modifications involve measures such as the straightening the channel, deepening or widening the channel, clearing vegetation from the banks, or lining the channel with concrete. These modifications are referred to as ***channelization***.


COLLINS
M. COLLINS & SONS

DEFORESTATION - SOIL EROSION -SHEETING



RESTORATION OF BEACHES

Groynes:

Wooden, concrete and/or rock barriers or walls at right angles to the sea.

Groynes arrest littoral drift and make the shore line progress seaward till become parallel to the wave direction

(A) Groynes on the sand-starved coast of northern New Jersey have little obvious effect on shoreline stability.

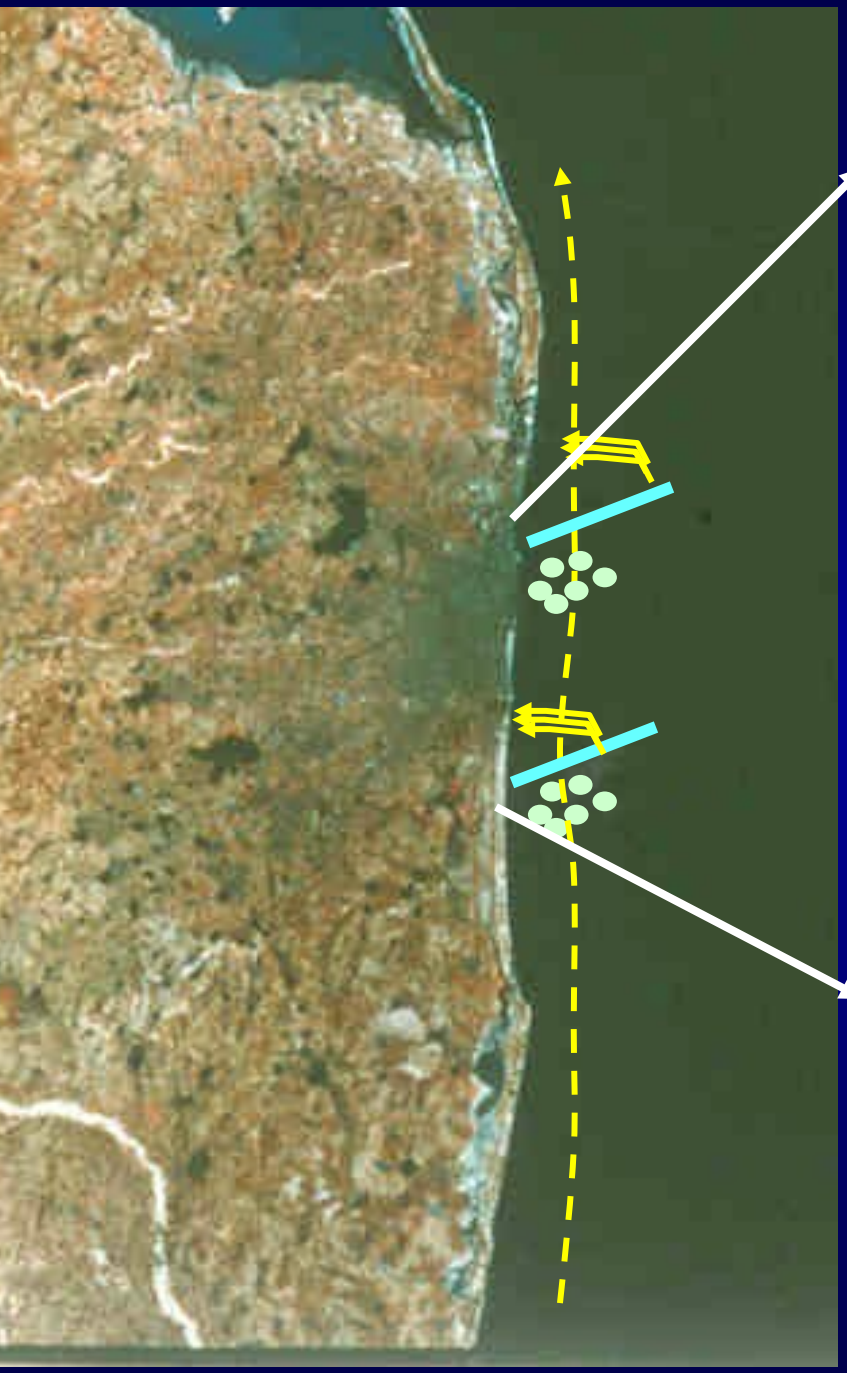
ROCK REVETMENTS

Rock faced concrete revetment

Sand bags

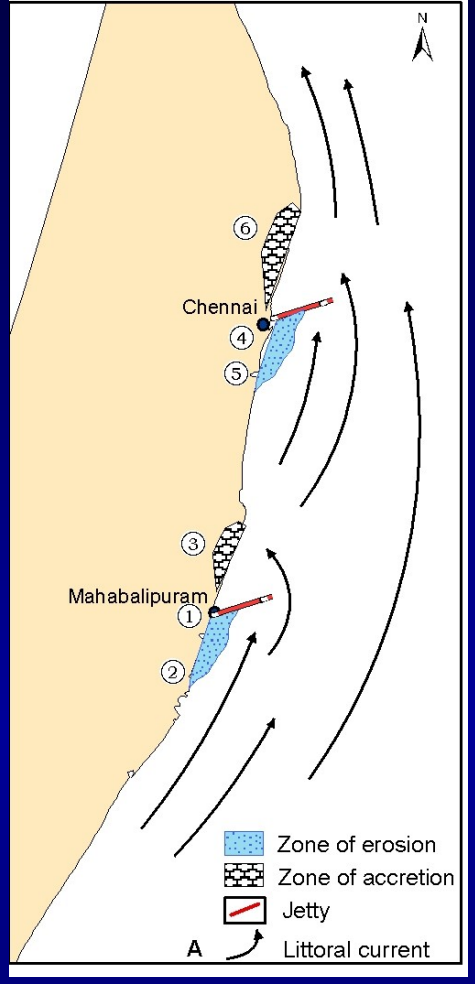
timber and geotextile

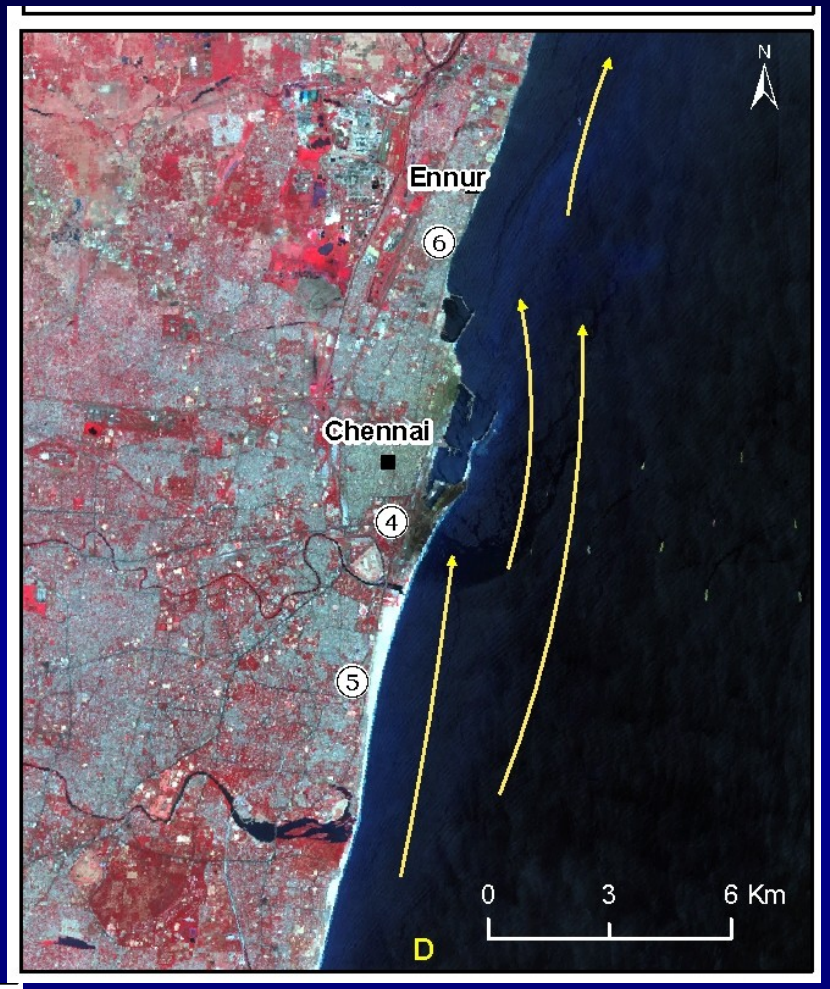
stabilisation using grass plants.



Madras Harbour

Mahabalipuram


N
6
Chennai
4
5
3
Mahabalipuram
1
2
Zone of erosion
Zone of accretion
Jetty
Littoral current
A


N
Ennur
6
Chennai
4
5
0
3
6 Km
D


C


B

OFFSHORE BREAKWATER

Structures constructed parallel to the coastline in break water zone thereby reducing the magnitude of wave attack

Enormous concrete blocks and natural boulders are sunk offshore to alter wave direction and to filter the energy of waves and tides.

The waves brake further offshore and therefore reduce their erosive power.

This leads to wider beaches

Figure 213. The vertical granite seawall at St. Malo in northern France during an onshore gale. Note the line of wooden posts aimed at reducing the direct wave forces on the wall, and the partial clapotis in the nearshore zone.

Nearshore breakwaters