



COASTAL PROCESSES AND CLASSIFICATION



OBJECTIVES

- Description of coastal terms
- The beach materials and their origins
- The basic hydrodynamics (waves, currents, waterlevels) and meteorological factors (wind)
- The morphological processes and form elements
- The shoreline evolution.

INTRODUCTION



- The coastal landscapes ← sediment transport ← hydrodynamic forces
- Beach materials and hydrodynamics \rightarrow coastal morphology

DEFINITION OF COASTAL TERMS



WORK IN GROUPS TO DEFINE:

- 1. LAND 4. COAST
- 2. SEA 5. COASTLINE
- 3. BEACH or SHORE 6. SHORELINE

- 7. COASTAL EROSION
- 8. TIDE or ASTRONOMICAL TIDE



Q: What is the **SHORELINE**?

A: **SHORELINE**: The intersection between the mean high water line and the shore.



Coastline changes of Cape Cod from 1984 to 2017

COASTLINE: Technically the line that forms the boundary between the COAST and the SHORE, i. e. the foot of the cliff or the foot of the dunes. Commonly, the line that forms the boundary between the land and the water





LAND: The area located landward the shoreline, which is identical to the area landward of the MHW line.





SEA: The open coastal waters located seawards of the shoreline. The seawater is saline. BEACH or SHORE: The zone of unconsolidated material that extends from the mean low water line to the place where there is a marked change in material or physiographic form, or to the line of permanent vegetation (the effective limit of storm waves and storm surge), i.e. to the coastline.

The beach or shore can be divided in the foreshore and the backshore.



COAST: The strip of land that extends from the coastline inland to the first major change in the terrain features, which are not influenced by the coastal processes. The main types of coastal features are dunes, cliffs and low-lying areas, possibly protected by dikes or seawalls.

Offs



COAST EROSION: Erosion in the coastal profile. This is taking place in the form of scouring in the foot of the cliffs or in the foot of the dunes. Coast erosion takes place mainly during strong winds, high waves and high tides and storm surge conditions. Coast erosion results in coastline retreat.



TIDE or ASTRONOMICAL TIDE:

The astronomical tide is generated by the rotation of the earth in combination with the varying gravitational impact on the water body of the sun, the moon and the planets. These phenomena cause predictable and regular oscillations in the water level, which is referred to as the tide. The astronomical tide at a specific location can be predicted and is published in Tidal Tables.

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- **BEACH MATERIALS**
- Materials supplied by Rivers
- Materials supplied by the Erosion of the Land Masses due to Wave, Storm Surge and Wind Action

Ocean Environmental Management

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BEACH MATERIALS

Materials supplied by Rivers

- Fine, cohesive materials
 - clay
 - silt...
- Non-cohesive materials
 - Sand
- Mixed supply of cohesive and non-cohesive material
 - Often found in monsoon and trade wind/wave climates

- Materials supplied by the Erosion of the Land Masses due to Wave, Storm Surge and Wind Action
 - The hydrodynamic forces erode semi-hard materials such as moraine, till, sandstone and limestone thereby forming a coastal cliff or a bluff.
 - The coast and the coastal hinterland consist in many cases of sedimentary materials



Boulder clay cliff.

- 1. Cliff with scees and talus.
- 2. Beach with boulders
- A. Moraine clay/till.
- B. Blown sand.
- C. Marine sediments

METEOMARINE FOR THE COASTAL MORPHOLOGICAL PROCESSES 17

- Wind
- Waves
- Currents
- Variations in Water-Level
- Sea Level Rise and Subsidence

COASTAL HYDRODYNAMICS AND TRANSPORT PROCESSES



Sediment Transport

COASTAL HYDRODYNAMICS AND TRANSPORT PROCESSES



Littoral Transport

Ocean Environmental Management

COASTAL CLASSIFICATION

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• How can we classify the coast?

COASTAL CLASSIFICATION

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- Classification of Coastal Profiles
- Classification of Coastlines



COASTAL CLASSIFICATION

- Classification of Coastal Profiles
 - Exposed Littoral Dune or Cliff Coast
 - Moderately Exposed Littoral Dune or Cliff Coast
 - Protected or Marshy Coast

- Tidal Flat Coast
- Monsoon Coast or Swell Coast
- Muddy Coast with Mangrove Vegetation
- Coral Coast



COASTAL CLASSIFICATION

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- Classification of Coastlines
 - Nearly Straight Coastlines
 - Special Coastal Form Elements
 - Delta coastlines
 - Sand spits
 - Barrier Islands
 - Coastlines close to river mouths and to tidal inlets
 - Accumulating sand spits

Delta

Rock

Rive

COASTAL CLASSIFICATION

• Nearly Straight Coastlines

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|------------|-----------------------------------|-----------|---|
| Coastal | Angle of Incidence | Exposure | Main Coastal Characteristics |
| Туре | $(0^\circ = \text{shore normal})$ | Exposure | Wall Coastar Characteristics |
| 1P | | Protected | Marshy |
| 1 M | 0° | Moderate | Narrow stable sand beach, barrier isl., sand spits |
| 1E | | Exposed | Wide stable sand beach, barrier isl., sand spits |
| 2P | | Protected | Marshy |
| 2M | 1°< 10° | Moderate | Narrow stable sand beach, barrier isl., sand spits |
| 2E | | Exposed | Wide stable sand beach, barrier isl., sand spits |
| 3P | | Protected | Marshy |
| 3M | 10° - 50° | Moderate | Narrow unstable sand/shingle beach, cliff or dunes |
| 3E | | Exposed | Wide unstable sand/shingle beach, cliff or dunes |
| 4P | | Protected | Marshy |
| 4M | 50° - 85° | Moderate | Narrow unstable sand/shingle beach, cliff or dunes, salients |
| 4E | | Exposed | Wide unstable sand/shingle beach, cliff or dunes, salients |
| 5P | | Protected | Marshy |
| 5M | 85° – 90° | Moderate | Sandy beach, accumulative land forms, spits |
| 5E | | Exposed | Sandy beach, accumulative land forms, spits |
| | | | Coastal Type Type Type Type Type Type Type Type |

GROUP PRESENTATION Topic 7. Types of Tide in Viet Nam \rightarrow Explain

THANK YOU!