

Barrier Island Coastal Processes

1. Offshore/Onshore Transport (Perpendicular)

- "Winter/Summer" beaches
- Response to seasonal differences in **wave energy**
- **Winter beach**
 - much flatter and wider with eroded dune fronts;
 - sand is stored in offshore (1/2 to 1 mile) sandbars.
- **Summer beach**
 - narrower and steeper with high berms of dune sand
 - sand is stored on the beach and foreshore (very shallow water)

2. Longshore Transport (Parallel)

- Sand is transported along beach by waves striking coast at an angle \Rightarrow "**longshore drift**"
- "Zig-zag" pattern of transport; the **net** transport is always parallel to the beach
- Current that carries the sand is called **longshore current**
- **Tidal inlets**
 - very important for sand distribution and storage
 - complex dynamics between tidal currents and longshore currents

3. Response to Sea-Level Fluctuations

- Causes landward or seaward beach migration
- Can be quite dramatic. Lateral change can be up to $\sim 1000x$ vertical change in sea level.

For example: 1' rise in sea level \Rightarrow 1000' landward migration

Barrier Island Engineering Techniques

- An attempt to protect property and stabilize erosion
- Two main philosophies

1. **Hard Stabilization** ("New Jerseyization")

- Seawalls \Rightarrow parallel to coastline near duneline

Adv: protects property behind beach.

Disadv: wave energy is reflected downward, causes severe beach erosion, ugly, debris on beach.

- Groins/Jetties \Rightarrow linear structures built perpendicular to beach, into the longshore current.

Adv: traps sand in longshore current to widen the beach or to keep inlets open, reduces wave energy.

Disadv: causes erosion on the downdrift side; severely disturbs natural longshore transport of sand.

2. **Soft Stabilization**

- Beach nourishment \Rightarrow artificial addition of sand

Adv: much more desirable (in theory); produces a wider beach with no structures.

Disadv: cost, sand may be eroded quickly; also environmental issues of dredging in sensitive areas (ie. tidal lagoons, inlets).

- Dune stabilization \Rightarrow artificial stabilization of dune systems; fences, planting dune grass (etc.)

Adv: protection from large storms, stabilizes migration.

Disadv: none really, but not long term solution if beach is naturally eroding.