Beach Features and Processes

Longshore Sediment Transport

Generally waves approach the coastline at an angle due to the relative location of the wave generating area. In many locations, for example, the East coast of Florida, the predominant wave direction is seasonal due to the dominance of various storm patterns and locations at differing times during the year.

When waves reach a sufficiently shallow depth, they break, thereby establishing the outer limit of the "surf zone", as shown in Figure 6. The character of the water and sediment motions within the surf zone differ greatly from those seaward of the surf zone. Within the surf zone, the breaking waves exert a "force" on the water causing a movement of water along the shore called a "longshore current". These currents are apparent to the casual swimmer as he or she is displaced along the shoreline. The magnitudes of longshore currents are generally small, on the order of 30 cm/second, but can range up to 150 cm/second. Due to wave breaking, the water inside the surf zone is much more turbulent and chaotic than that outside the surf zone. These two characteristics, the turbulent water motions and the relatively weak longshore current are responsible for the mobilization and transport of sediment in a longshore direction. As can be appreciated, the magnitudes of sand transported along the shoreline depend on the wave height and direction characteristics and can vary considerable from place to place and can even vary from year to year at a particular locality. Interference with the longshore sediment transport will cause areas of accretion and erosion.

Methods exist for the calculation of longshore sediment transport based on wave heights and directions; however, due to our imprecise understanding of transport processes and lack of quality wave data, results of such calculations should be considered as estimates only. Some of the best field estimates of longshore sediment transport are based on the rates of accumulation caused by the construction of long impermeable structures on the updrift sides of channel entrances. Still, such data must be interpreted carefully.

The notation generally adopted for the direction of longshore sediment transport is that positive transport is to the right as an observer faces