



*Measuring longshore currents with fluorescent dye.*

## **Chapter 11 Currents**

### **Background**

While waves are the most important process moving sediment particles on a beach, longshore currents also have a role to play. These currents move parallel to the beach near where the waves break. Their existence is dependent on wave action. As was seen in Chapter 10, climate change will likely impact wave regimes and therefore too longshore current regimes. Monitoring longshore currents will help to contribute to knowledge of a specific beach and to the body of knowledge relating to climate change.

### **Activity 11.1 → Measuring longshore currents**

**What to measure** → When the waves approach the beach at an angle, they generate a longshore current which moves parallel to the beach (see Figure 21). While this current is not in itself strong enough to pick up sediment particles from the sea bottom, it can move material that has already been stirred up by the waves.

The longshore current is responsible for moving material from one part of the beach to another. When a structure such as a jetty or groyne is built out into the sea, this longshore current results in sand building up on one side of the structure (see Figure 22).

Measurements of longshore currents are best combined with wave measurements. So if longshore currents are being monitored, then waves should also be measured (see Chapter 10). Together, these provide a picture of the processes moving sand around on the beach.

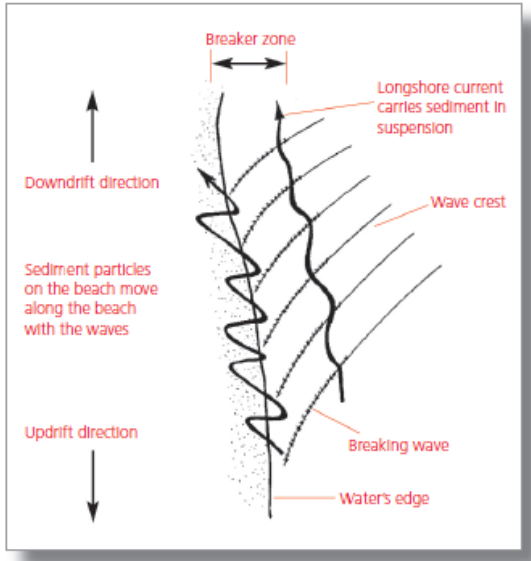


Figure 21 Longshore currents (adapted from US Army Corps of Engineers, 1981b).

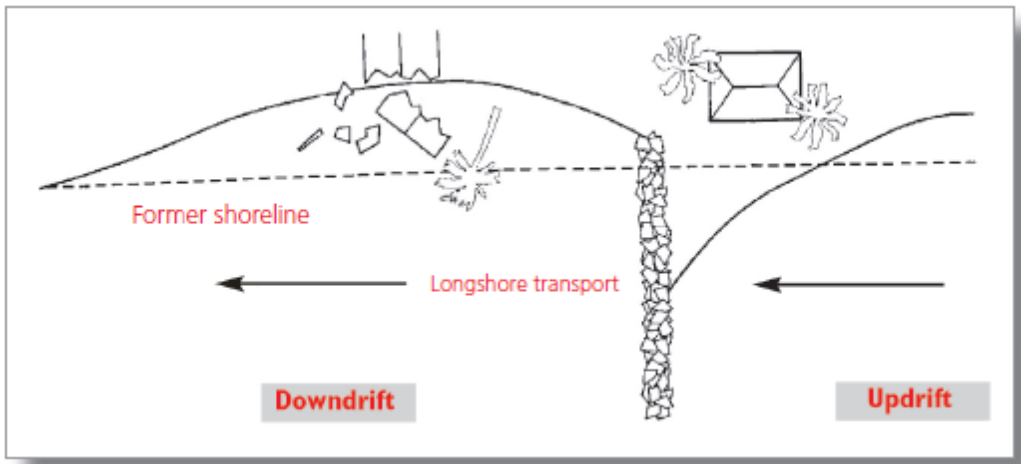


Figure 22 Effect of a groyne on longshore transport (adapted from Bush et al., 1995).



Groyne at Nisbett Plantation, Nevis. The sand has built up on the updrift side of the groyne in the foreground, while the waves reach further inland on the downdrift side as a result of erosion.

The longshore current flows in a

direction roughly parallel to the beach, near where the waves break. The current speed and direction can be measured. Current speeds are recorded in feet per second or cm per second. Current direction is recorded in degrees and is the direction towards which the current is going. So if a current is going from north to south, the current direction is recorded as south or south-going; similarly, a current going from east to west is recorded as west or west-going. (This is opposite to wind and wave direction, which are recorded as the direction from which the wind is blowing or the waves are coming.)

**How to measure** → Place a stick in the sand near the water's edge. One observer walks into the water from the stick and crumbles a dye tablet into the water, as near as possible to where the waves are breaking. (Dye tablets can be replaced by food colouring – available in the baking sections of most grocery stores). The observers on the beach stand by the stick, watch the coloured water and observe the direction in which it moves. After one minute, the maximum distance the coloured water has moved is measured along the beach starting from the stick. This is recorded. The measurement is made again after 2 minutes.

The distance moved per minute is used to determine the current speed in ft/second or cm/second. The direction in which the dye moved must also be recorded.

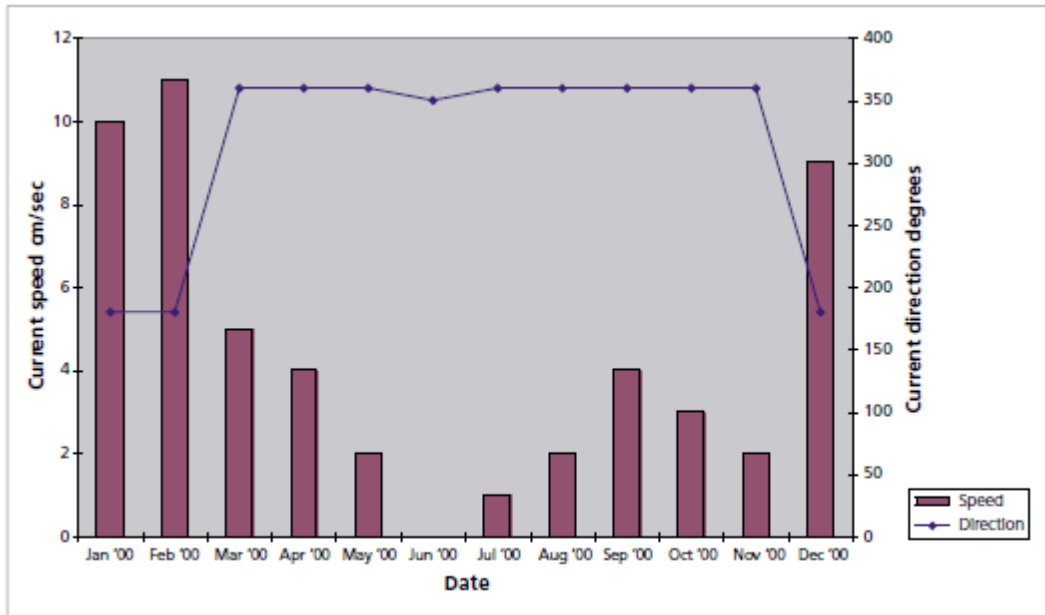
These measurements can be repeated at several different places along the beach to see if the current speed and direction is the same or whether it varies.

If the dye does not move much, but just remains in a pool near the stick, then this means there is no longshore current on that day.

**When to measure** → As with the wave measurements, this will depend on the nature of the monitoring and the time available. While the time is not likely to be available for daily measurements, weekly or twice monthly measurements will yield some interesting information.

**What will the measurements show** → The measurements will show how the longshore current varies over time, and how it changes with the wave height and direction. For instance, if the waves usually approach a beach from the south, and it is only during winter storms that the waves come from the north, then monitoring currents and waves during the normal southerly wave regime and the less frequent northerly storm wave regime, will yield some interesting results. It may be possible also to relate these variations to visual changes in the sand build-up on the beach or measurements of beach width (see Chapter 5).

Figure 23 shows current speed and direction based on once/month measurements over a one-year period. The speed was highest in the winter months when the current direction was south-going. While in the middle months of the year, the current speed was lower and the direction of current movement was north-going.



**Figure 23** Mixed graph showing current speed and direction

**Further activities** → Relate the direction of the longshore current to the source of beach material (see also Chapter 6); possibly some of the material at the monitored beach originates from an adjacent beach or coral reef and is moved to the sample beach by waves and longshore currents.

Discuss the impact of groynes and jetties in your area and the role of longshore currents. Often beachfront home owners build such structures to try and protect their homes, but sometimes homeowners on the other side of the groyne or jetty may experience erosion as a result of the structure. Discuss such measures in the context of the entire beach, not just the affected homeowners.

Suggest the students to carry out research into who owns the beach in your country. What does the law say? Are there any particular building restrictions near beaches so as to protect the public's right to use the beach?

**Watch out for rip currents** → Rip currents are narrow localized currents that flow away from the shore towards the ocean at right angles to the shoreline. They form near breaks in offshore sand bars, near groynes and jetties, and at places where the longshore current is very strong. At beaches with very high waves, rip currents can be very dangerous, and it is safest not to bathe at such beaches unless lifeguards are present. Swimmers caught in a rip current sometimes panic as they are carried offshore. Trying desperately to swim back to shallower water, they can tire and drown. The safest action is to swim parallel to the beach until out of the rip, then swim in.