

## HYDROGRAPHY AND OCEANOGRAPHY 2 - CURRENTS

### *Basic terms*

<ul style="list-style-type: none"> <li>• <i>current</i></li> <li>• <i>trade winds</i></li> <li>• <i>equator</i></li> <li>• <i>setting</i></li> <li>• <i>drift</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>stream</i></li> <li>• <i>Sailing Directions</i></li> <li>•</li> </ul>
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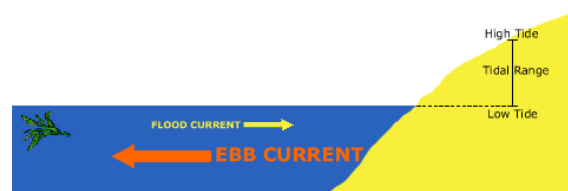
<https://en.wikipedia.org/wiki/Oceanography>

The term "**current**" describes the horizontal motion of the water. Oceanic currents are driven by several factors. One is the rise and fall of the tides. Tides create a current in the oceans, near the shore, and in bays and estuaries along the coast. These are called "**tidal currents**." Tidal currents are the only type of currents that change in a very regular pattern and can be predicted for future dates.

A second factor that drives ocean currents is **wind**. Winds drive currents that are at or near the ocean's surface. These currents are generally measured in meters per second or in knots (1 knot = 1.85 kilometers per hour or 1.15 miles per hour). Winds drive currents near coastal areas on a localized scale and in the open ocean on a global scale.

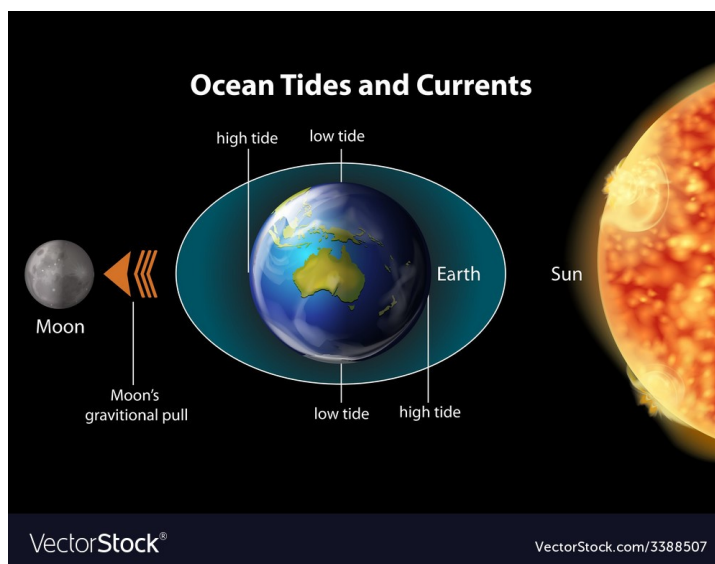
A third factor that drives currents is **thermohaline circulation** - a process driven by density differences in water due to temperature (thermo) and salinity (haline) in different parts of the ocean. Currents driven by thermohaline circulation occur at both deep and shallow ocean levels and move much slower than tidal or surface currents.

Currents (the flowing of the sea in one direction) may be **periodic** in relation to the tides, **seasonal** in relation to a prevailing wind which blows only at certain times of the year, or **permanent** in relation to the main rotational winds (i.e., winds affected by the earth's rotation, such as the trade winds) which blow over the wide ocean surfaces.

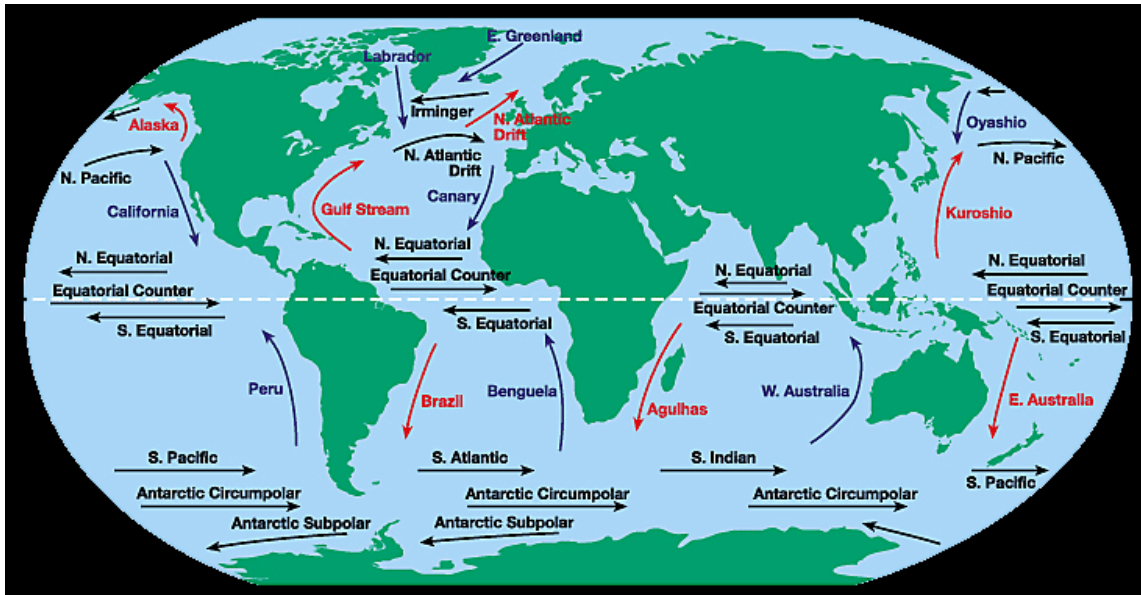


**Tidal currents** occur in conjunction with the rise and fall of the tide. The vertical motion of the tides near the shore causes the water to move horizontally, creating currents. When a tidal current moves toward the land and away from the sea, it “floods.” When it moves toward the sea away from the land, it “ebbs.” These tidal currents that ebb and flood in opposite directions are called “rectilinear” or “reversing” currents.

**Rectilinear tidal currents**, which typically are found in coastal rivers and estuaries, experience a “slack water” period of no velocity as they move from the ebbing to flooding stage, and vice versa. After a brief slack period, which can range from seconds to several minutes and generally coincides with high or low tide, the current switches direction and increases in velocity.



**In the Atlantic Ocean**, the two patterns of trade winds on either side of the equator, the north-east and south-east trades, give rise to two westward moving drifts, known as the equatorial currents. When the Southern Current reaches the coast of South America at about Cape St. Roque it divides into two parts. One branch, the Brazil Current, flows south following the coast as far as the River Plate, where it comes under the influence of the strong westerly winds known as the Roaring Forties. It then flows eastward across the South Atlantic as far as the Cape of Good Hope, part continuing into the Indian Ocean, part being deflected northward by the African land mass to become the Benguella Current. The other part of the Southern Equatorial Current flows north and joins the Northern Equatorial Current.



<https://www.slideshare.net/calee1182/waves-currents-tides>

These two **drifts**, blocked by the shape of the land, escape into the Caribbean Sea and Gulf of Mexico where, unable to continue their drift westward because of the total land block formed by the Isthmus of Panama, they raise the level of the sea. This congestion of water must escape, and the only direction available is north-east up the coast of North America. This is the Gulf Stream. It is deflected off the coast of Newfoundland by the south-flowing Labrador Current and flows across the North Atlantic until it is blocked by the coast of Europe, where it divides. In the Indian Ocean, north of the equator, the dominant factor in the creation of currents is the monsoon winds. The currents in the open sea change with them, forming north-east and south-west drifts. The Mozambique Current is one of the most powerful currents in the world at times flowing at a rate of 4-5 knots. As soon as it reaches open water south of the Cape of Good Hope it meets the west wind drift caused by the "Roaring Forties" and joins it to form a strong east-flowing stream.

**The Pacific currents** are, in general, less pronounced than those of the Atlantic and Indian Oceans. The North Equatorial Current, a westerly stream caused by the action of the north-east trade winds, splits into two parts when it meets the Philippine Islands, one part flowing north and repeating very much the characteristic pattern of the Gulf Stream in the Atlantic. It is known as the Kuro Siwo, or Black Stream.

The **setting**, or direction, of a current is that point of the compass towards which it flows, the drift of a current is the rate in knots at which it runs. Information on currents is given in the Current Atlas of the World and is also included in the appropriate Sailing Directions.

IMO STANDARD MARINE COMMUNICATION PHRASES

IV-A/3.5 - BRIEFING ON METEOROLOGICAL CONDITION

*Weak (tidal) current setting .... degrees,*

*Strong (tidal) current setting .... degrees.*

*Direction of (tidal) current will change in ... hours.*

## A. Comprehension & vocabulary

### A.1 Supply the following terms as required:

- **current** • **stream** • **tidal** • **nontidal** • **tidal** • **nontidal** • **tide**
- **setting** • **drift** • **temporary**.

#### Classification of currents

Currents may be classified as 1. \_\_\_\_\_ and 2. \_\_\_\_\_ currents. 3. \_\_\_\_\_ currents are caused by gravitational interactions between the Sun, Moon and the Earth and are a part of the same general movement of the sea that is manifested in the vertical rise and fall, called 4. \_\_\_\_\_. 5. \_\_\_\_\_ currents include the permanent movement in the general circulatory systems of the sea as well as 6. \_\_\_\_\_ currents arising from the more pronounced meteorological variability. The 7. \_\_\_\_\_ of a current is the direction toward which it flows. The 8. \_\_\_\_\_ is the speed of the current. In British usage tidal current is called tidal 9. \_\_\_\_\_, and nontidal current is called 10. \_\_\_\_\_.

### A.2 Give the source and geographical end point of the following currents:

- **Gulf Stream** • **Humboldt Current** • **Kuro Siwo**
- **Mozambique Current**

### A.2 Supply the appropriate geographical name (see the sketch):

- **Atlantic Ocean** • **Caribbean** • **Northern**
- **North Atlantic** • **Florida**
- **Gulf of Mexico** • **Benguella** • **Newfoundland**

#### The Gulf Stream

The Gulf Stream is sometimes called the 1. \_\_\_\_\_ Current. It starts in the 2. \_\_\_\_\_ Sea where the water, expanded by the heat, escapes into the 3. \_\_\_\_\_. Here it is warmed still further and expands to a vast bulk escaping through the 4. \_\_\_\_\_ straits, and to the eastward of the Grand Banks off 5. \_\_\_\_\_, continuing in great depth across the 6. \_\_\_\_\_ to 7. \_\_\_\_\_ Europe. Its velocity is calculated at about 80 miles a day. A counter current flows to the south of it westward across the Atlantic to the 8. \_\_\_\_\_ sea.

### A.4 Give appropriate answers about the reading text:

1. What are the three basic kinds of currents?
2. Which currents or drifts arise as a result of the Trade Winds in the Atlantic Ocean?
3. What are the «Roaring Forties»?
4. What does the southern Equatorial Current divide into?  
Describe the flow of each.
5. Why does the level of the sea in the Gulf of Mexico rise?
6. What is the source of the Gulf Stream?
7. Describe the flow of the Gulf Stream.
8. How are the currents in the Indian Ocean created?

9. Describe the characteristics of the Mozambique Current.
10. What are the basic drifts on the Pacific?
11. Which current in the Pacific is similar to the Gulf Stream?
12. Where can the information on currents be found?
13. What are the two other names for *current*?

## B. Grammar

### B.1 Form adjectives from the following nouns:

NOUN	ADJECTIVE
equator	
tide	
geography	
period	
season	
east	
west	
north	
south	
coast	
meteorology	

### B.2 Supply the following adjectives as required:

- *mean* • *variable* • *moving* • *tidal* • *large* • *prevailing* • *Tidal*

#### Ocean currents (From Pilot Chart)

The arrows on the chart are approximations of 1. \_\_\_\_\_ direction and the figures are approximations of the 2. \_\_\_\_\_ speed expressed in knots. The number over the arrow is the 3. \_\_\_\_\_ drift in knots.

The Gulf Stream, relatively narrow and fast 4. \_\_\_\_\_, does not have its position rigidly fixed but may meander.

Permanent currents in the Sargasso Sea are relatively weak and 5. \_\_\_\_\_. 6. \_\_\_\_\_ currents predominate in nearshore areas, in various straits and channels and in bays, i.e. where tidal ranges are 7. \_\_\_\_\_.

### B.3 The verbs occurring with the nouns *current*, *stream* or *drift* as subjects in the text are:

- *flow* • *reach* • *divide into* • *join* • *be deflected* • *split into*

Find and write down full sentences where these verbs occur with *current*, *stream* or *drift* as the subject:

#### EXAMPLE

When the Southern Equatorial Current reaches the coast of South America ...