

Effects of Tidal Flow on the race course

The effects of Tidal Flow (or current) while sailing can be quite puzzling at first especially for inland sailors. In this article I will try and explain some of the effects of Tidal Flow and how it influences our sailing.

The Basics

What is Tidal Flow and why does it occur?

Tidal Flow is the movement of open water from one place to another. It occurs due to the gravitational pull effects of the sun and the moon. There are two types of 'tides', as described below:

- Neap tides – These tides are not very strong because the gravitational force is small. This is because (see figure 1) the gravitational force of the sun and the moon are acting at right angles to each other.

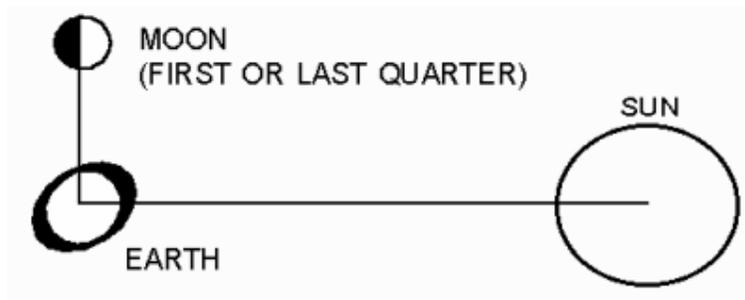


Figure 1

- Spring Tides – These tides are very strong because the gravitational force is very large. This is because (see figures 2 and 3) the gravitational effects of the sun and the moon are in line with each other.

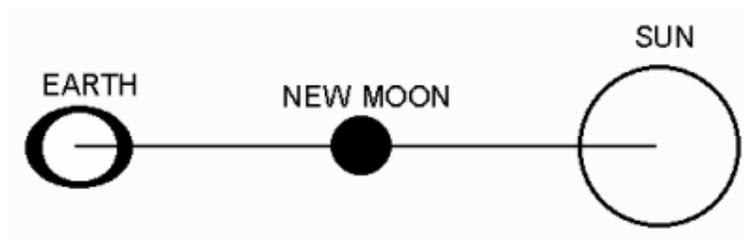


Figure 2

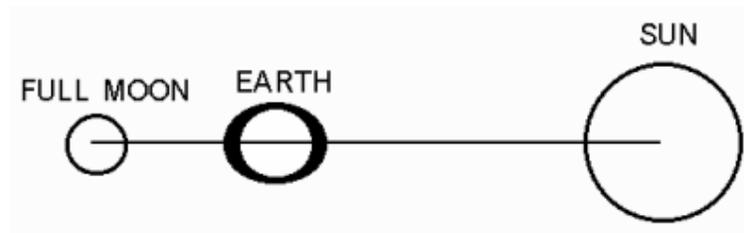


Figure 3

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When the tide is coming in we say that the tide is ‘flooding’, when the tide is going out we say that the tide is ‘ebbing’.

What do the terms “High Water” and “Low Water” mean?

High Water is the moment in time at a given place that the tide has stopped flooding and the water level has reached its highest level. Low Water is the moment in time at a given place that the tide has stopped ebbing and the water has reached its lowest level.

A full tidal cycle is takes just over 12 hours, to explain the cycle we will assume that it is 12 hours. When talking about the tidal flow cycle we can use an important rule called the rule of twelfths.

What is the rule of twelfth’s and why is it useful?

If it takes 12 hours for a full tidal cycle it must take 6 hours for the tide to flood (come in) and 6 hours for the tide to ebb (go out). If we know how much water is going to come in – the same amount must go out. Please see the below diagram :-

Hours After Low Water	Number of 12ths of water Flow	
1	1/12	Flood
2	2/12s	
3	3/12s	
4	3/12s	
5	2/12s	
6	1/12	
High Water		
7	1/12	Ebb
8	2/12s	
9	3/12s	
10	3/12s	
11	2/12s	
12	1/12	
Low Water		

The rule of twelfths is that in the first hour after a low water, 1/12 of that water will flow into the harbour. In the second hour, 2/12ths will flow in and in the third hour, 3/12ths will flow in. In the fourth hour, 3/12ths will flow in, in the fifth hour, 2/12ths will flow in and in the sixth hour, 1/12th will flow in. Therefore in the third and fourth hours, there is more water flowing into the harbour, meaning that the current will be flowing faster. At the time of high and low water, there is no current at all and this is called slack water.

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How does this affect us over the race course?

When sailing on coastal waters tidal flow can have a great effect on our sailing. If the wind and tidal flow are in the same direction as shown in Figure 4 (wind with tide), the wind speed over the sails is reduced compared to the true wind speed – due to the tidal flow pushing the boat away from the wind. Yet if the wind and the tide are in opposite directions as shown in Figure 5, the wind speed over the sails is increased compared to the true wind speed – due to the tidal flow pushing the boat towards the wind.

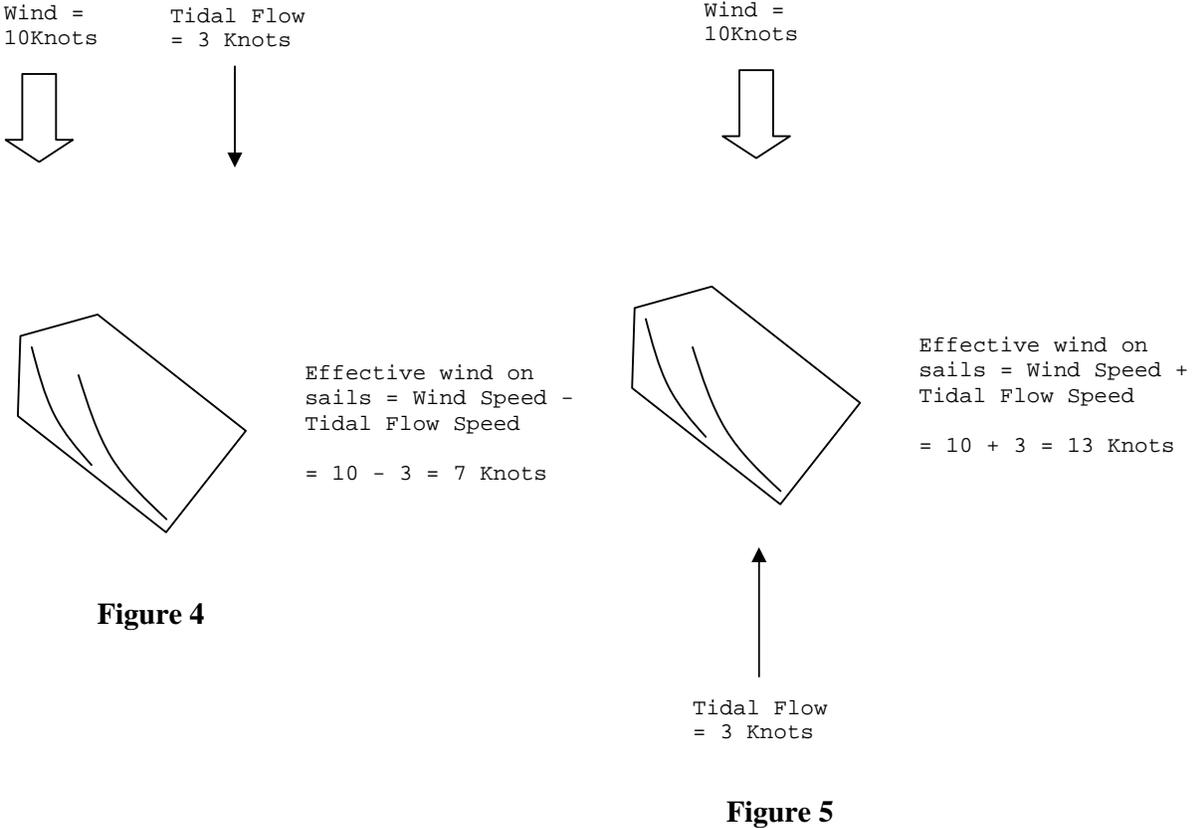


Figure 6 shows advantageous and disadvantageous tidal flow directions in relation to the boat while sailing on a close-hauled course. This knowledge can help plan the fastest route to the windward mark from the leeward mark. In simple terms we want the strongest tidal flow to be pushing onto the leeward side of the boat for as long as possible. As shown in Figure 7.

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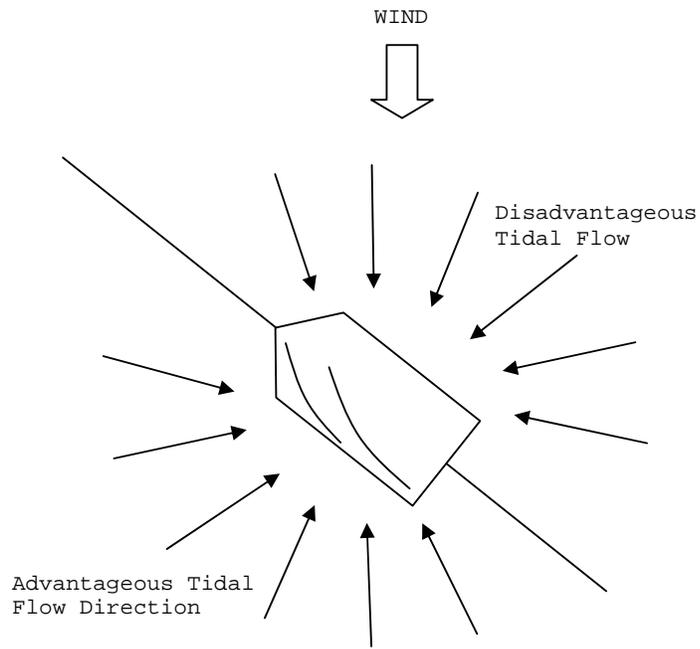


Figure 6

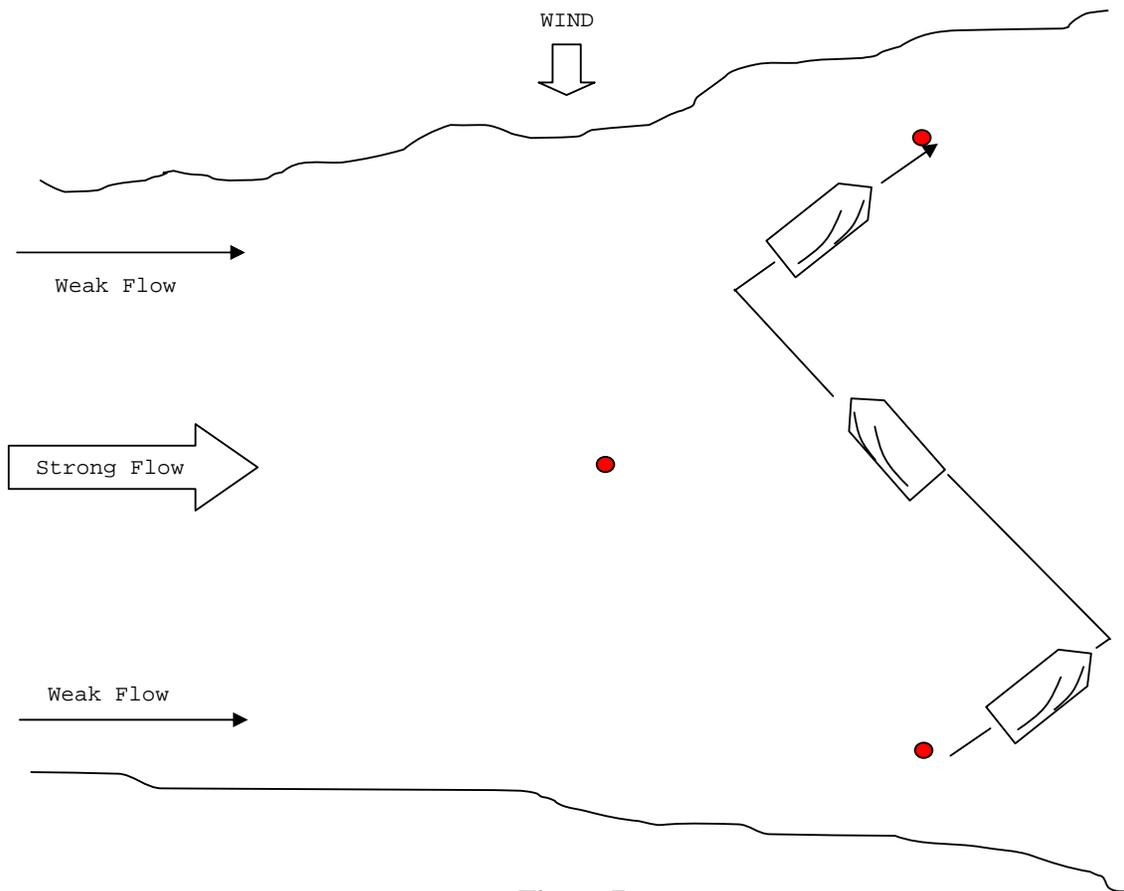


Figure 7

Effects of Tidal Flow on the race course

Sea State and Tidal Flow?

Can Tidal Flow affect the Sea State?

The simple answer is “Yes”, but we want to know “Why?”.

When the Tidal Flow and the wind are in the same direction, the Tidal Flow has the effect of smoothing the surface of the water – decreasing the size of the waves. However, when the Tidal Flow and the wind are in opposite directions, this has the effect of aggravating the surface of the water – increasing the size of the waves.

Conclusion

There are five key things to remember if you are going to use Tidal Flow to your advantage while racing.

1. Tidal Flow will be extra strong during Spring Tides
2. The strongest current will be flowing in the 3rd & 4th hours before/after High Water.
3. At the times around High Water and Low Water there will be no Tidal Flow, this is called “Slack Water”.
4. If the Tidal Flow is pushing onto the leeward side of the boat, there will be more wind travelling across your rig.
5. There will be larger waves when the wind and the Tidal Flow are in opposite directions.

Useful References

United Kingdom Hydrographic Office - <http://www.ukho.gov.uk/>