

TIDES

General info

Tides are created by the gravitational pull on the water bodies of the earth by the moon particularly but also the sun to a lesser degree, as they follow their movements in relation to the earth.

Their effectiveness is in proportion to their sizes and proximity; the sun is 400x bigger than the moon but is 150m Km from earth, while the moon is only 384K Km, so the sun is about 390x further away than the moon and its effect is much less.

The moon's cycle is about 30 days, so it orbits the earth 12 times a year. The orbit is roughly in the same plane as that of the earth orbit round the sun, so every 15 days the sun and moon line up in relation to the earth, either at full or new moon. This generates a bigger gravitational pull so the tides are higher: – spring tides. Conversely when the moon isn't aligned with the sun – half moon - the tides are lower: – neap tides. The difference can be about 1-2 m height. As a generalisation spring tides seem to occur at about midday or 6pm GMT (1 or 7pm BST). Tides are in 12hour cycles due to the “tidal bulge” – the gravitational pull is counteracted by the earth's spin and gravity causing the pull from the moon on one side to have an equal effect on the other side of the earth. Supermoons have an even bigger pull, so causing some of the coastal flooding we had in the last few years.

Tidal flow at a point follows an approximate scale over the 6 hours from high to low (or the reverse) of 1-2-3-3-2-1 so in hour 3 the tide will flow about 3 times faster than in hour 1*.

Due to surface tension and friction, water will flow more slowly in shallower depths, so there will be no tide flow in the shallows on the beach but at the surface a mile offshore the tide will be at its strongest unless there are any obstructions!

Being a fluid, water will generate eddies as it flows round rocks, groynes, headlands etc, and these can be vertical as well as horizontal – see the rough and smooth water either side of a groyne, and round the end of the groyne, when the tide is running.

Something else to indicate the tide is its streaming effect on a moored boat or buoy. The boat will also be affected by wind so may not always be riding to tide.

When wind and tide directions oppose each other, the friction causes the sea state to build a wind-blown chop – more of either creates steeper waves. Conversely, as the tide and wind move in the same direction the waves will reduce.

Summary and tips

Check the tide direction and speed at the start line and at the windward mark before the start of the race; see if there is a difference of angle and/or speed. Know roughly what speed your boat might reach** in the conditions and judge how much effect the tide will have on your boat (1metre/second=1.94knots). Note what time high or low water will be and if it will occur during the race. Remember the flow speed scale. Tide changes in the shallows first, usually on the north bank in an estuary.

Look at a marine chart of the sailing area and see if there are any shallows or geo features which may affect the tide (or wind).

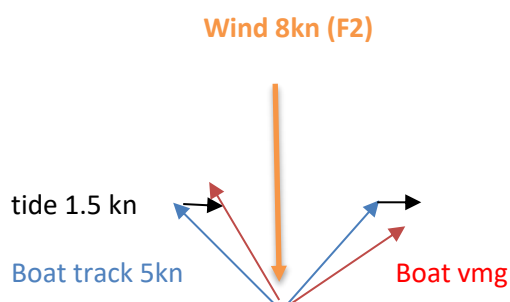
If sailing against the tide, try to go inshore, or behind a headland, or to a shallow area.

If sailing with the tide, stay in deep water.

On an offwind course look for the angle of tide in relation to your heading and try and follow a transit.

When sailing an upwind or running leg, check if the tide direction gives a more favourable tack over the course to the next mark.

- The waves may be at different angles to the boat direction on either tack so surfing may be possible on one tack or upwind one tack may be along the waves but the other may be directly into them
- The tide may have a bend in the flow
- It may be possible to “lee bow” the tide on one tack – see diag below: red line shows speed made good (vmg) with tide at 90deg to wind



Another effect of this is that as the tide is pushing the boat up into the wind on starboard tack the apparent wind speed is increased so the boat will travel faster, whereas on port tack the tide is moving the boat away from the wind, reducing the apparent wind and slowing the boat speed. The boat position is therefore improved by sailing on the “lee bowed” tack so this should be done in the strongest tide while any tack not being “lee bowed” should be taken in the weakest tide, as long as the boat can travel faster than the tide. If the boat speed is less than tide flow, try and avoid the tide as much as possible.

- If beating upwind against the tide, try not to “pinch”, rather sail full and fast to maximise the speed, as the percentage variations in boat speed are effectively enormous in terms of vmg.
- Conversely, if beating with the tide, you can afford to “pinch” as the slight boat speed loss is reduced by the tidal assistance, and especially so if it means the difference between “lee bowing” the tide or not, or pointing higher than other boats.

*tide flow variation table

MAX TIDE 1.5kn	HT+0.5hr	HT+1.5hr	HT+2.5hr	HT+3.5hr	HT+4.5hr	HT+5.5hr
FLOW RATIO	1	2	3	3	2	1
FLOW SPEED kn	0.5	1.0	1.5	1.5	1.0	0.5

**boatspeed table

Waterline length ft	Waterline length mm	Boat type	Max displacement speed m/second	Max displacement speed knots
10	3048	Topper	1.175	2.28
12.5	3810	OK	1.316	2.55
14	4267	Tasar	1.393	2.7