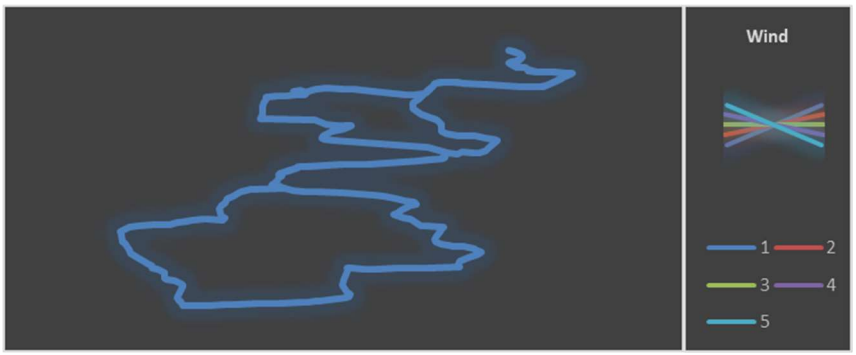
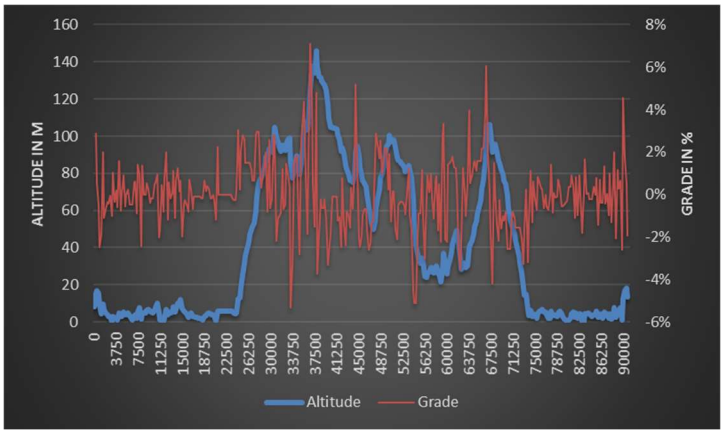
CASE STUDY

TRIATHLON HAMBURG 2017 – WIND IMPACT

THE COURSE

The bike course of the Triathlon in Hamburg goes from the city of Hamburg to the south and the round must be done two times. The topography is more or less flat, but in northern Germany stronger wind – normally coming from the West – may have a significant impact. As the main direction of the course is north to south and vice versa, west wind hits a rider often as side wind.





MODELLING

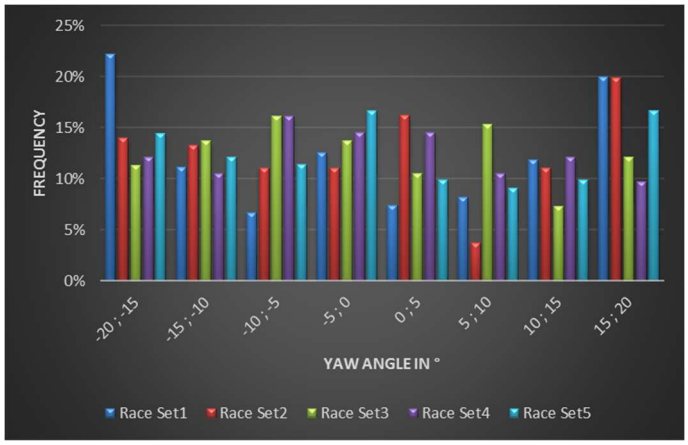
We have modelled a rider with body weight of 68kg and body height of 1.78m able to produce a constant power of 250 Watt. Wind is coming from the West (between 250 and 290 degrees) and a wind speed of 20km/h.

	1 (Basis)	2	3	4	5
Drag coefficient CdA	0.28	0.28	0.28	0.28	0.28
Rolling resistance coefficient	0.005	0.005	0.005	0.005	0.005
Drive and slip loss Cm (%)	3%	3%	3%	3%	3%
Weight bike (kg)	8.5	8.5	8.5	8.5	8.5
Weight rider (kg)	68	68	68	68	68
Constant power	250	250	250	250	250
Height above sea level (m)	20	20	20	20	20
Temperature	25	25	25	25	25
Wind (km/h)	20	20	20	20	20
Wind direction (degree)	250	260	270	280	290

RESULTS

Distance in m			90'902		
Total Time	2:30:00	2:31:26	2:33:01	2:34:45	2:36:35
"Best" Race Set			2:25:42		

From the result table we see a time difference of 6 minutes for one round depending on the wind direction. Not surprisingly, wind has a significant impact. But much more interesting is the distribution of yaw angles, i.e. the effective angle the wind hits a rider. This is dependent from the wind direction and wind speed, the drive direction and driving speed. This analysis will give insight on the material to be chosen, especially the wheel set:



Depending on the wind direction we see yaw angles between 10 and 20 degrees (left and right wind) for up to 66% of the course.

RECOMMENDATION

We recommend using the following wheel sets under different wind conditions (with higher body weight higher rim heights are possible):

	Rim Height in mm	
Wind	**Front Wheel**	**Rear Wheel**
Light	70 - 80	80
Medium	55	80
Strong	45 - 55	55