Wind direction dependency in Dynamic root testing

The encircled Eucalyptus sp. tree was tested through several days at high wind velocity during February 2022 with DynaRoot dynamic root testing system. The tree is approximately 17m tall and has a dimater of 44 cm at breast height. The measurements were conducted in the United Kingdoms by Mr. James Chambers, Tim Moya Asssociates.
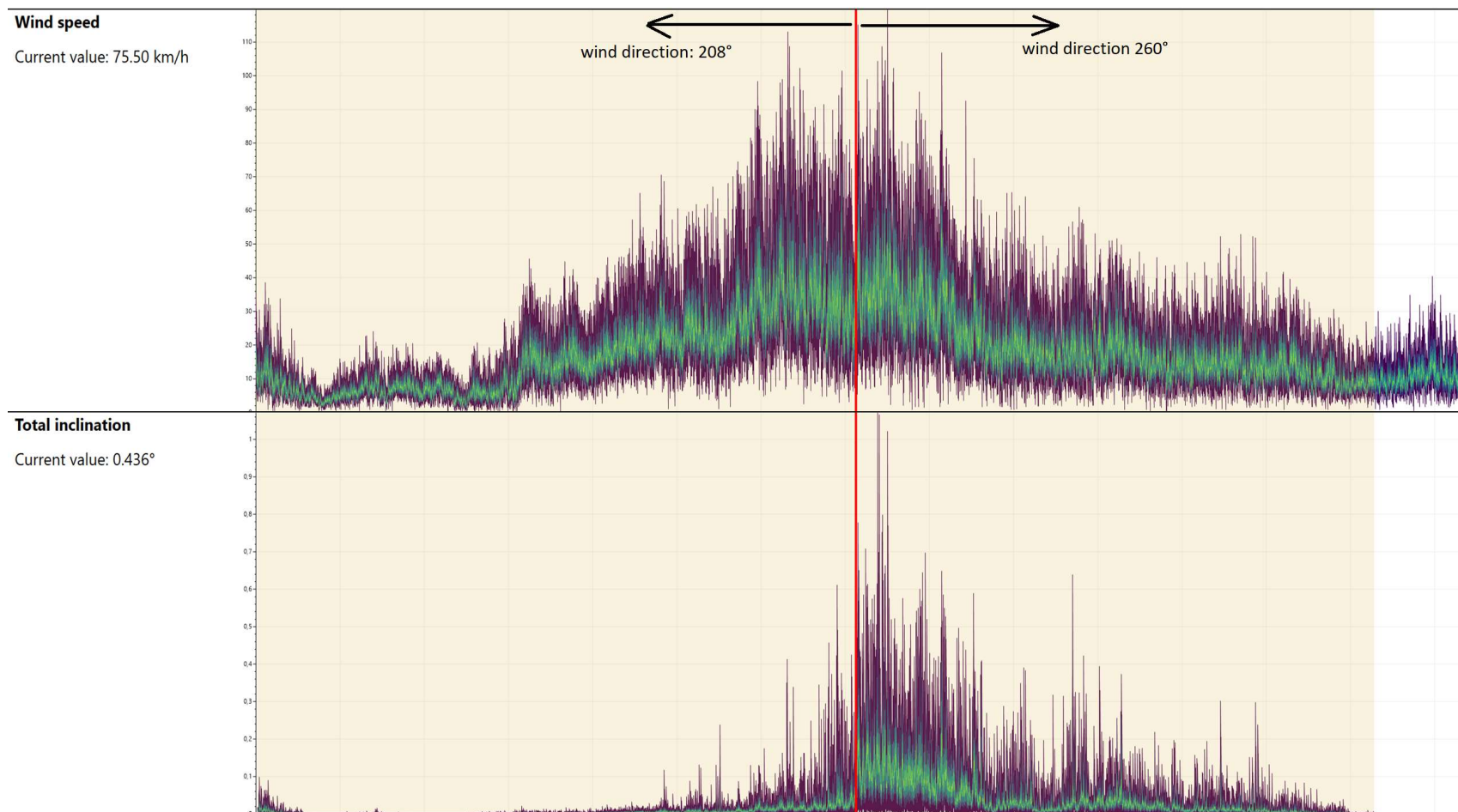
The image on the left shows the satellite image of the surrounding area of the measured tree. The red cross indicates the tree in question, while the yellow cross indicates the location of the wind anemometer. It is clearly visible that the tree is protected from the wind from the south, southwest and southeast by several large buildings, while completely exposed to the wind in any other direction.

Date	max. wind speed (km/h)	wind direction (degre)	Safety Factor	correlation coeff.
October 27	84	340	0,94	0,95
February 18/1	113	208	3,96	0,94
February 18/2	119	260	0,96	0,95
February 18/3	53	243	1,24	0,72
February 19/1	72	259	1,1	0,82
February 19/2	68	221	2,89	0,76
February 20	72	215	2,89	0,72
February 20/1	94	281	0,92	0,85
February 20/2	50	307	0,87	0,68

The table on the left shows the measured wind speeds and the direction of the wind, with its corresponding Safety Factor calculated by the software. The results show that from the protected wind blow directions (S,SW,SE) the Safety Factor is significantly higher. From unprotected directions (West ~ 260°, NW ~ 340°) the Safety Factor is below 1 which is deemed unsafe by the software. On the right the arrows indicate few of the wind blow directions from the table.

Wind speed

Current value: 75.50 km/h

wind direction: 208°   wind direction 260°

Total inclination

Current value: 0.436°

The graph shows that after the change in wind direction (red line) the inclination measured on the tree became significantly higher.

Conclusions

Ultimately as the gathered data shows the results of DynaRoot and DynaTree systems and generally the dynamic test systems are highly influenced by wind direction. Surrounding buildings or other tall trees can affect the measurement resulting in high Safety Factor, in case the wind blows from their direction. It is extremely important to always take the wind direction into consideration and if the measurement show good results from a „wind protected" direction caution and other measurements with different unprotected wind directions is recommended.