Turbulence

GASP turbulence is modelled by a straight line with respect to windspeed (Figure 1), which is comparable to the Normal Turbulence Model (NTM) defined by the IEC 61400-1 design standard [1]. As part of the wind fatigue parameters the slope (A) and offset (B) parameters are provided for both the turbulence mean value and 90% quantile:

$$\sigma_{U,mean}(U) = sigma\_meanA \cdot U + sigma\_meanB \tag{1}$$

$$\sigma_{U,P90}(U) = sigma\_P90A \cdot U + sigma\_P90B \tag{2}$$

Note that the turbulence model returns the windspeed standard deviation (σ_U). This can be converted to turbulence intensity (TI) by dividing with the windspeed:

$$TI_{mean}(U) = sigma\_meanA + \frac{sigma\_meanB}{U} \tag{3}$$

$$TI_{P90}(U) = sigma\_P90A + \frac{sigma\_P90B}{U} \tag{4}$$

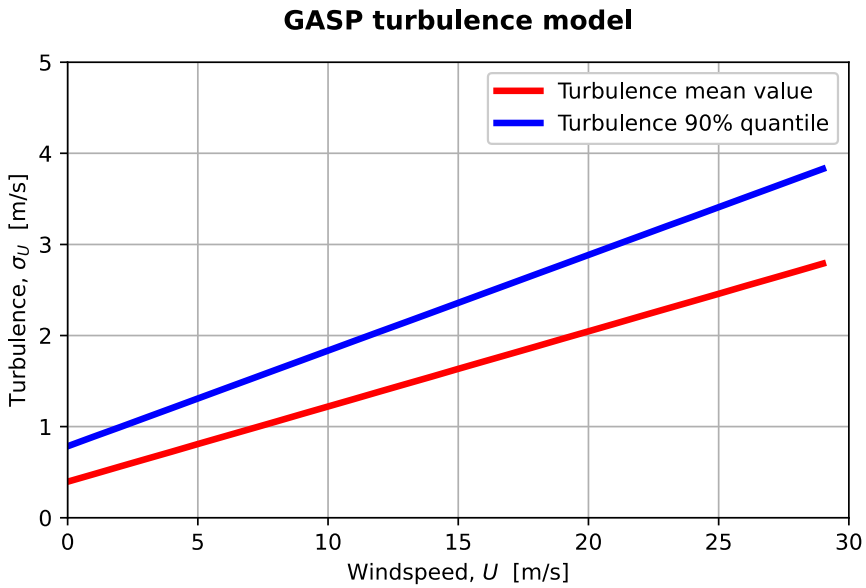

Figure 1: Example of GASP turbulence as function of windspeed.

References

[1] IEC., "International Standard IEC 61400-1 ed. 4, 'Wind Turbines - Part 1: Design Requirements'." 2019.