Memo: Accuracy of Wind Speeds in GASP - Global Atlas of Siting Parameters

Authors: Morten L. Thøgersen (mlt@emd.dk), Lasse Svenningsen (ls@emd.dk), Thomas Sørensen (ts@emd.dk), 2021-09-07

Introduction

How accurate is your resource prospecting based on GASP data in windPRO or windPROSPECTING? This note gives a first hint.

Approach

The accuracy of the wind speeds obtained from GASP data have been evaluated by comparing against mean wind speeds from measurements. These were extracted as data-subsets from a database with 200+ high-quality tall meteorological towers around the globe. The approach is as follows:

Figure 1: Distribution of errors for all 241 masts.

- Use masts with >12 months of data and a mean wind speed > 5 m/s
- Wind speeds from top anemometer – and limit to masts taller than 50m
- Only traditional masts (no remote sensing devices)
- ERA5 as the long-term reference data – the reference period used is 20 years (1999-2018)
- Long-term correcting (MCP) using an index-approach
- 'Ground truth' defined as long-term corrected wind speeds
- Horizontal interpolation of GASP mean wind speeds by bi-linear interpolation (resolution 250m)
- Vertical interpolation of GASP mean wind speeds via shear-exponent using nearest model heights
- Calculate mean wind speed error (percentage) for all masts
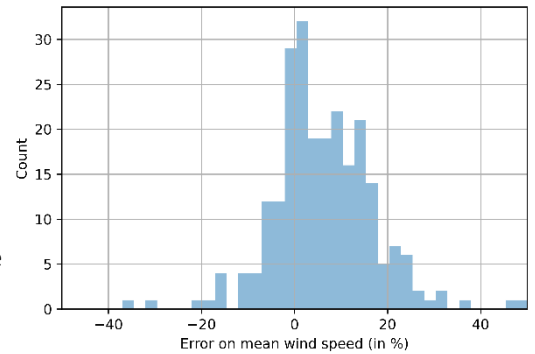- Evaluate errors for subsets of different typical terrain types

Results

The table below summarizes the statistics for the mean wind speed error histogram shown in Figure 1 and for data-subsets.

Data Subset	# of masts	Error in %		
		Mean	Median	Std.dev.
All masts (see Approach)	**241**	**6.9**	**5.6**	**12.7**
Masts in "flat" terrain	110	5.5	4.0	8.1
Masts in "hilly" terrain	93	6.6	4.3	13.5
Masts in "steep" terrain	38	11.5	12.1	19.5
Mast in forested terrain (Area > 50% in R=30km)	84	9.5	6.6	13.6
Mast in terrain with crops (Area > 35% in R=30km)	71	7.8	10.1	8.5
Offshore masts	6	1.9	0.3	4.5
DTU validation study, see [2]	**35**	**-1.0**	**-**	**18.0**

Endnotes

1. The model-chain and downscaling approach used in GASP and windPRO are comparable in methodology and generalization approach. Modelling errors in both approaches are expected within the same order of magnitude.
2. The DTU validation study by Brian Ohrbeck Hansen is found here: https://globalwindatlas.info/about/validation. The 35 sites are located within Bangladesh, Maldives, Pakistan, Papua New Guinea, Vietnam and Zambia.
3. These findings are to be considered preliminary. This is work in progress.

Acknowledgements