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DISCOVERING THE TRUE WIND RESOURCE: INCLUDING HI-RES TERRAIN EFFECTS FOR A NEW AND GLOBAL WIND ATLAS.

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Introduction

Currently, policy makers and energy planners have no global wind resource dataset appropriate for their pressing needs. The use of coarse resolution reanalysis datasets has the serious shortcoming that the wind energy resource is underestimated, as small scale spatial variability of winds is missing. This missing variability means that a large part of the wind resource is not included. Crucially it is the windiest sites that suffer the largest wind resource errors; in simple terrain the windiest sites may be underestimated by 25%, for complex terrain the underestimate can be 100%.

Approach

The small scale spatial variability of winds can be modelled using novel statistical methods and by application of established microscale models within WAsP, developed at Risø DTU. We present the framework for a single global methodology, which is relative fast and economical to complete. The method employs the latest global meteorological datasets (reanalysis), which are downscaled to high-resolution wind resource datasets via a so-called generalization step, and microscale modelling using a new feature of WAsP that allows calculation of resource data covering extensive areas.

Main body of abstract

New and improved global meteorological and topographical dataset are becoming available in the public domain. These data together with existing modelling tools make it possible to create a new and much needed wind climate and resource dataset for the globe. This international effort is part of an initiative to i. map globally the renewable energy resources for global end-users working on energy planning and ii. develop an accompanying capacity building web-based framework for training materials.

Geospatial information systems (GIS) will be one of the significant applications of the new Global Wind Atlas datasets. As location of wind resource, and its relationships to population centres, electrical transmission grids, terrain types, and protected land areas are important parts of the resource assessment downstream of the generation of wind climate statistics. Related to these issues of integration are the temporal characteristics and spatial correlation of the wind resources will also be addressed.

The uncertainty of the new wind climate and resource dataset will be determined by carefully selected test regions, using mesoscale modelling and synthetic aperture radar (SAR) derived estimates. Uncertainty will be assessed as a function of spatial aggregation. It is expected that the uncertainty on point data will be larger than that of site dedicated assessments, but the uncertainty will be reduced at levels of aggregation appropriate for energy planning, and importantly much improved relative to what is used today.

Conclusion

The Global Wind Atlas, through a transparent methodology, will provide a public domain dataset of wind energy resources, including high resolution effects, for the whole world. The wind atlas data will be the most appropriate wind resource dataset available for the needs of policy makers, energy planners and the Integrated Assessment Modelling (IAM) community. It will not replace the need for dedicated wind resource assessment at specific sites, but it will be the best dataset for area aggregated assessment of resources.