

Technical University of Denmark



## Dynamical and statistical downscaling approaches for extreme wind atlas of South Africa

Larsén, Xiaoli Guo; Kruger, A.; Badger, Jake; Ejsing Jørgensen, Hans

*Published in:*  
EMS Annual Meeting Abstracts

*Publication date:*  
2013

*Document Version*  
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

*Citation (APA):*  
Larsén, X. G., Kruger, A., Badger, J., & Ejsing Jørgensen, H. (2013). Dynamical and statistical downscaling approaches for extreme wind atlas of South Africa. In EMS Annual Meeting Abstracts (Chapter EMS2013-123). European Meteorological Society. (EMS Annual Meeting Abstracts, Vol. 10).

## DTU Library

Technical Information Center of Denmark

---

### General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.



## **Dynamical and statistical downscaling approaches for extreme wind atlas of South Africa**

X.G. Larsen (1), A. Kruger (2), J. Badger (1), and H.E. Jørgensen (1)

(1) Wind Energy Department, Risø Campus, Technical University of Denmark, Denmark, (2) Climate Service, South African Weather Service, Pretoria East, South Africa

Two independent approaches are used to obtain the extreme wind atlas for South Africa. The first one is a statistical downscaling approach. The reanalysis provides wind fields that are smoothed due to the effective resolution of the global models, which leads to underestimation of the extreme winds. The statistical approach adds in the missing wind variability to the time series of the global reanalysis data through spectral power under the assumption of a Gaussian process. The power spectrum can be provided by existing measurements which can be as short as a few months. In the absence of measurements, a power spectral model based on experimental and theoretical studies is used. The extreme wind value is thus corrected to a desired temporal resolution in the mesoscale range. The power spectral model is most suitable for simple to moderate terrains and relatively high uncertainty is expected in complex terrains. This leads to our second approach, the selective dynamical downscaling method, which employs mesoscale weather model WRF to model storm episodes at high resolution for relatively more challenging terrains. For a selected area, the annual strongest storms are first identified from the global data during 1999 – 2012 at all grid points in the domain of interest. WRF is used to model all the selected storms. A post-processing procedure is applied to the extreme winds from the mesoscale modeling before they can be put further into a microscale model. The estimations from both approaches are validated with measurements from South Africa.