Developing a direction-dependent global wind speed model

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Introduction

- Precise wind resource maps are required for finding suitable new wind turbine sites
- Wind resource patterns are complex due to topography and land use

Methods

1. Obtaining measured near-surface wind speed
2. Obtaining a digital elevation model and land use dataset
3. Development of directional predictor variables
4. Modeling of directional wind speed based on a least-squares boosting approach
5. Estimation of wind speed distribution parameters

Results

- Abundant wind resources in many deserts, coastal regions, and on mountain-tops
- In a global comparison, Germany has an average wind resource

Conclusion

The developed model enables accurate and spatially explicit wind resource estimates at a very high spatial resolution

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The small-scale distribution of capacity factor depends on orography and land use features in main wind direction.
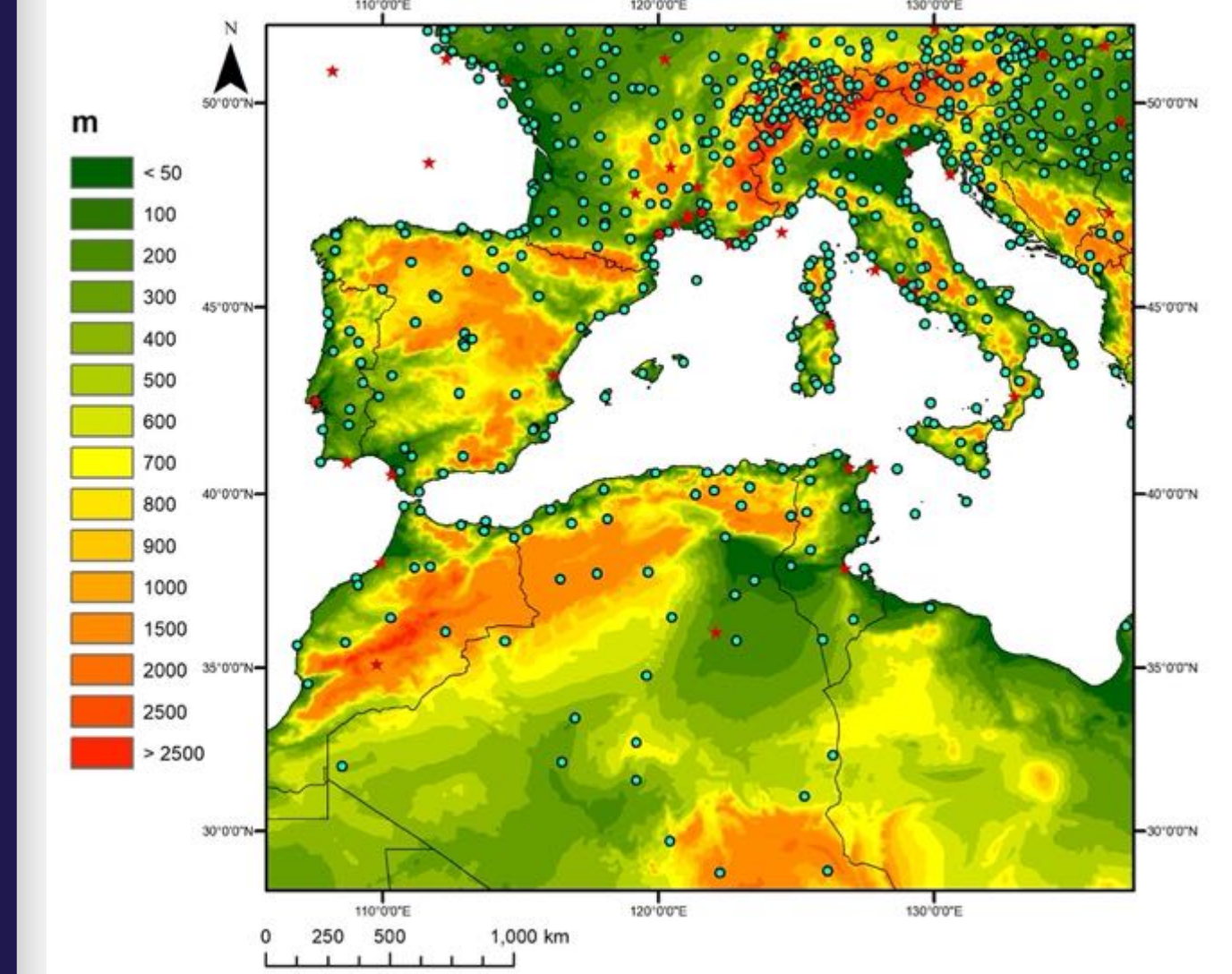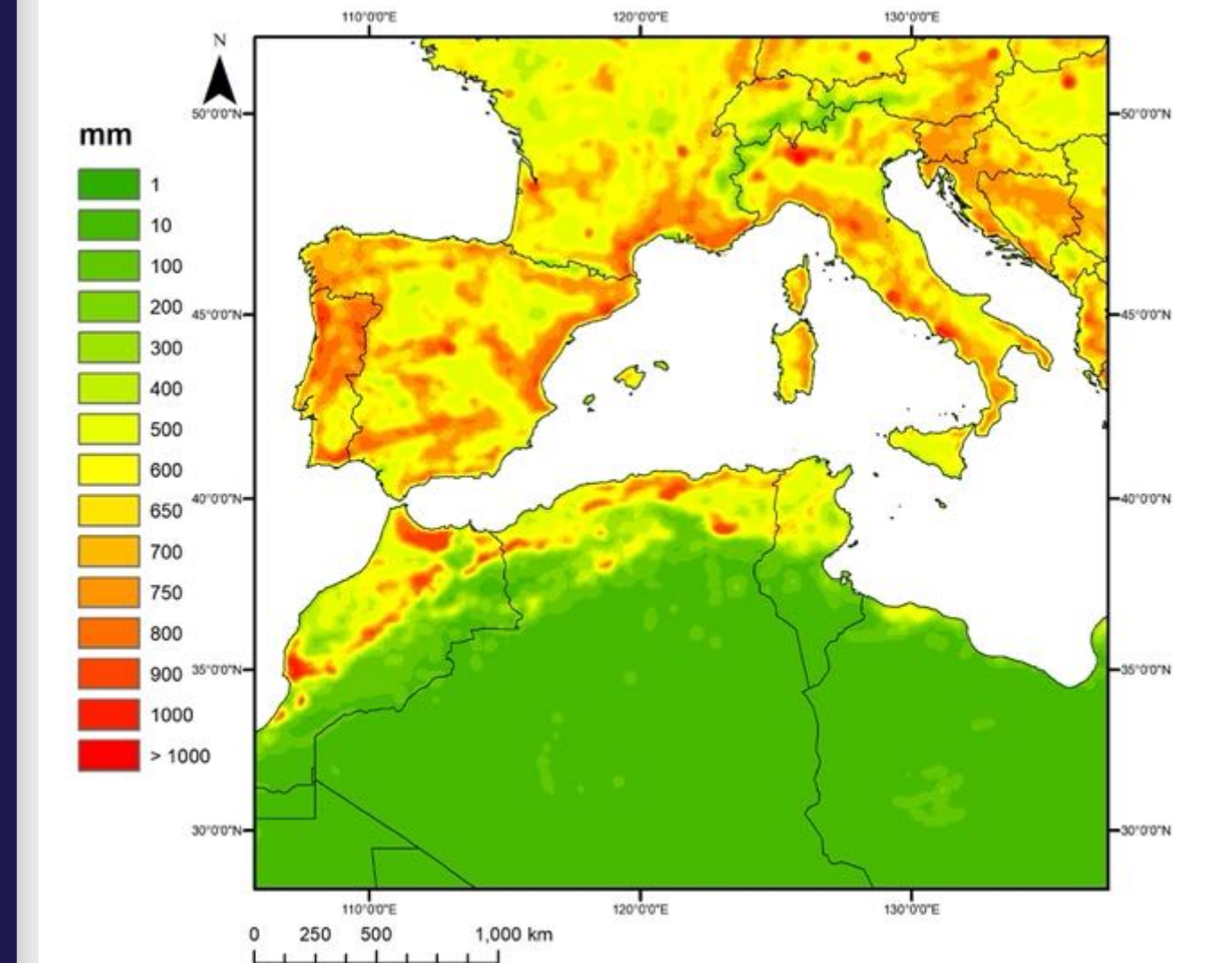

Capacity factor

- < 5
- 10
- 15
- 20
- 25
- 30
- 35
- 40
- 45
- > 45
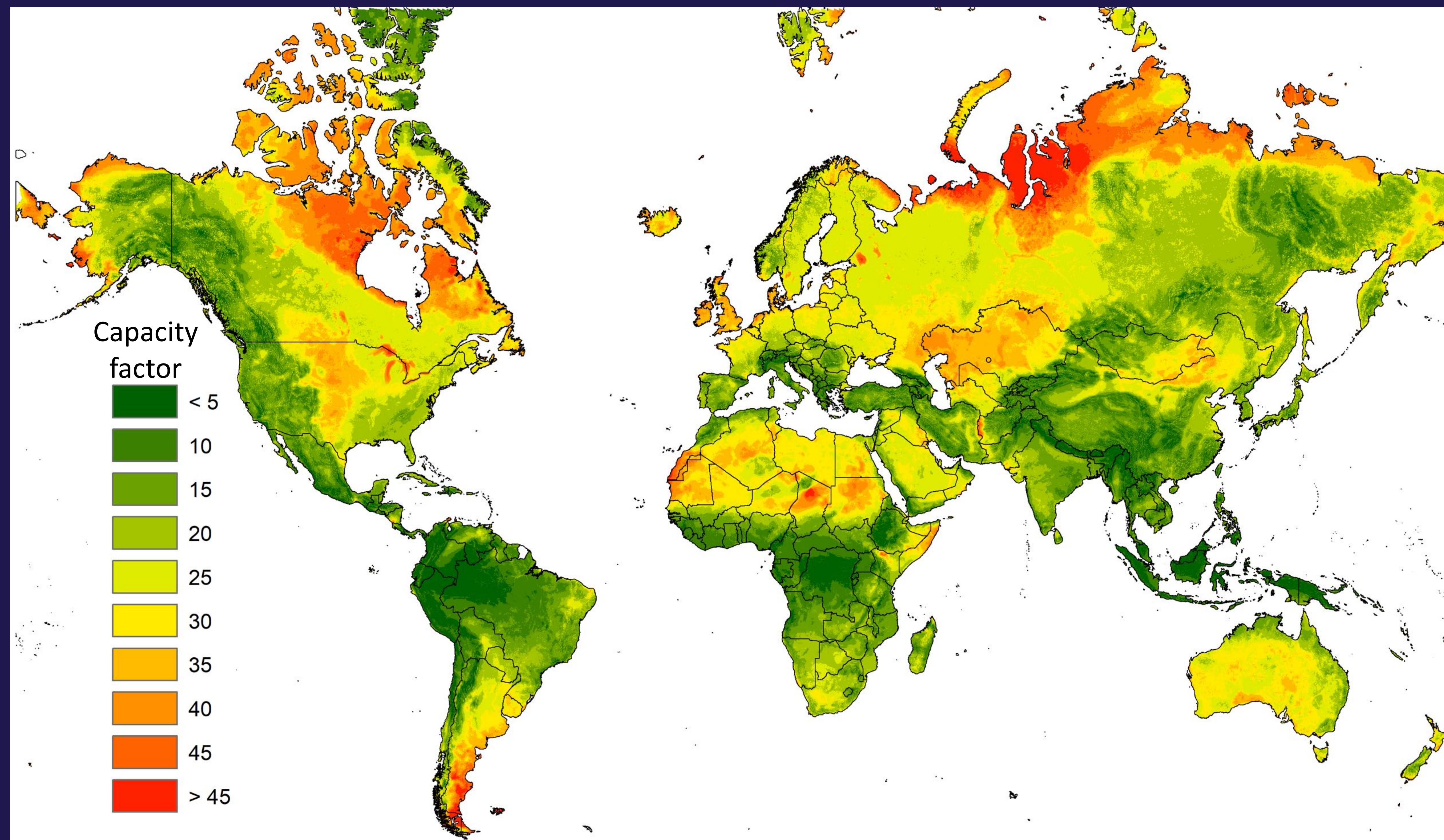
Download the poster

Background information (Jung and Schindler, 2020)

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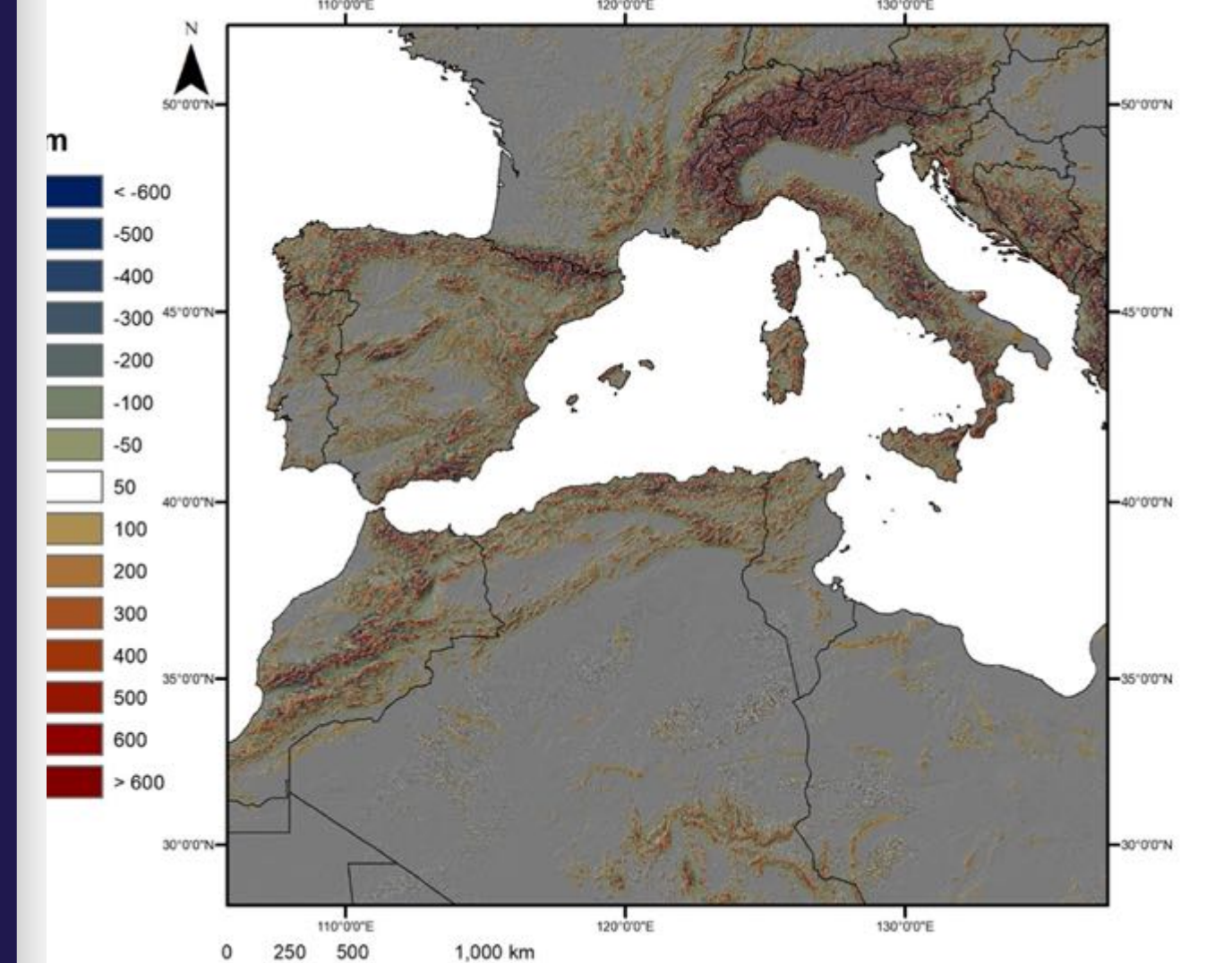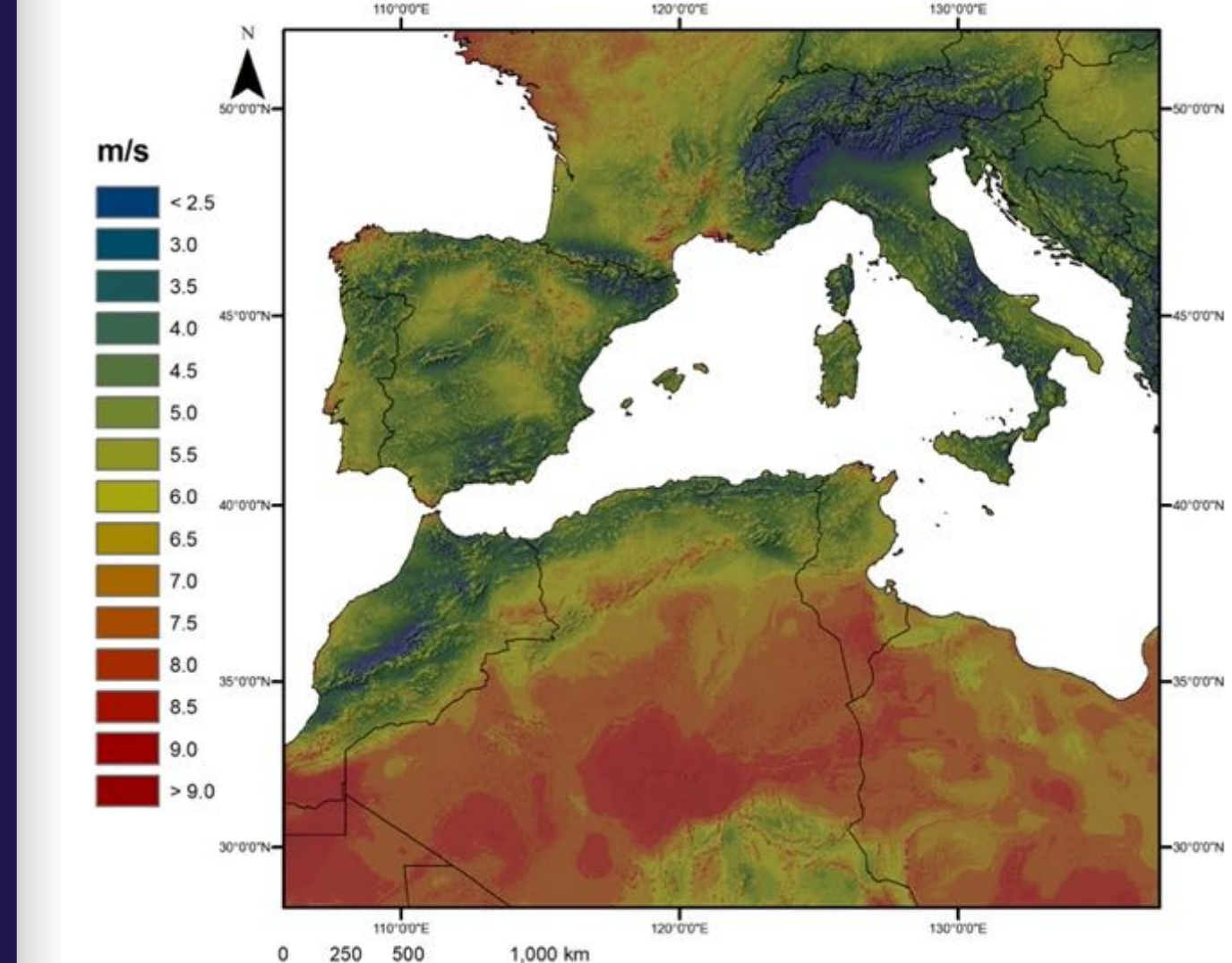universität freiburg

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Additional info

Elevation and wind speed measurement sites

Roughness length

Relative elevation

Modeled mean wind speed in 120 m