

GOWIRES: A global wind turbine database with historical and future wind resources

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Introduction

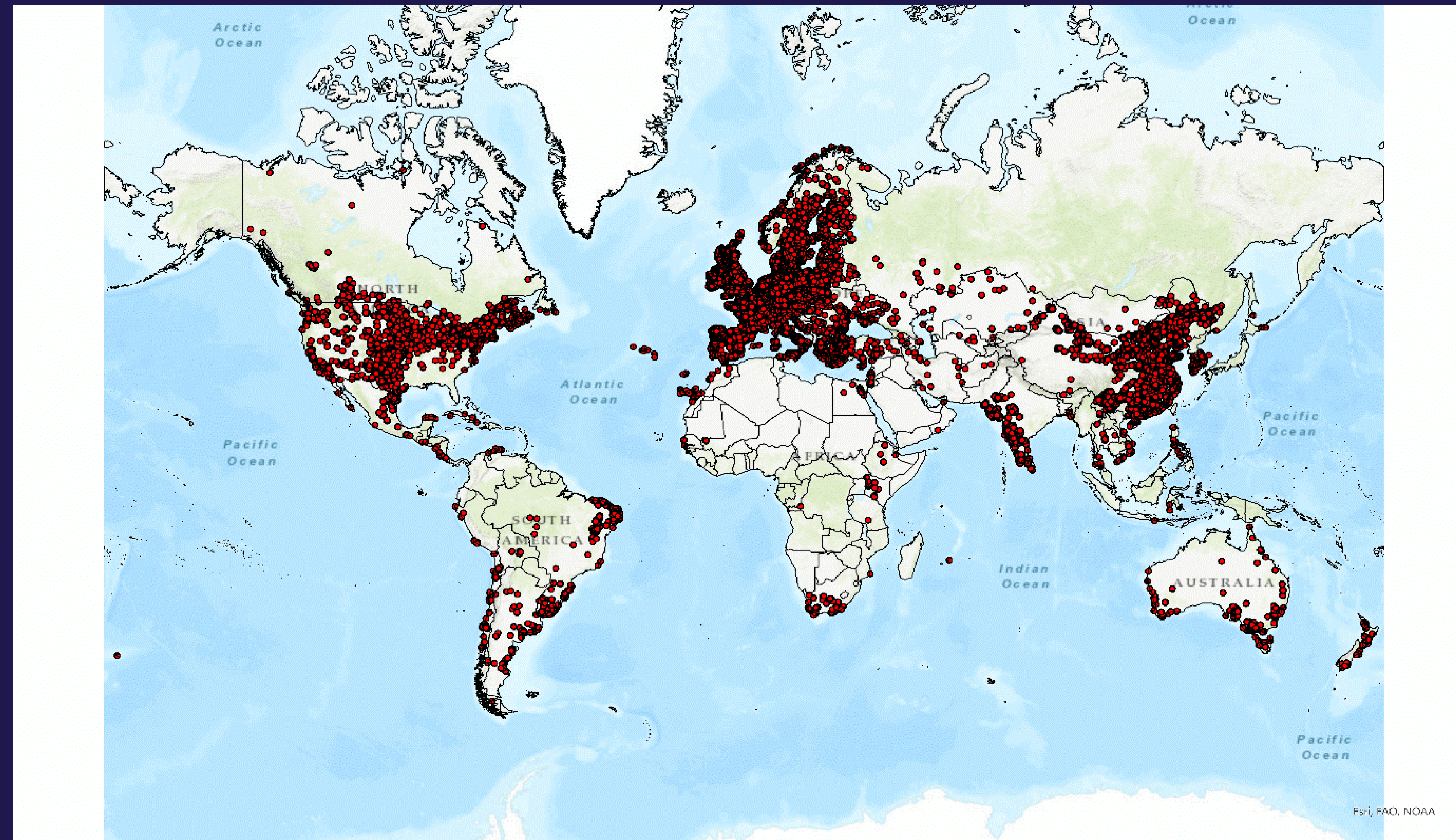
- Consistent global-scale datasets of existing wind turbines are essential but rare
- GOWIRES provides detailed information on 416,417 horizontal-axis wind turbines across 89 countries
- It includes geographic coordinates, key technical specifications, and site-specific environmental characteristics for each wind turbine
- GOWIRES also has information on historical and future wind resources

Methods

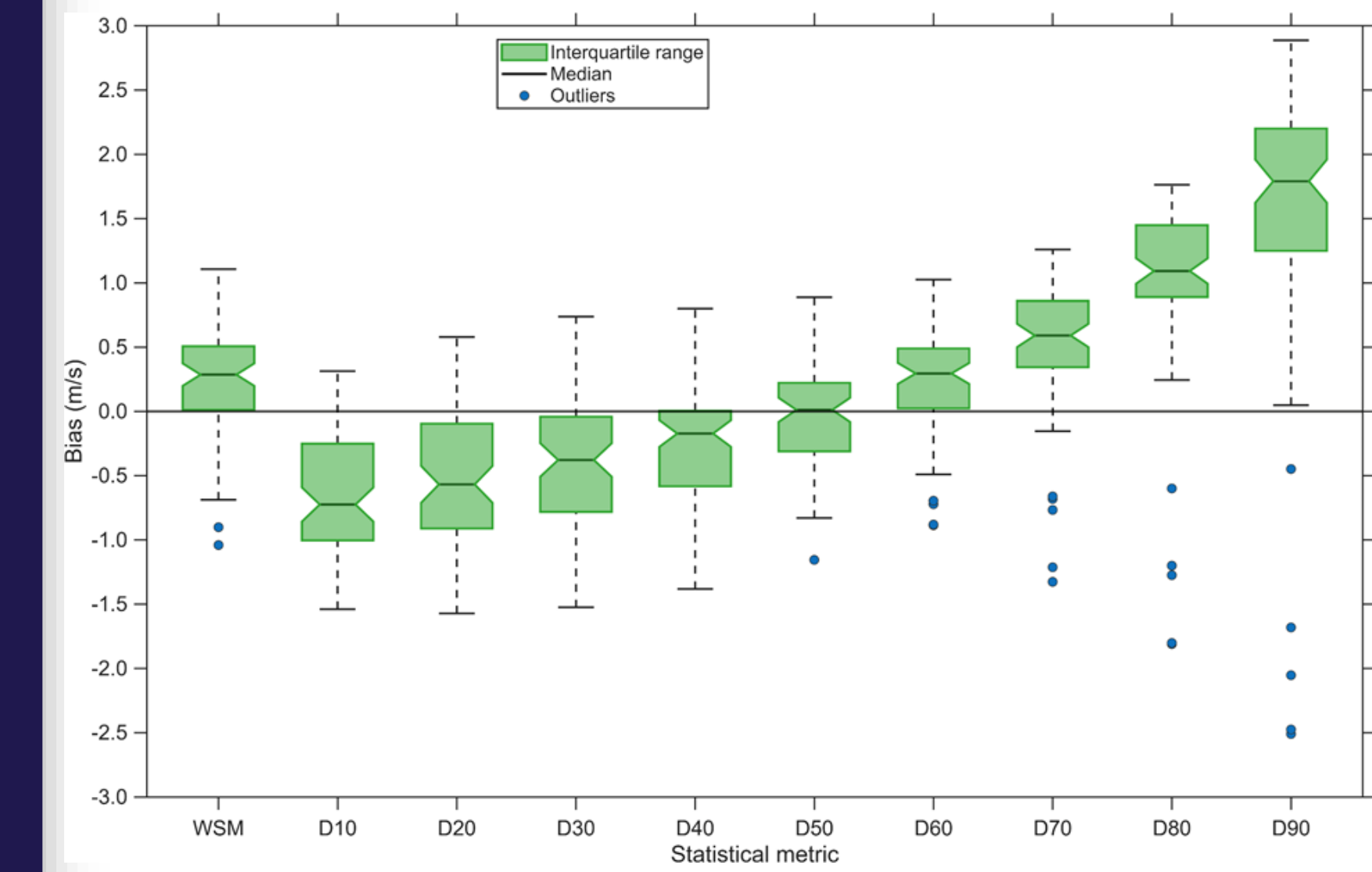
- High-precision wind turbine coordinates from OpenStreetMap (OSM) and national inventories
- Technical specifications of the wind turbines
- Characterizing the surrounding environment of each site using land-use and terrain models
- Site-specific wind resource for the historical period 1989–2018
- Application of global climate model data and the quantile mapping method to project future wind resources (2030-2059)

GOWIRES

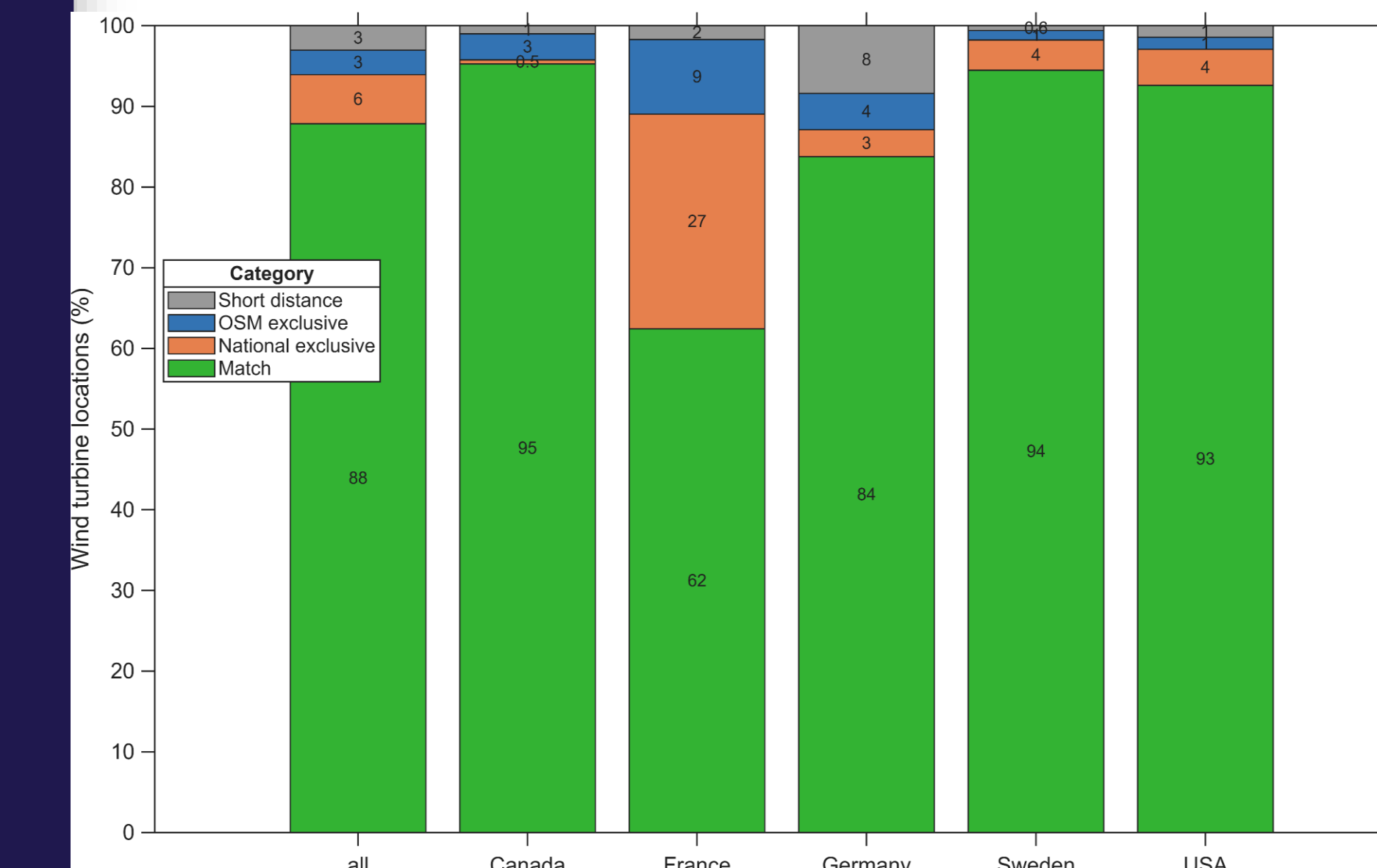
Closing the gap in open global data on onshore wind turbines



Bias of mean wind speed and the deciles of the wind speed distribution in eight German wind farms



Matching the locations of wind turbines with national inventories of wind turbines



Conclusions

- GOWIRES fills a gap by combining locations, technical details, site conditions, and wind resources in one dataset
- It enables turbine-level analyses of energy yield, repowering, site selection, and climate change impacts
- GOWIRES is a basis for research, planning, and industry applications across countries and scenarios

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