Climate models unveil changing landscape for wind energy in Northern Hemisphere

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Wind energy, an important renewable power source, has witnessed rapid growth in recent years due to its abundance, cleanliness, safety, and mature generation technology.

However, global wind power development still falls short of the requirements for achieving a comprehensive energy transition. To address this challenge and fulfill objectives of the Paris Agreement, it is

crucial to understand future changes in wind resources, particularly in major wind markets in the Northern Hemisphere.

Researchers led by Prof. Huang Gang and Dr. Miao Haozeyu from the Institute of Atmospheric Physics of the Chinese Academy of Sciences have evaluated the performance of the Coupled Model Intercomparison Project Phase 5 (CMIP5) and Phase 6 (CMIP6) simulations of surface wind speed in the Northern Hemisphere. By comparing the simulations with observational data, the researchers found that CMIP6 models exhibit an overall improvement in simulation capability, accurately reproducing the observed reduction in surface wind speed in recent decades.

Based on the more reliable CMIP6 models, the researchers explored future evolution of wind energy resources in the Northern Hemisphere by the end of the century (2100) under various climate change scenarios. Using different greenhouse gas and aerosol emission scenarios, they projected a continued decrease in surface wind speeds on land, with more substantial declines anticipated under higher emission scenarios.

Their study, published in *Renewable Energy*, also highlights the non-linear relationship between wind energy and emissions across regions. It predicts that Europe and Asia will experience the fastest decline in wind energy under the SSP3-7.0 emission scenario, while North America will experience a more moderate decline. These findings underscore the importance of reducing greenhouse gas and aerosol emissions to preserve and maximize wind energy resources.

The study offers guidance on how carbon emissions impact wind energy, as well as the siting and planning of future wind farms.

More information: Haozeyu Miao et al, Evaluation and future projections of wind energy resources over the Northern Hemisphere in

CMIP5 and CMIP6 models, *Renewable Energy* (2023). DOI: 10.1016/j.renene.2023.05.007

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