The 2023 National Offshore Wind data set: NOW-23

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We published a new data set

It’s cool and it’s free

Please use it!
2023 National Offshore Wind data set (NOW-23): a 20+ year WRF dataset for all US offshore regions

2000-2019+

Data publicly available at 5-minute, 2-km resolutions, up to 500 m above the surface

This dataset is expected to replace NREL’s WIND Toolkit for its offshore component:
- 20 years vs 7 years
- WRF 4.1.2 vs 3.4
- ERA-5 vs ERA-interim

More in Bodini et al., *ESSD + NOWRDC report*, in prep.
"Eastern" regions: What’s the mean wind speed at 160 m?

- Great Lakes (2000-2020)
- North Atlantic (2000-2020)
- South Atlantic (2000-2020)
- Gulf of Mexico (2000-2020)
- Mid Atlantic (2000-2020)

★ = validation against lidar data
A 1-year post-construction dataset assesses the wind resource change due to wakes

**INTERNAL WAKES:** 26-29% power deficit on average
Vineyard Wind only simulation – No Wind Farm simulation

**CLUSTER-INDUCED WAKES:** 13-15% power deficit on average
All Wind Farm simulation – Vineyard Wind only simulation

Combination of the two:

More in Rosencrans et al., in review in *Wind Energy Science*; and Rybchuk et al., *Wind Energy Science*, 2022
“Western” regions: What’s the mean wind speed at 160 m?

Pacific Northwest (2000-2019)

California

Now deprecated “CA20” data set

Hawaii (2000-2019)

⭐ = validation against lidar data
Important caveat:
California data set and recently deployed lidars disagree

2020:
WRF setup used in the Pacific was chosen based on validation with best observations available at the time:
1) an array of CA buoys (4 m above the water)
2) four coastal radars
3) three floating lidars in the Mid-Atlantic

NOW:
Validation against 2 floating lidars, October 2020 – September 2021

More in Bodini et al., NREL report, 2022
How does NOW-23 compare to CA20?

NOW-23 – CA20 160-m wind speed difference

<table>
<thead>
<tr>
<th></th>
<th>NOW-23</th>
<th>CA20</th>
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<tbody>
<tr>
<td>PBL scheme</td>
<td>YSU</td>
<td>MYNN</td>
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<tr>
<td>SL scheme</td>
<td>MM5</td>
<td>MYNN</td>
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Please use this one!
How does NOW-23 compare to the WIND Toolkit?
The NOW-23 data set is publicly available!

2023 National Offshore Wind data set (NOW-23)

The 2023 National Offshore Wind data set (NOW-23) is the latest wind resource data set for offshore regions in the United States, which supersedes, for its offshore component, the Wind Integration National Dataset (WIND) Toolkit, which was published about a decade ago and is currently one of the primary resources for stakeholders conducting wind resource assessments in the continental United States.

The NOW-23 data set was produced using the Weather Research and Forecasting Model (WRF) version 4.2.1. A regional approach was used, for each offshore region, the WRF setup was selected based on validation against available observations. The WRF model was initialized with the European Centre for Medium Range Weather Forecast (ECMWF) ERA-5 data set, using a 6-hour refresh rate. The model is configured with an initial horizontal grid spacing of 6 km and an internal nested domain that refined the spatial resolution to 2 km. The model is run with 61 vertical levels, with 12 levels in the lower 30 km of the atmosphere, stretching from 5 m to 45 m in height. The WRFN planetary boundary layer and surface layer schemes were used the North Atlantic, Mid-Atlantic, Great Lakes, Hawaii, and North Pacific regions. On the other hand, using the USF planetary boundary layer and MM5 surface layer schemes resulted in a better skill in the South Atlantic, Gulf of Mexico, and South Pacific regions. A more detailed description of the WRF model setup can be found in the WRF namelist that is linked at the bottom of this page.

5-min time series data at multiple heights up to 500 m

dx.doi.org/10.25984/1821404

Example/tutorial:
https://nrel.github.io/rex/misc/examples.wind.html#data-access-examples
Where can people read more about NOW-23?

**NOW-23 OVERVIEW**
- 2024 (upcoming): ESSD journal article on NOW-23 data set overview
- 2023 (upcoming): NOWRDC technical report on NOW-23 data set overview

**CALIFORNIA (former CA20)**
- 2020: NREL report on BOEM-funded California data set
- 2022: NREL report on bias in BOEM-funded California data set
- 2023 (accepted): MWR journal article on investigation of bias in California data set
- 2023 (upcoming): NREL-PNNL report on solution to bias in California data set

**WAKE DATA SET**
- 2023 (in review): WES journal article on wake data set in Mid-Atlantic
- 2022: WES journal article on sensitivity in wake data set in Mid-Atlantic

**UNCERTAINTY QUANTIFICATION**
- 2021: WES journal article on uncertainty quantification in California
- 2023: WES journal article on sea surface temperature sensitivity in Mid-Atlantic
- 2023: WES journal article on uncertainty quantification in Mid-Atlantic

**OTHER**
- 2022: WES journal article on validation in Mid-Atlantic
- 2023: WES journal article on offshore turbulence intensity analysis in Mid-Atlantic
Next steps

- Validate against observations the Pacific NW and Hawaii regions
- Release the new, user-friendly data portal
- Provide guidance on NOW-23 vs WTK-LED data sets
- Continuously update the temporal extent of the data set
- Expand the wake analysis to other offshore regions
What do you need from us?
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