

Post-processing to increase spatial and temporal resolution of reanalysis wind speed data

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Overview

- **Objective**

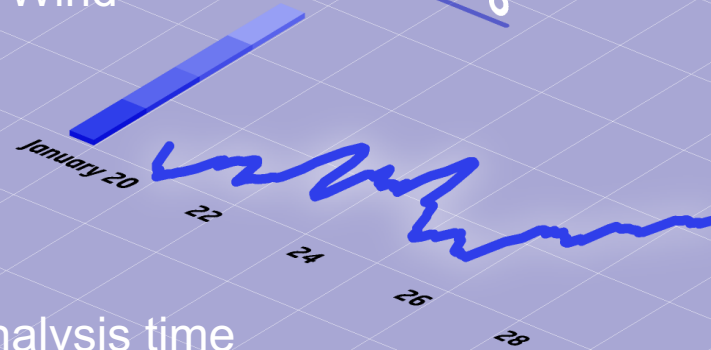
- Apply a widely use reanalysis dataset (e.g., ERA5)
- But still get high resolution wind speed time series
 - » Up to 5 min resolution
 - » Up to km-level wind resource information

- **A solution**

- Use (e.g., ERA5)
- Post-process the wind speeds to (artificially) increase spatial and temporal resolution

Correlations in renewable energy sources (CorRES) ☁

- A time series simulation tool for variable renewable energy
- Developed at DTU Wind
- Globally using reanalysis time series and microscale data¹
- Sub-hourly simulation capabilities^{2,3}

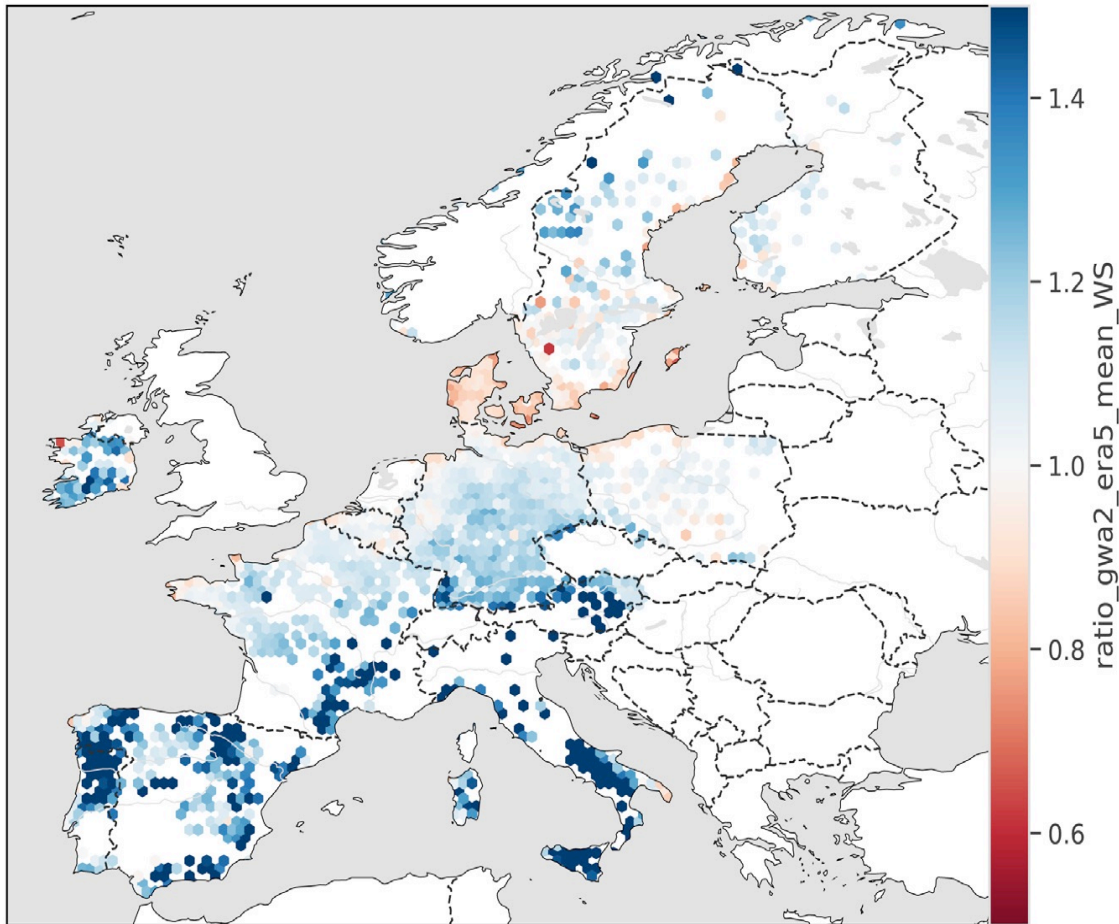


¹J. P. Murcia, et al., "Validation of European-scale simulated wind speed and wind generation time series", *Applied Energy*, 2022 (<https://doi.org/10.1016/j.apenergy.2021.117794>)

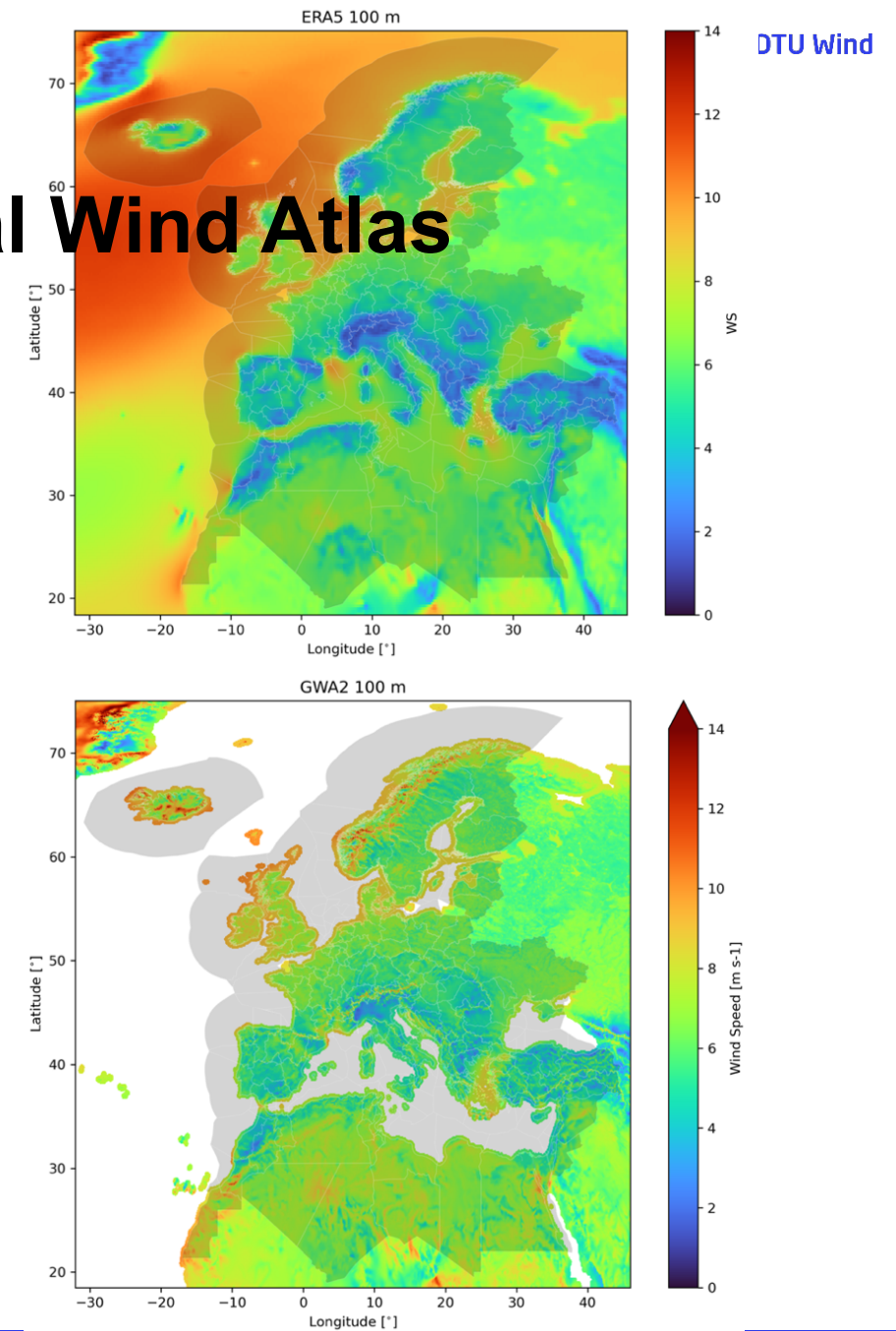
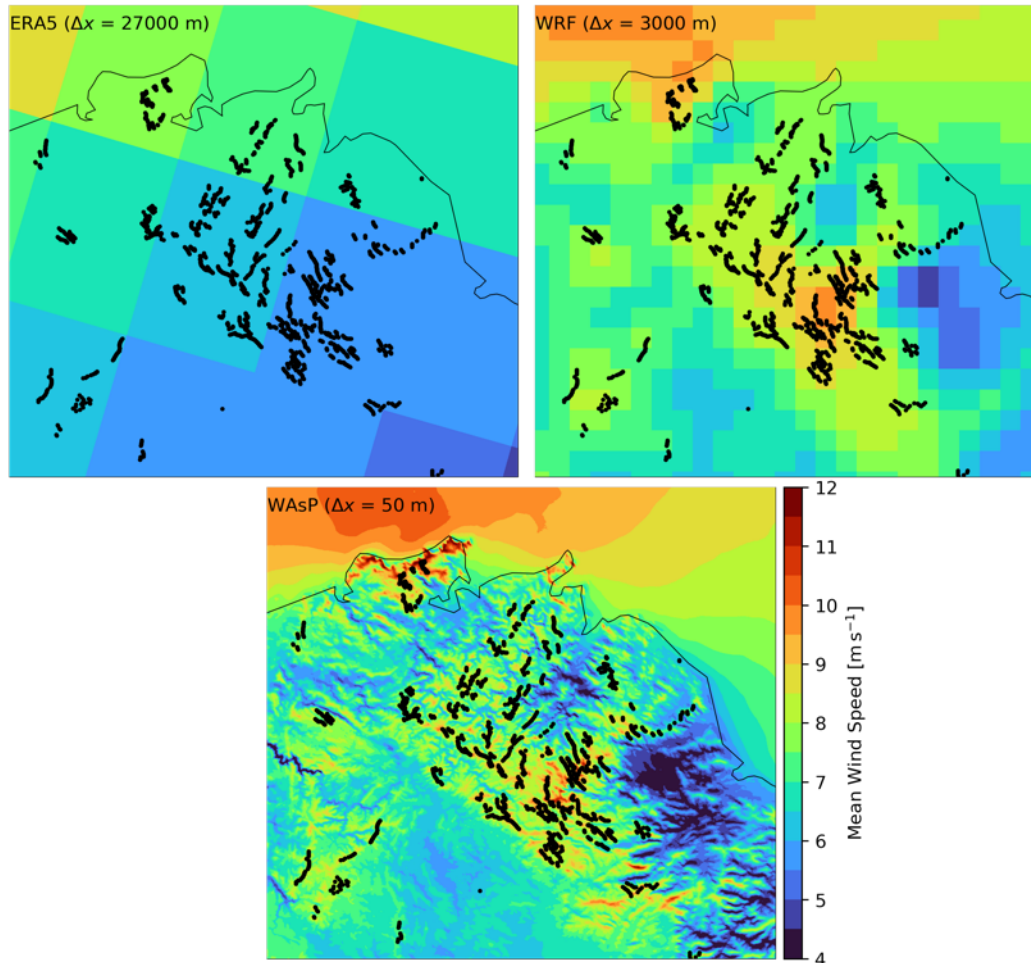
²J. P. Murcia Leon, et al., "Power Fluctuations In High Installation Density Offshore Wind Fleets", *Wind Energy Science*, 2021. (<https://doi.org/10.5194/wes-6-461-2021>)

³M. Koivisto, et al., "Combination of meteorological reanalysis data and stochastic simulation for modelling wind generation variability", *Renewable Energy*, 2020 (<https://doi.org/10.1016/j.renene.2020.06.033>)

High spatial resolution via Global Wind Atlas

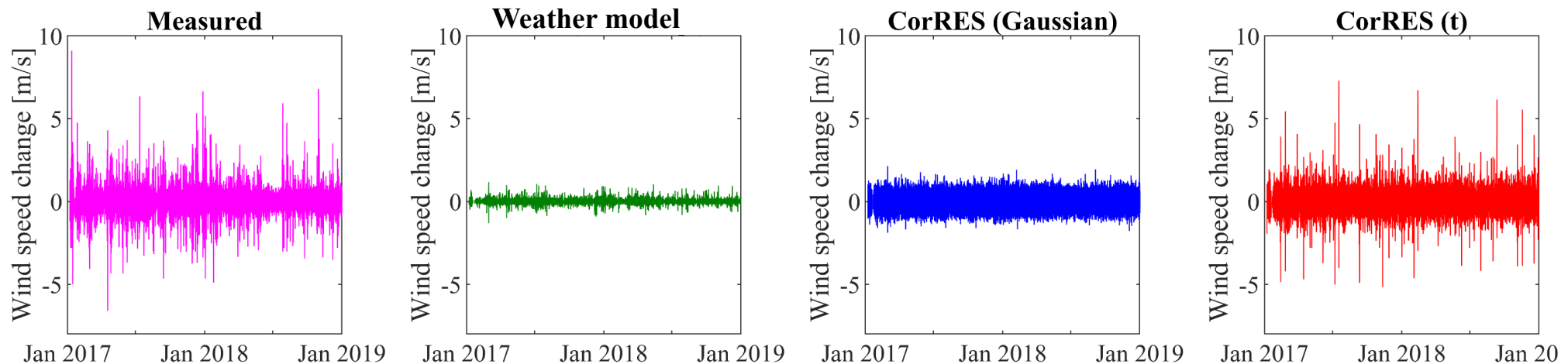


High spatial resolution via Global Wind Atlas



High temporal resolution via stochastic simulation

- Up to 5 min resolution for wind
 - Simultaneous running of a few hundred plants (usually applied for offshore plants)

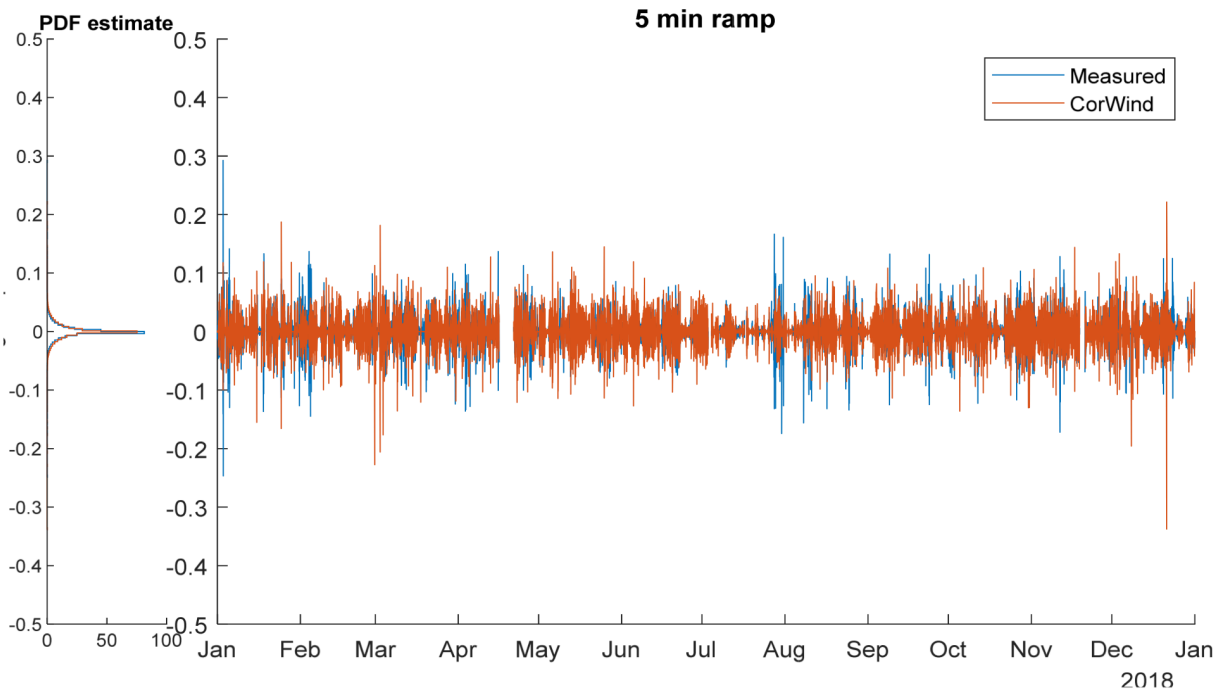


10 min wind speed ramps in measured data (magenta) and in different stages of the CorRES simulation procedure: interpolated from hourly weather data (green) to the final result with stochastic simulation included (red)

M. Koivisto et al., "Combination of meteorological reanalysis data and stochastic simulation for modelling wind generation variability", *Renewable Energy*, 2020 (<https://doi.org/10.1016/j.renene.2020.06.033>).

J. P. Murcia Leon et al., "Power Fluctuations In High Installation Density Offshore Wind Fleets", *Wind Energy Science*, 2021 (<https://doi.org/10.5194/wes-2020-95>).

High temporal resolution via stochastic simulation



	mean	SD	min	Prct 0.1	Prct 1	Prct 5	Prct 95	Prct 99	Prct 99.9	max
Measured	0.000	0.013	-0.247	-0.089	-0.040	-0.020	0.020	0.040	0.081	0.292
CorWind	0.000	0.015	-0.338	-0.078	-0.043	-0.024	0.025	0.044	0.076	0.221

