

IEA Wind TEM #111 on REANALYSES FOR WIND ENERGY

25 April 2024

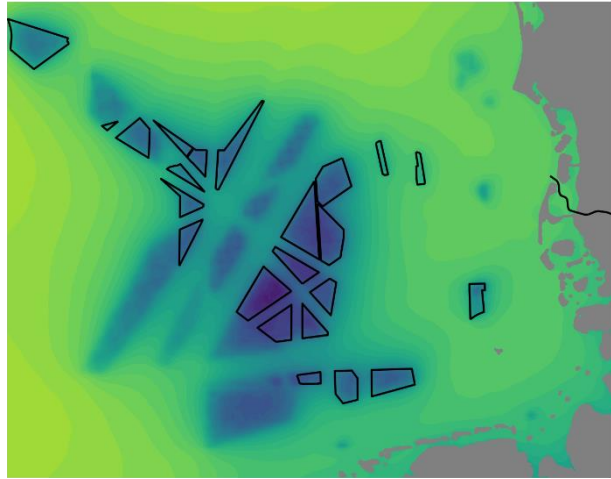
How reanalysis (data) help us improving
on-site measurements

[Julia Gottschall](#)



Use of reanalysis data at Fraunhofer IWES

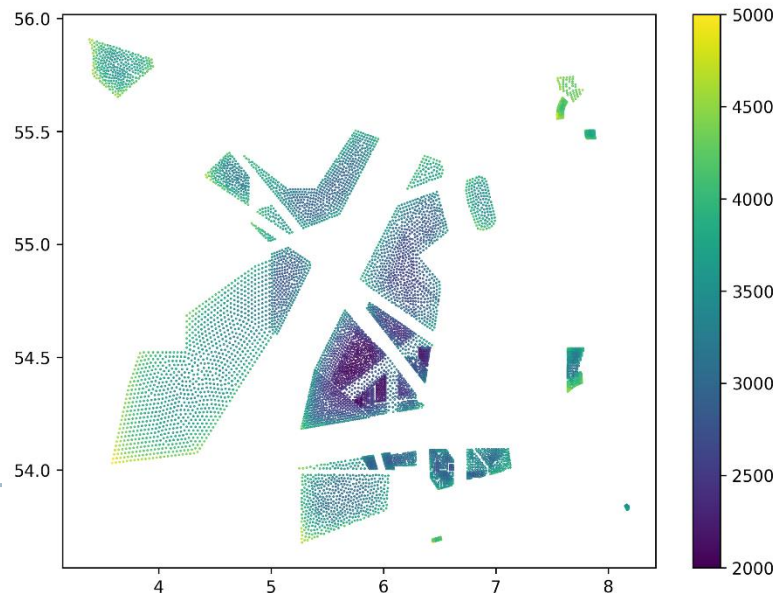
Two groups → “Numerical Site Assessment” // “Wind Measurement and Characterization”



← Use Case – Large-Scale Wake Effects

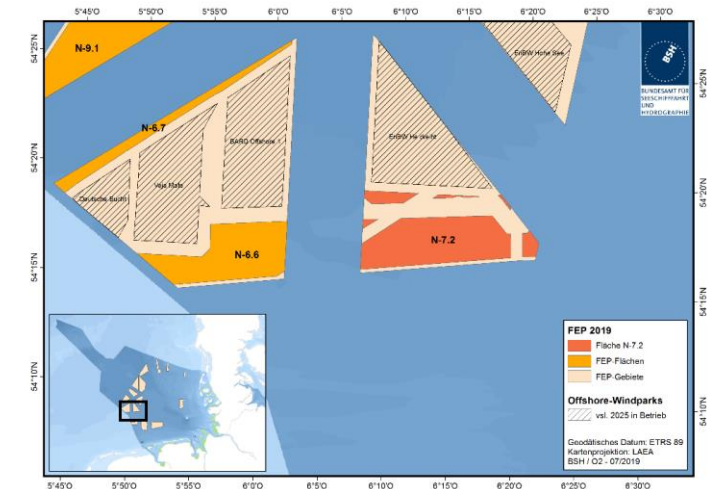
- Reanalysis data used as boundary conditions for mesoscale downscaling
- Wind farm impact added through various wind farm parametrisation

[for more details → [Martin Dörenkötter](#)]

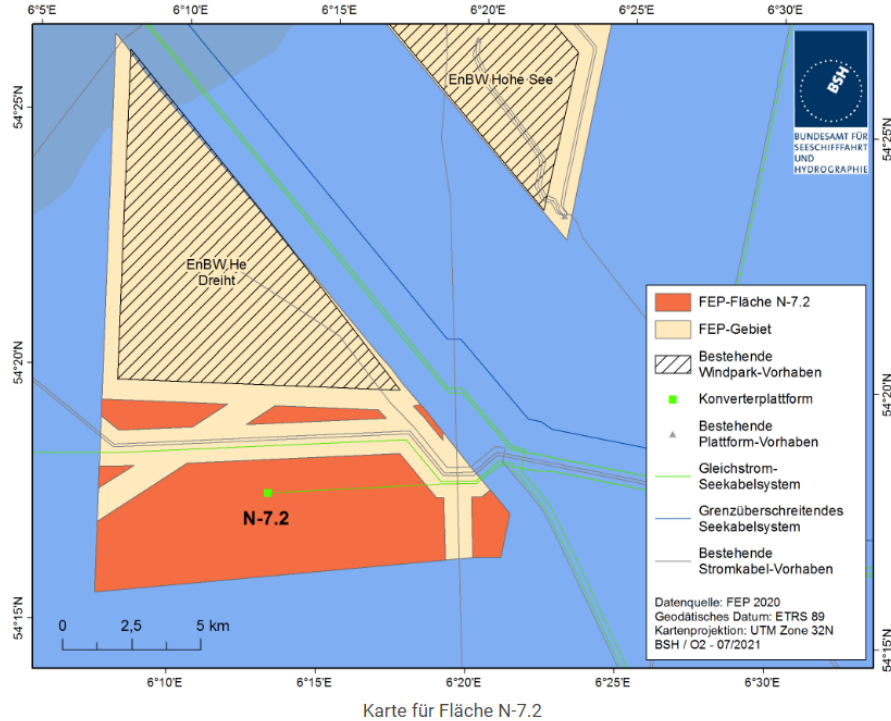


Use Case – Further improving on-site measurements →

- Monitoring
- Data gap filling / long-term extrapolation
- Replace measurements at some point?



On-site measurements against ERA5 offshore



Fläche N-7.2 – Datenportal Flächenvoruntersuchung (PINTA) (bsh.de)

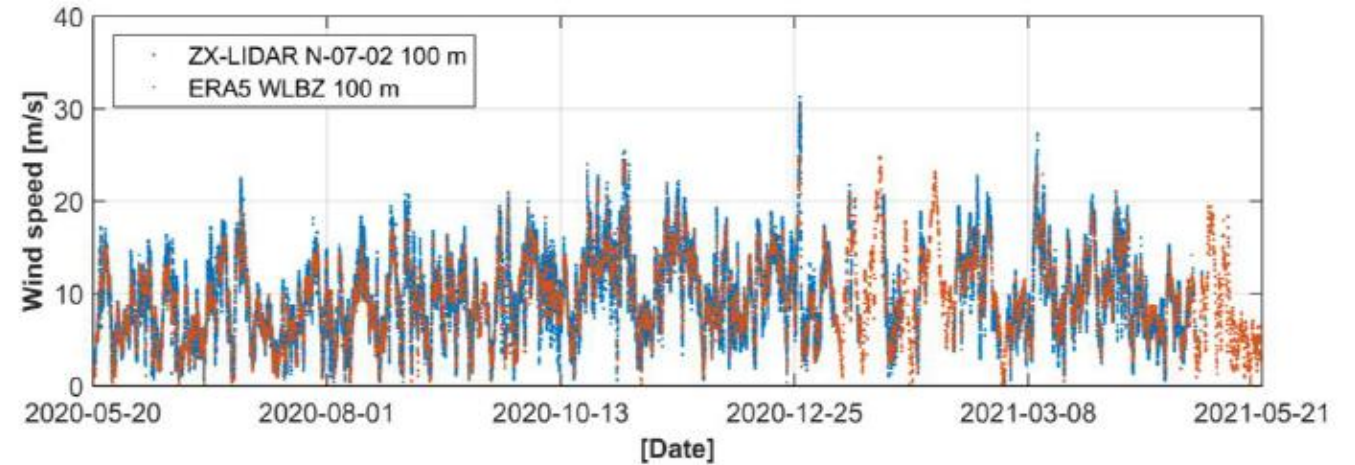
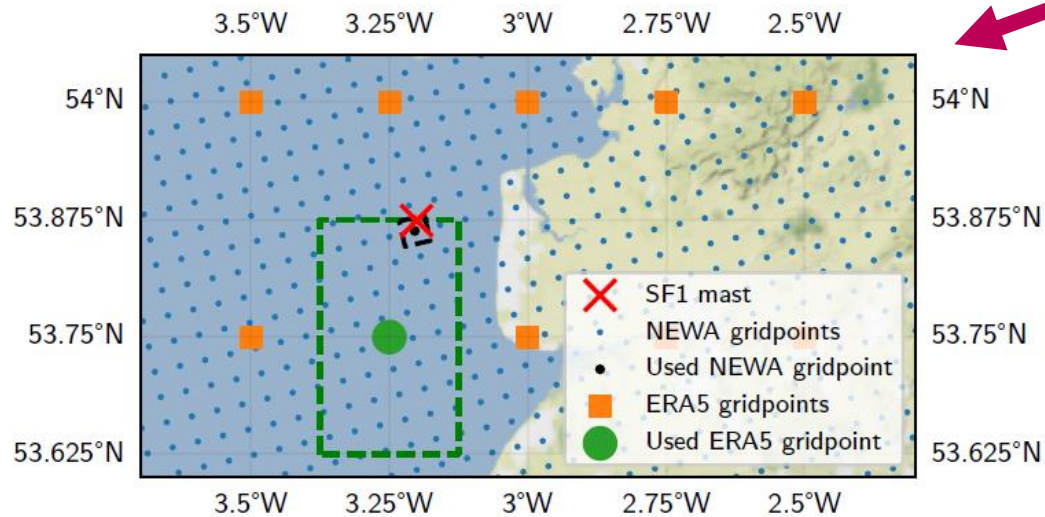


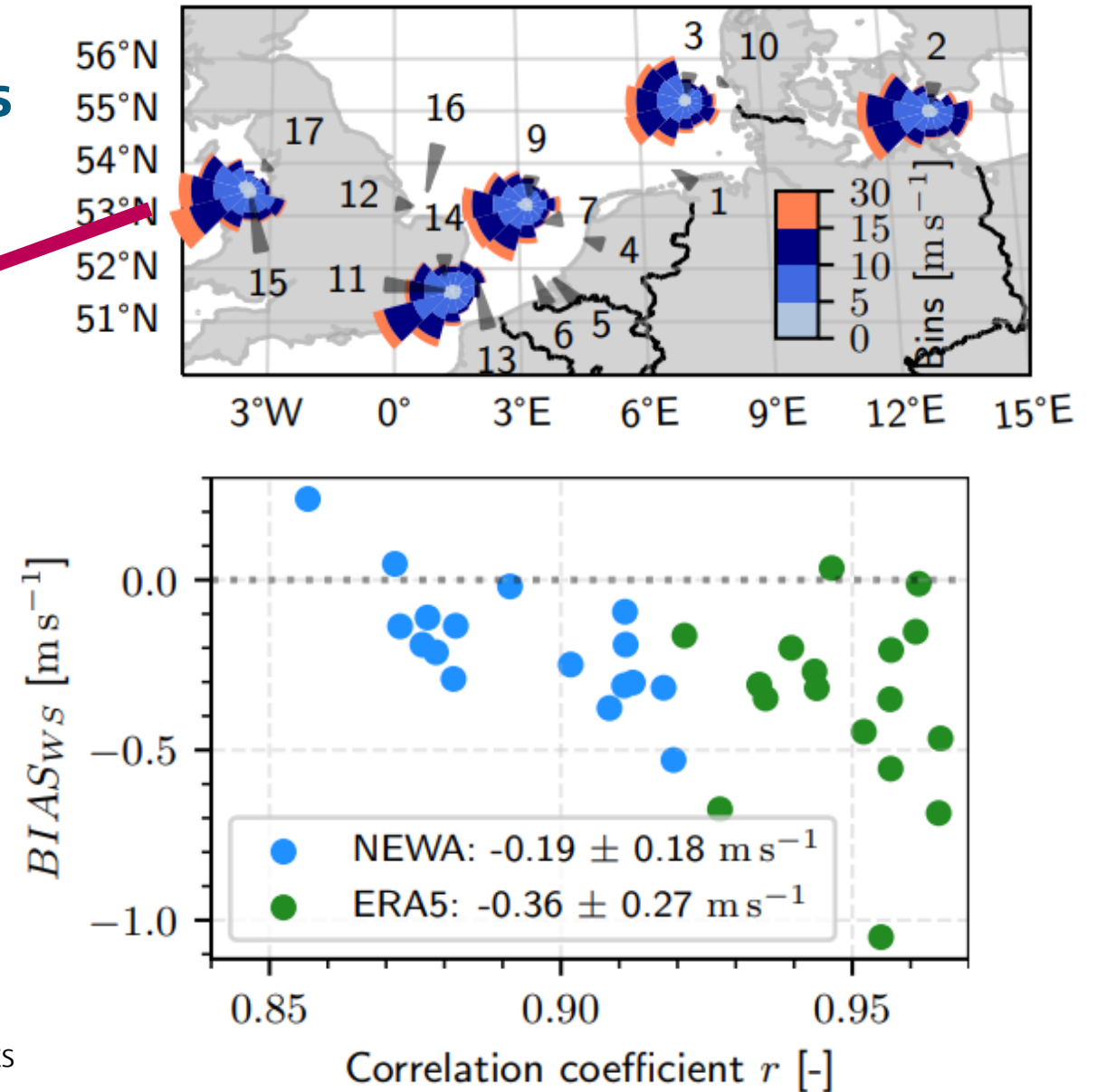
Figure 2.21: Time series of the wind speed (top) and wind direction (bottom) in 100 m height of the ZX-LIDAR N-07-02 and ERA5 WLBZ model data (from 2020-05-20 to 2021-05-20).

Verifying ERA5 against measurements

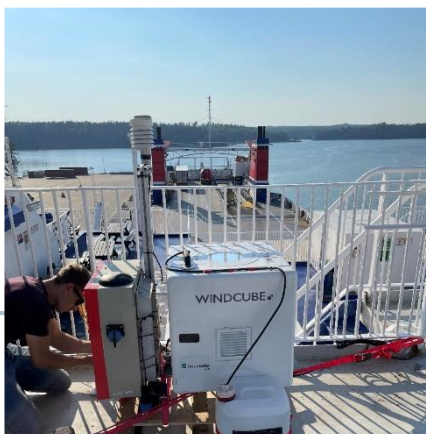
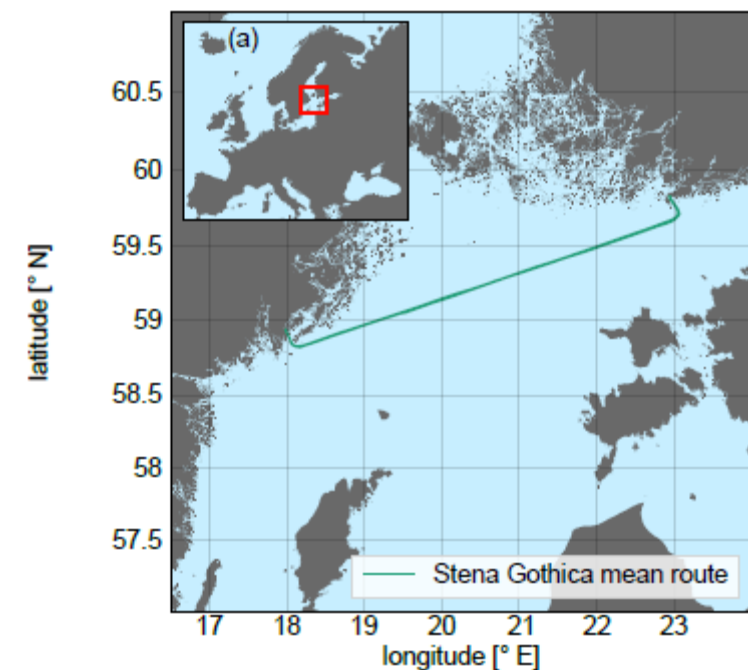


<https://iopscience.iop.org/article/10.1088/1742-6596/2151/1/012009>

- In summary: larger bias but higher correlation (for ERA5 cf. NEWA)
- Uncertainty from verification/calibration to reference (?)
- Or rather equivalence → recently published “triple collocation” results



Spatially distributed measurements (“ferry lidar” approach)



AMTD - Ship-based lidar measurements for validating ASCAT-derived and ERA5 offshore wind profiles (copernicus.org)

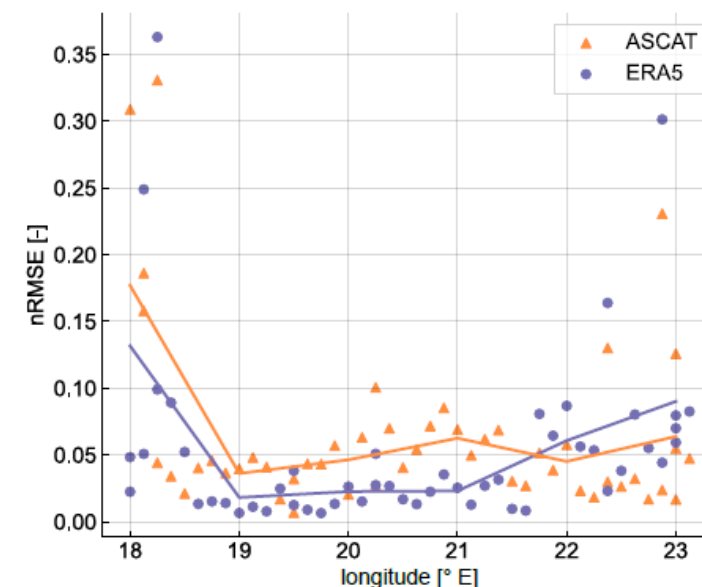
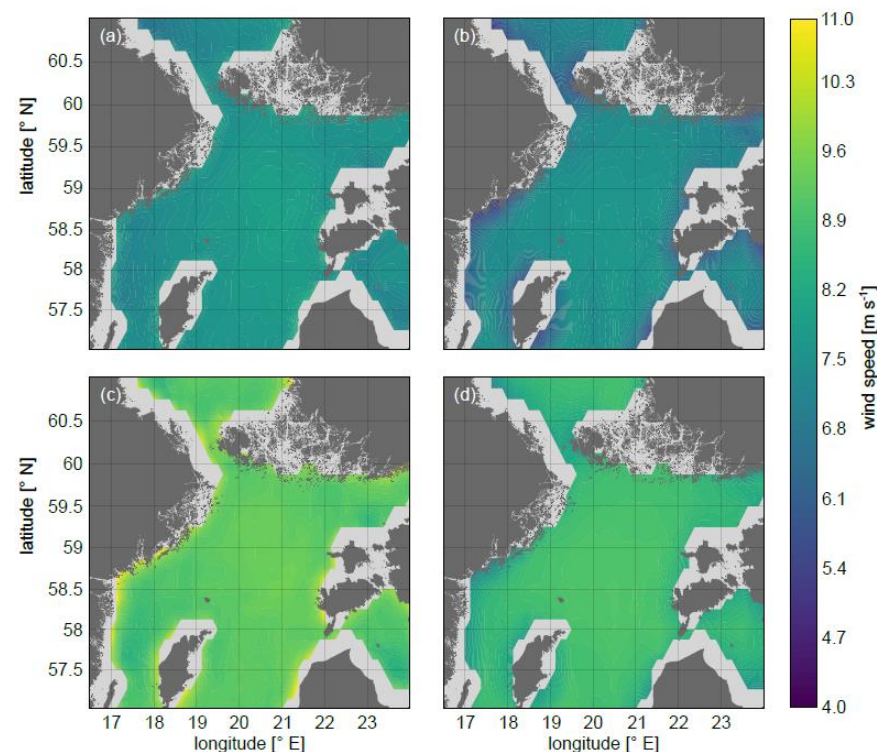


Figure 9. Mean wind speed for the campaign period at 10 m (upper panels) and 100 m (bottom panels) for ASCAT (left panels) and ERA5 (right panels).

Concluding remarks

How reanalysis (data) help us improving on-site measurements

- Reanalysis datasets are an extremely valuable data source in the context of (offshore) wind resource assessment
- .. Not instead of measurements but in combination
- It is ongoing R&D how we can make best use of both together



Thank you
for your attention!
julia.gottschall@iwes.fraunhofer.de

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Use Case – Large-Scale Wake Effects

Reanalysis Data

Application:

- Reanalysis data used as boundary conditions for mesoscale downscaling
- Wind farm impact added through various wind farm parametrisation

Challenges:

- Nudging mainly above ABL to not impact wind farm physics
 - ▶ Needs reliable values also at higher altitudes
- Minimizing phase error would help

Feed-Back to Reanalysis – Models:

- Own improvements of wind farm parametrisations
- Validation studies ongoing against lidar, airborne and SCADA data
- Could support implementation in larger-scale models

