



Validation of Vortex-ERA5

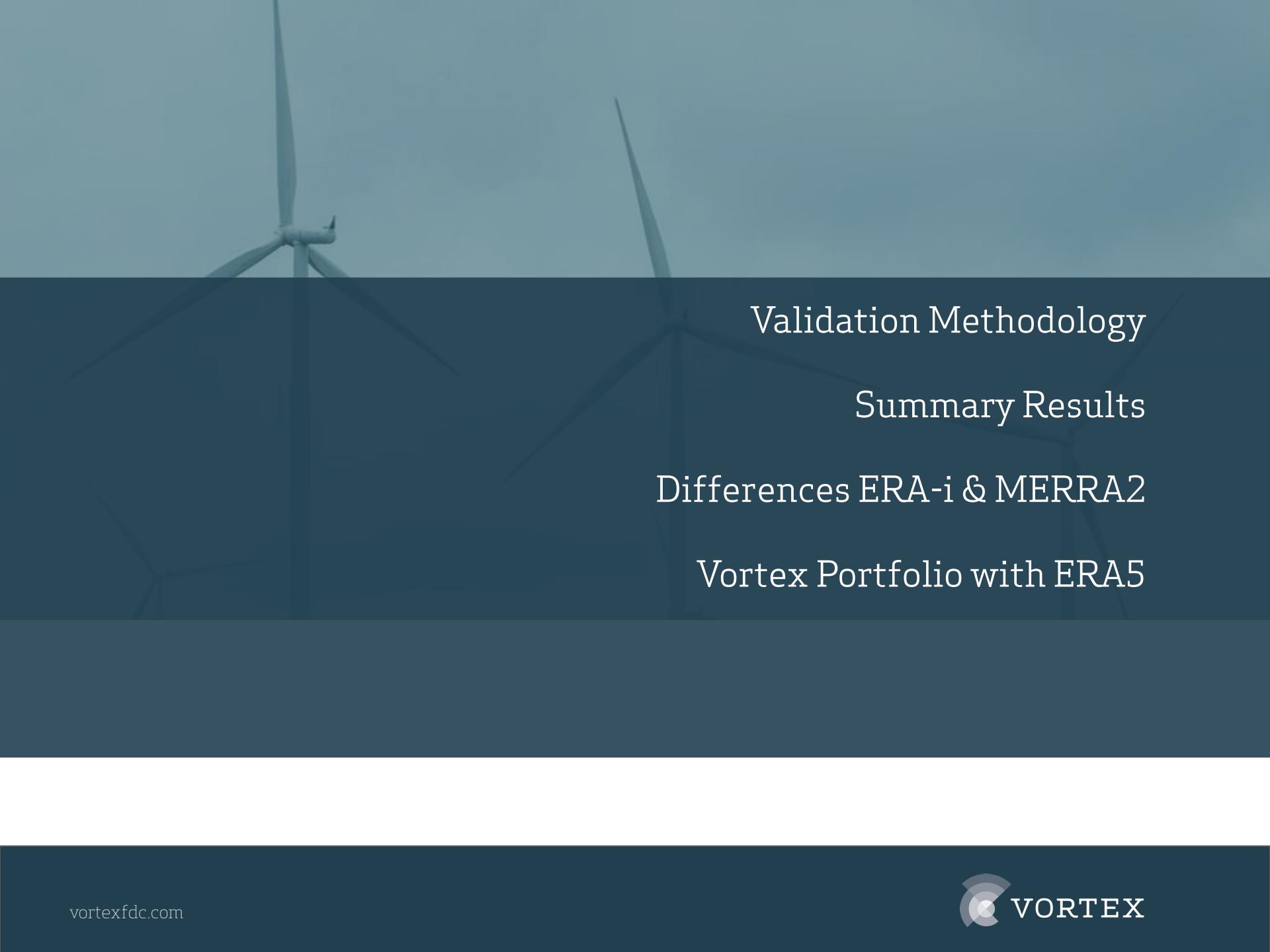
Give me 5, ERA!

Data and analysis
Pau Casso & Abel Tortosa

Speaking
Abel Tortosa



Get in touch
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A dark, semi-transparent background image showing several wind turbines against a bright sky.

Validation Methodology

Summary Results

Differences ERA-i & MERRA2

Vortex Portfolio with ERA5

Validation Methodology

ERA5 Dataset

37 Pressure Levels + Surface

0.25x0.25 degrees

Hourly Data

Period 2010-2016

2TB per Year

WRF Mesoscale Model

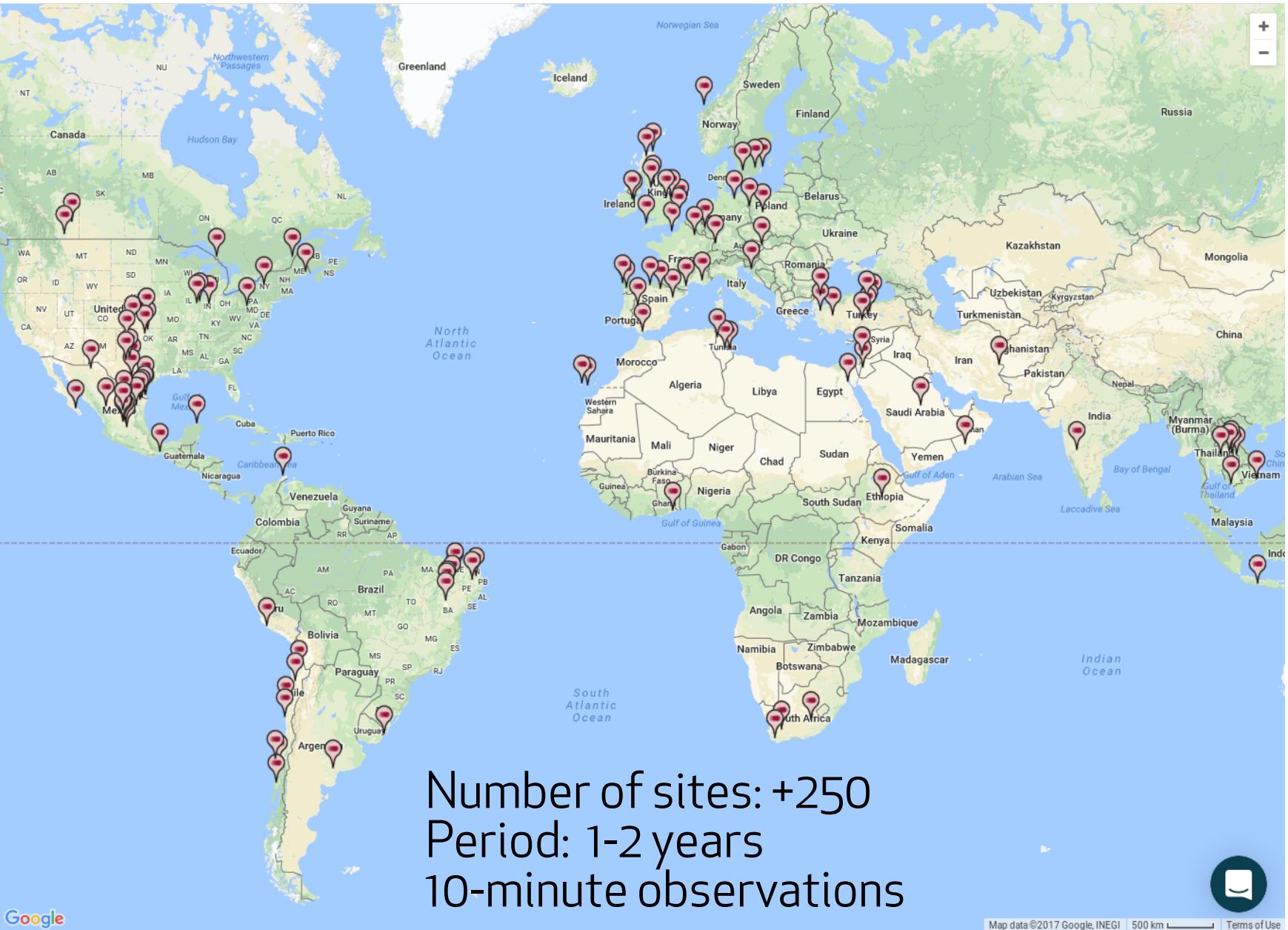
42 Vertical Levels

3km horizontal resolution

Hourly Output

PBL Mellor Yamada Janick

* standard Vortex SERIES config



Google

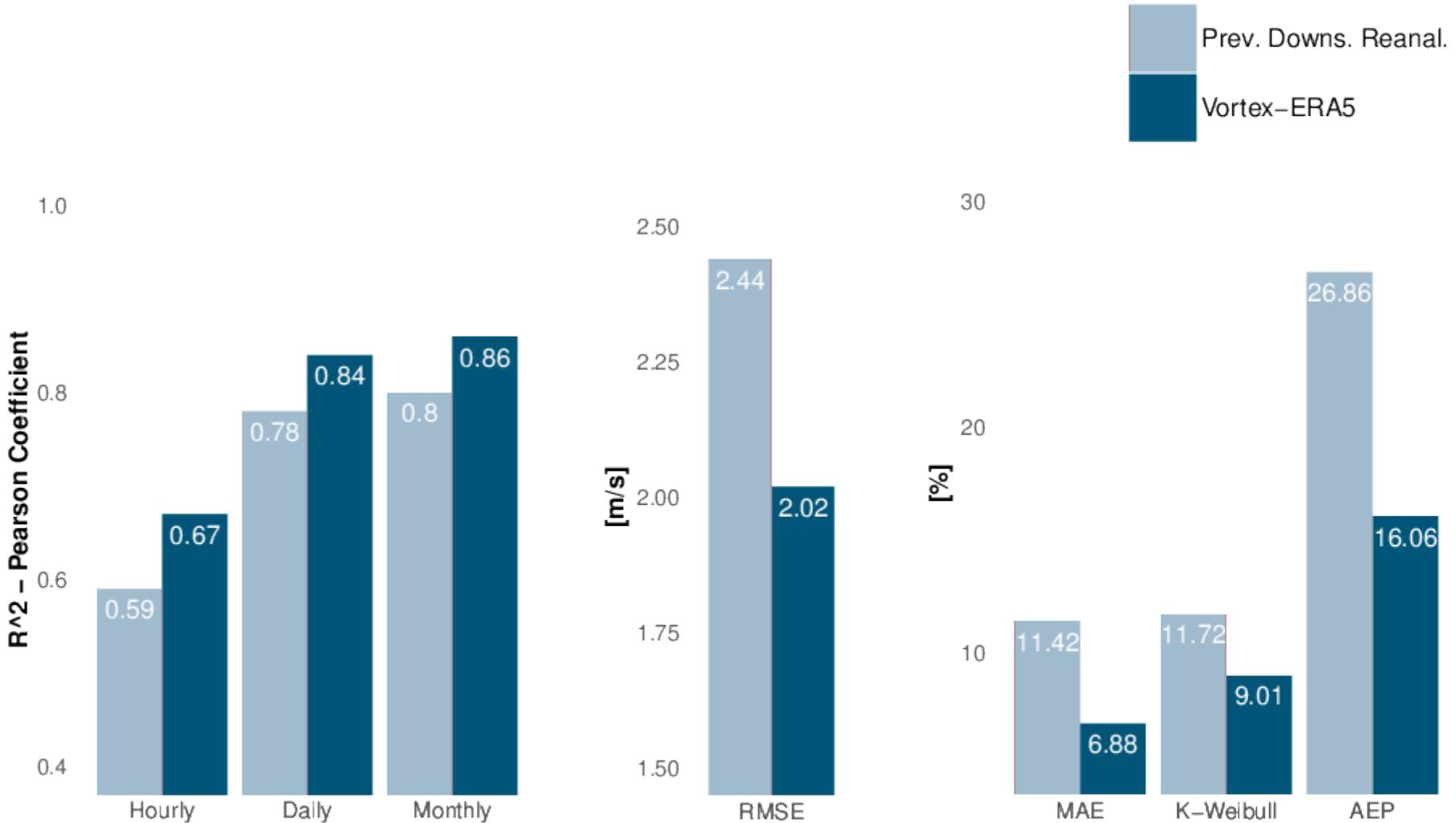
Map data ©2017 Google, INEGI | 500 km | Terms of Use

Validation Methodology

Wind Industry Common Metrics

- R² Pearson Coefficient (hourly, daily & monthly)
- Mean Wind Speed Bias (%)
- RMSE (m/s)
- Weibull Parameters Error (%)
- AEP Error (%)

Validation Results



Validation Results

Prev. Dnw. Reanal.

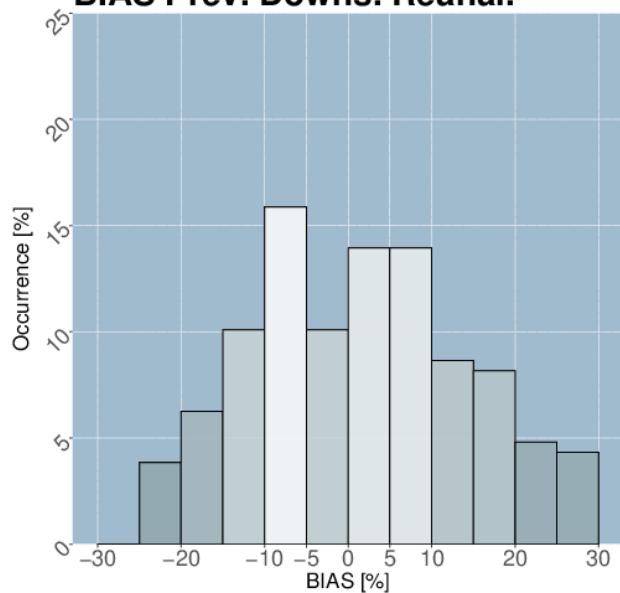
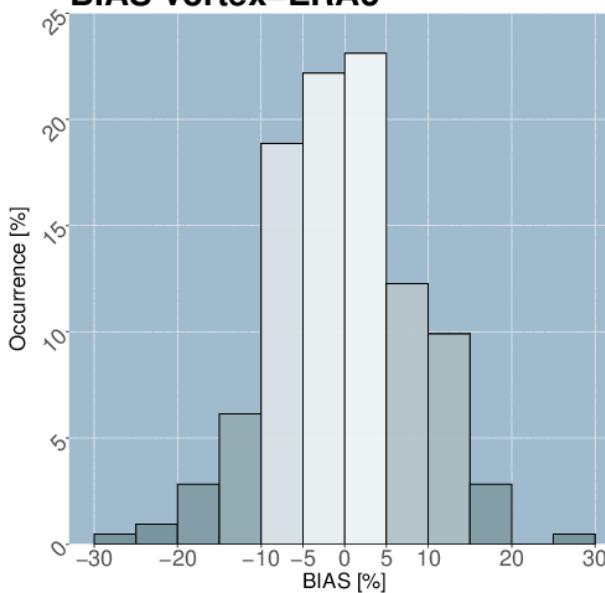
R² (hourly)
R² (daily)
R² (monthly)
RMSE [m/s]
MAE [%] *
BIAS [%]
K-Weibull [%]
AEP [%]

Average	Std. Dev.
0.59	0.14
0.78	0.12
0.80	0.22
2.44	0.56
11.42	8.36
1.49	14.08
11.72	10.29
26.86	20.77

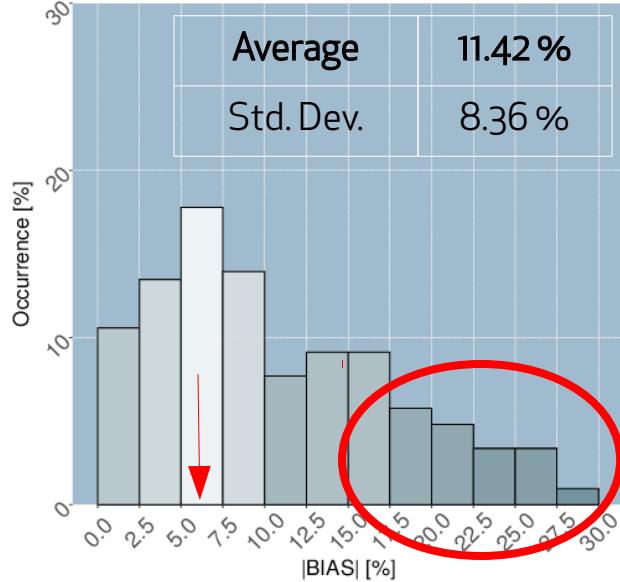
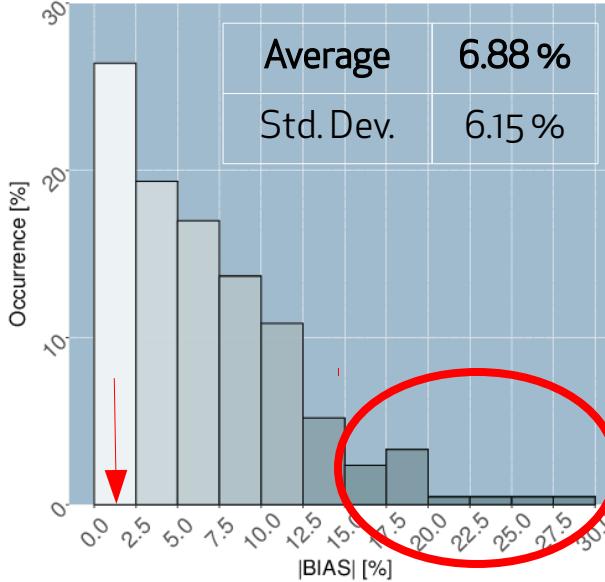
Vortex ERA 5

Average	Std. Dev.
0.67	0.13
0.84	0.09
0.86	0.15
2.02	0.53
6.88	6.15
-0.56	9.41
9.01	8.28
16.06	12.90

*MAE is the mean of the absolute BIAS

BIAS Prev. Downs. Reanal.**BIAS Vortex-ERA5**

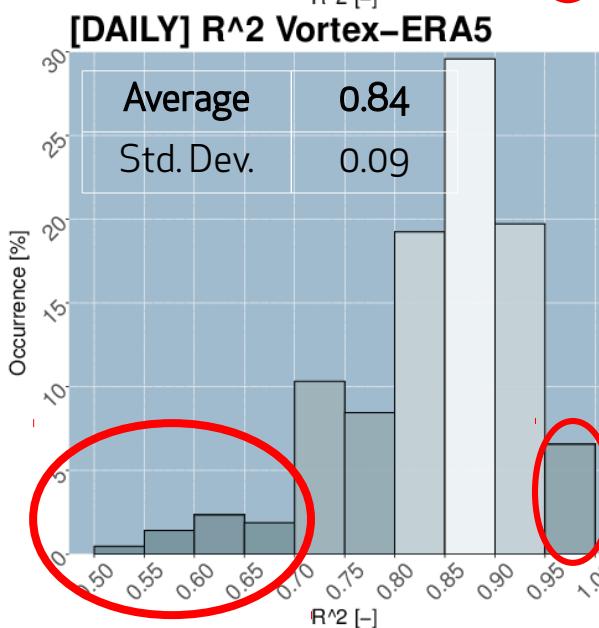
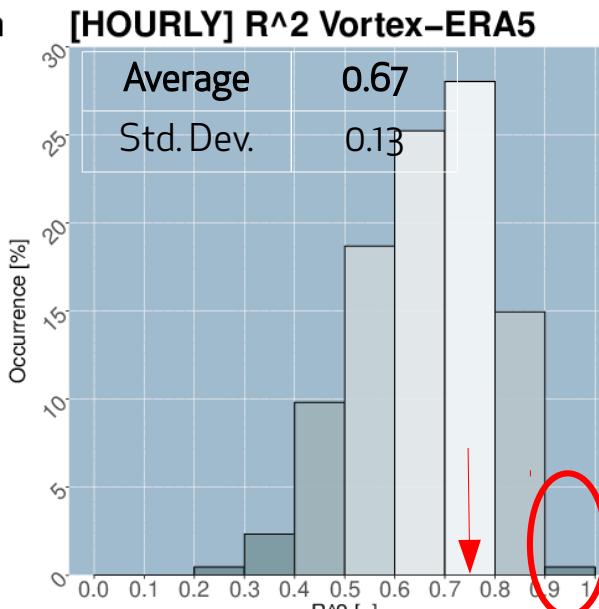
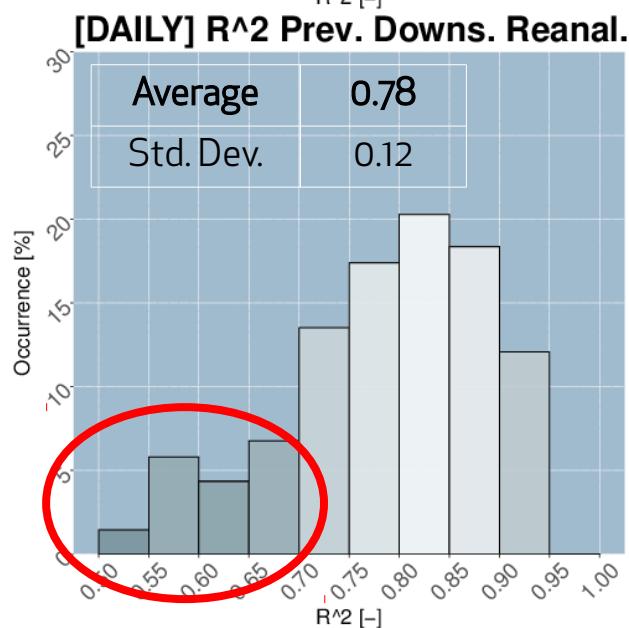
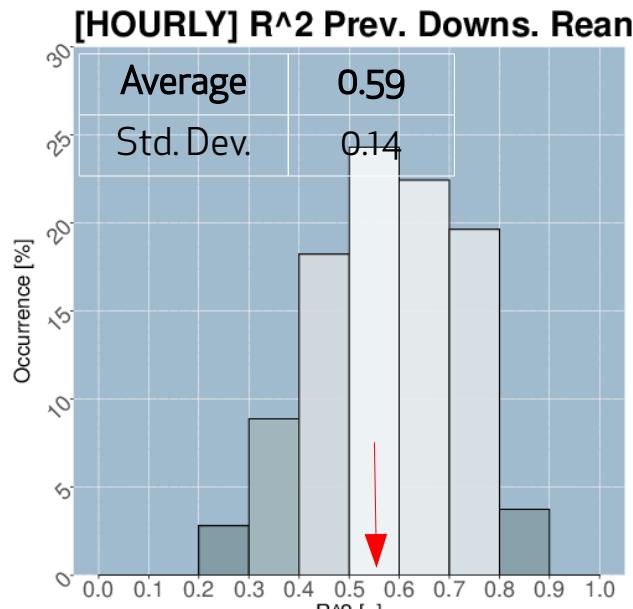
Lighter/darker bars are the most/less populated bins

|BIAS| Prev. Downs. Reanal.**|BIAS| Vortex-ERA5**

BIAS and ABSOLUTE BIAS

Comments:

- The most significant populations are shifted to lower errors in Vortex-ERA5
- Trend to over estimate have been corrected
- Distributions are narrower for Vortex-ERA5



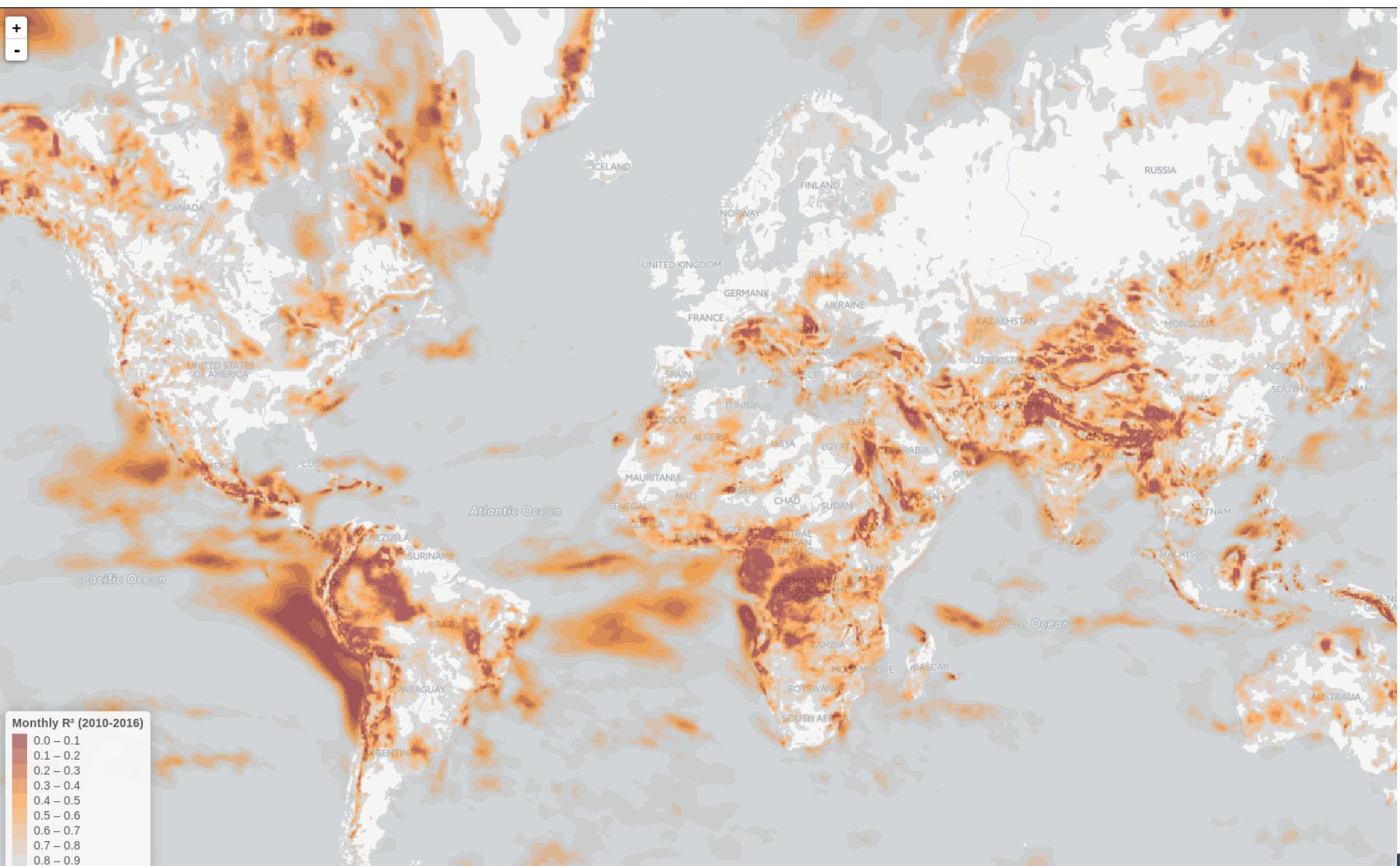
Lighter/darker bars are the most/less populated bins

HOURLY and DAILY CORRELATION

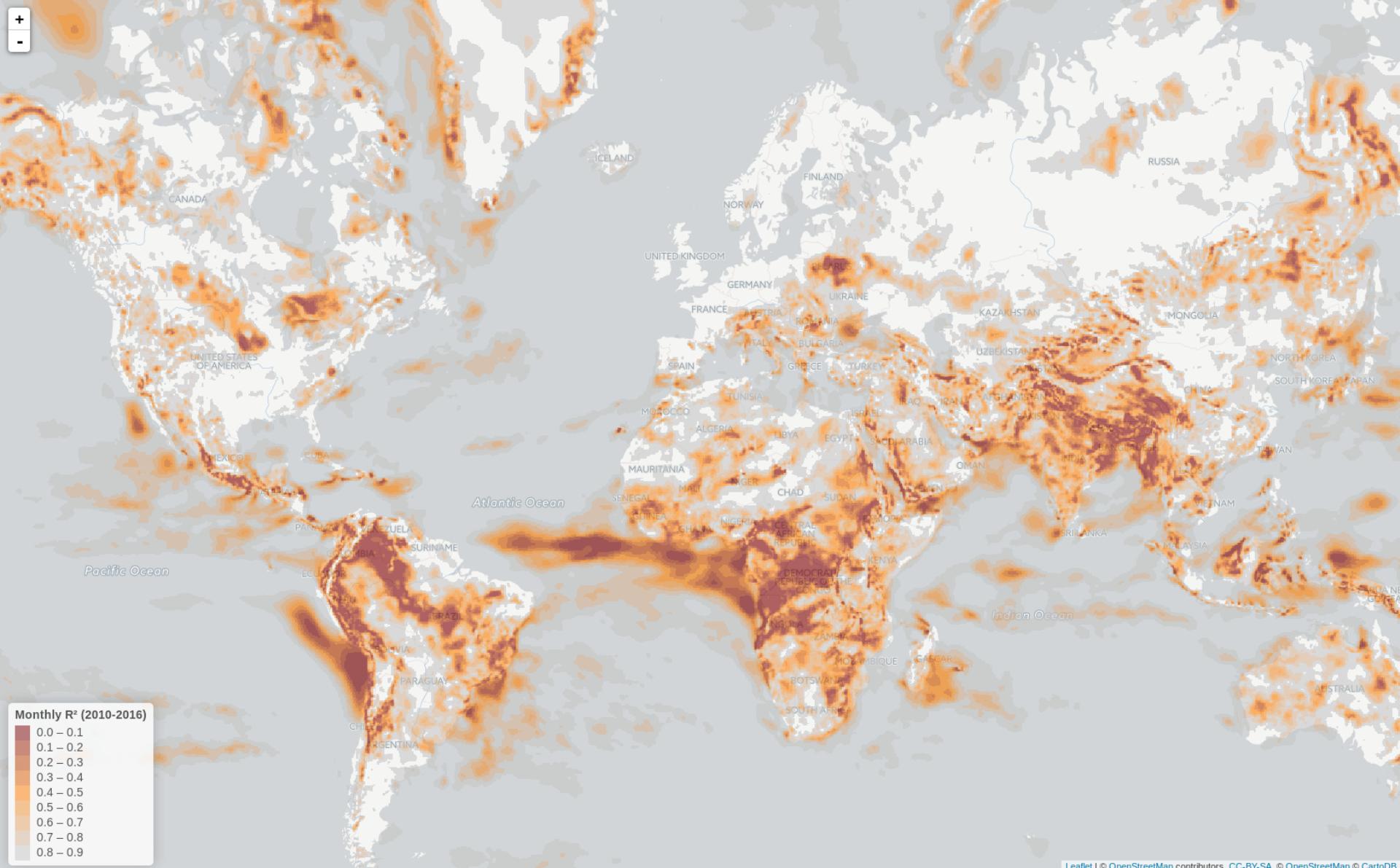
Comments:

- the most significant populations are shifted to greater R^2 (from 0.5-0.6 to 0.7-0.8!!) in Vortex-ERA5
- For hourly, Vortex-ERA5 shows population in the bin 0.9-1.0 !!
- For daily the bin 0.95-1.00 is populated in Vortex-ERA5!!
- Distributions are narrower for Vortex-ERA5

Monthly R² - ERAi Vs. ERA5 (deseasonalized)



Monthly R² - MERRA2 Vs. ERA5 (deseasonalized)



Vortex Portfolio with ERA5

Product	Resolution
	FARM 100-500 m
	LES 100 m
	SERIE 3 km
	MAP 3-1 km

* Previous Reanalysis sources are still offered to guarantee/offer consistency