



Rethinking wind resource assessment for southern Asia conditions

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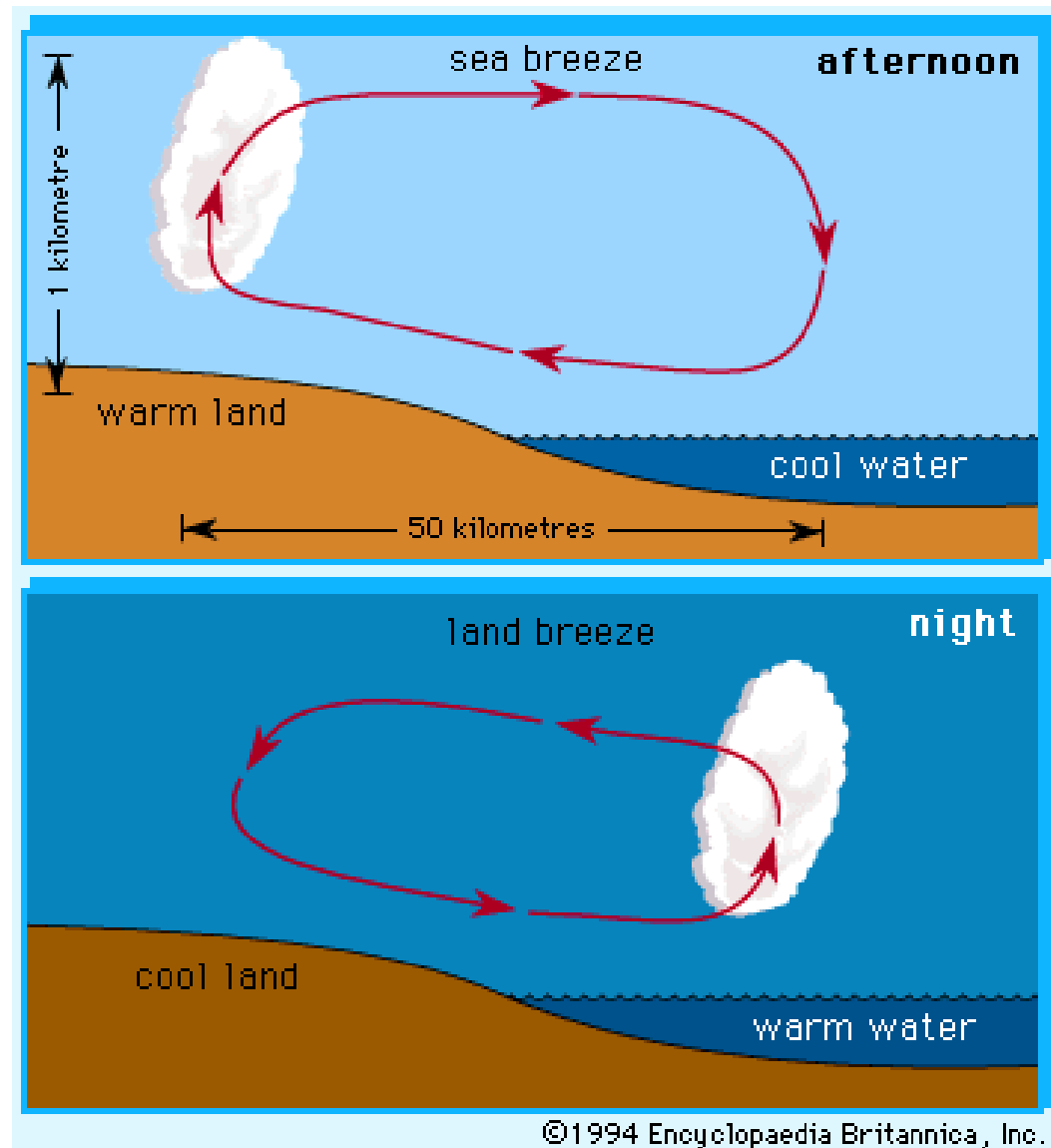
Vortex FDC

Bangkok,
7th July 2026



1. Wind resource assessment origins — Weibull and WRG
2. What compression loses: temporal and spatial variability
3. Use cases and benefits: hybridisation, BESS, uncertainty, P90
4. South East Asia: a different market, a different climate

INTRODUCTION



SUMMER 12AM → WING FOILING

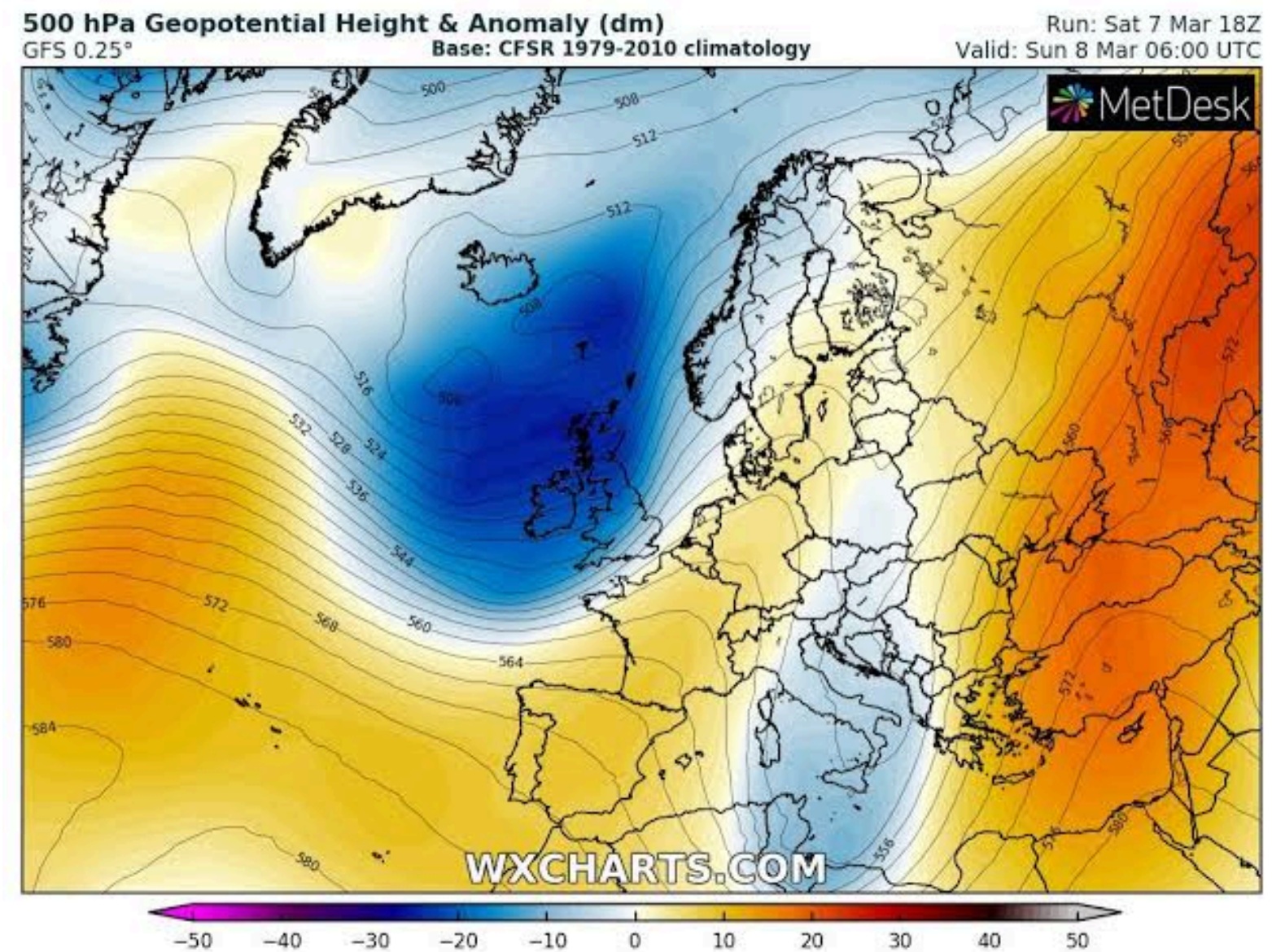


How to find wind near my home, in southern Europe



INTRODUCTION

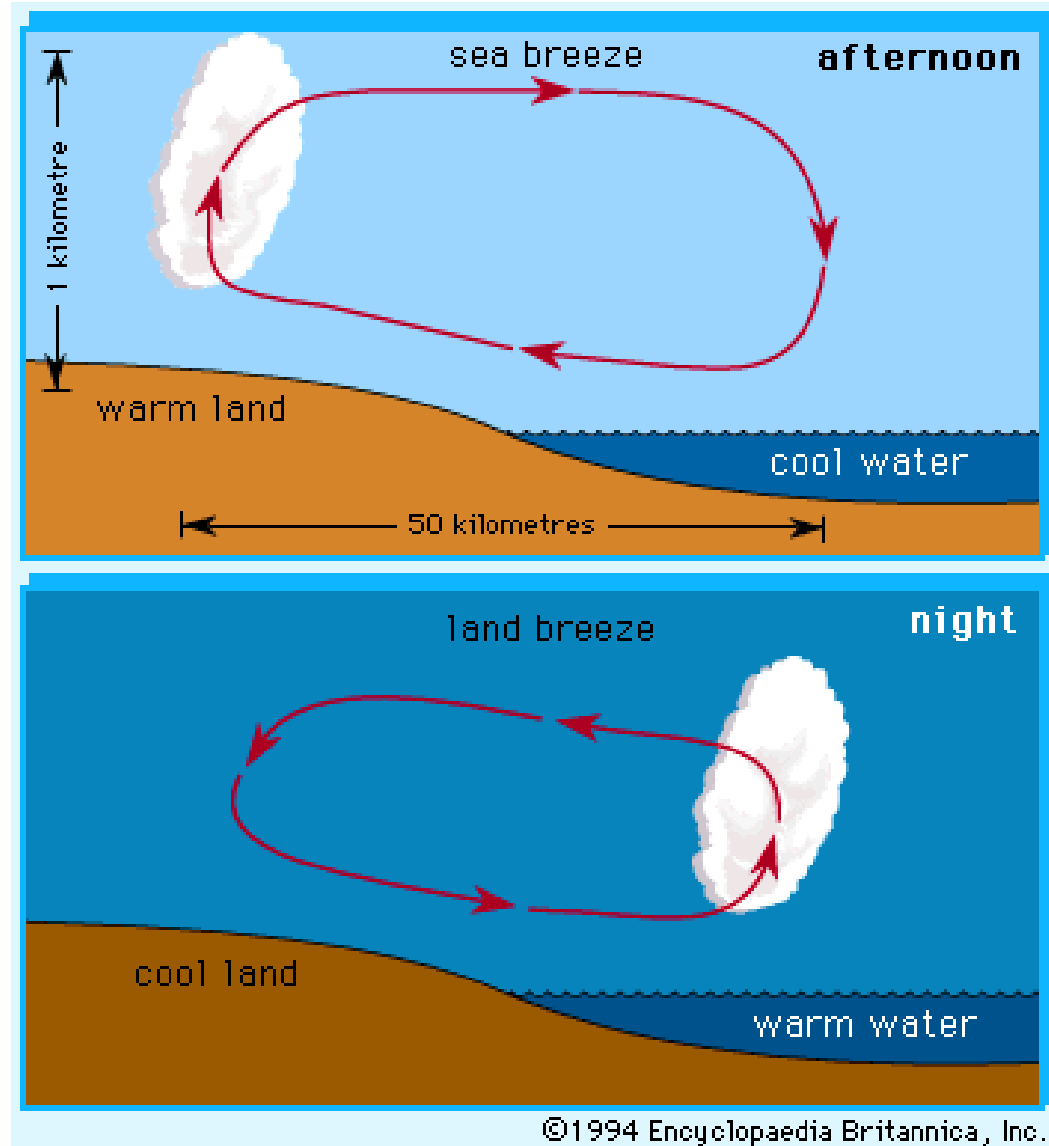
WINTER: LOW PESSURES



Well, winter is much more unpredictable.



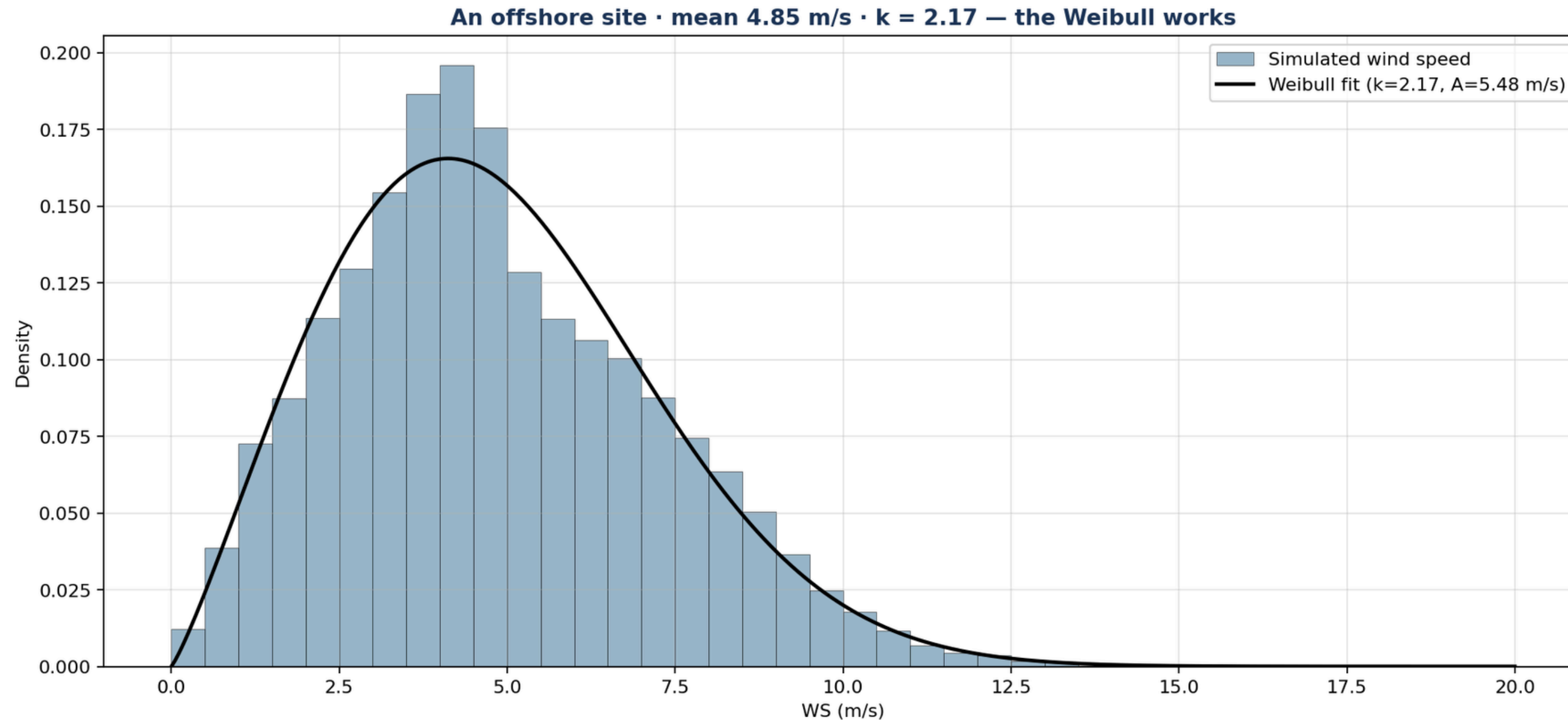
INTRODUCTION



While Thailand makes it much more predictable with two main seasons, with its transitions.



WIND RESOURCE ASSESSMENT OLD SCHOOL

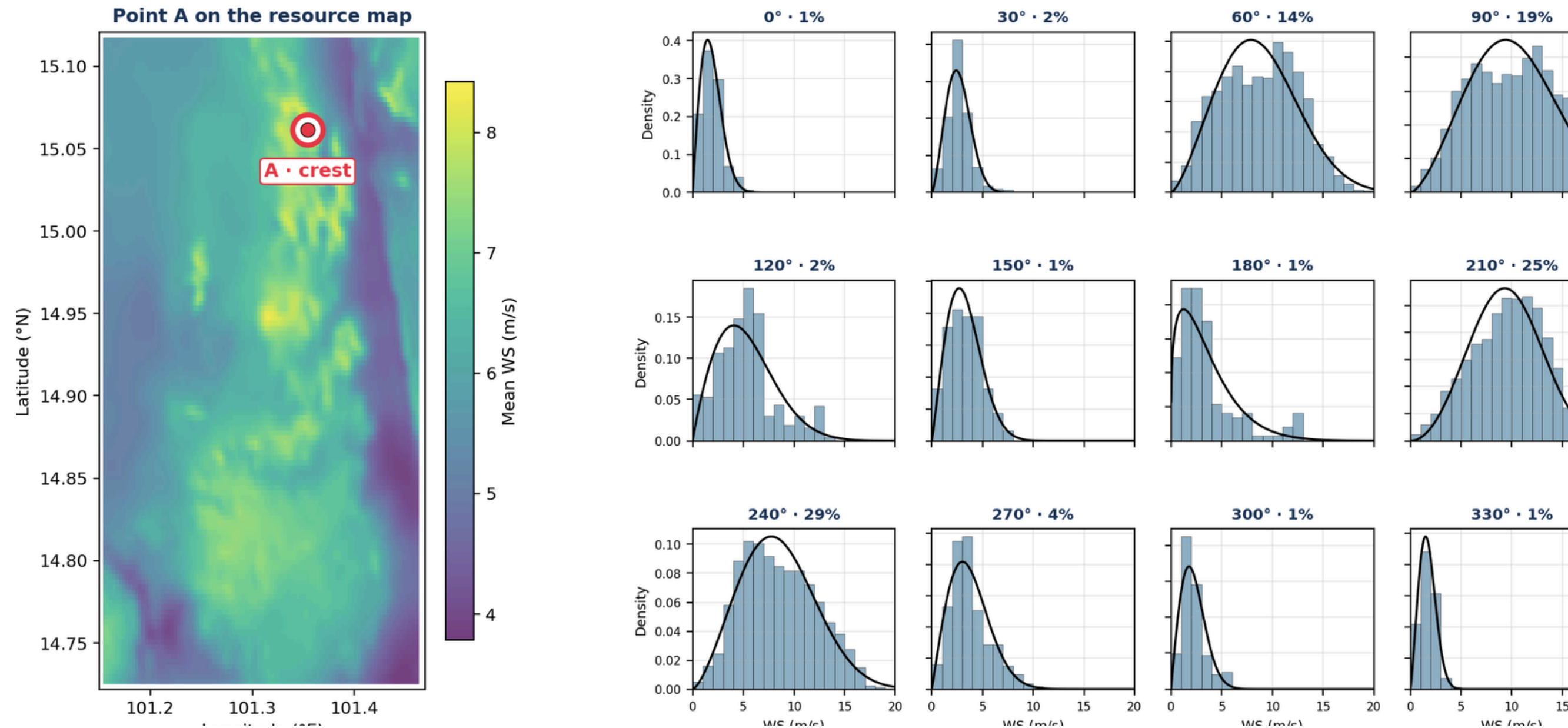


Where the wind is well-behaved, two parameters really do capture the whole histogram.



WIND RESOURCE ASSESSMENT: WRG

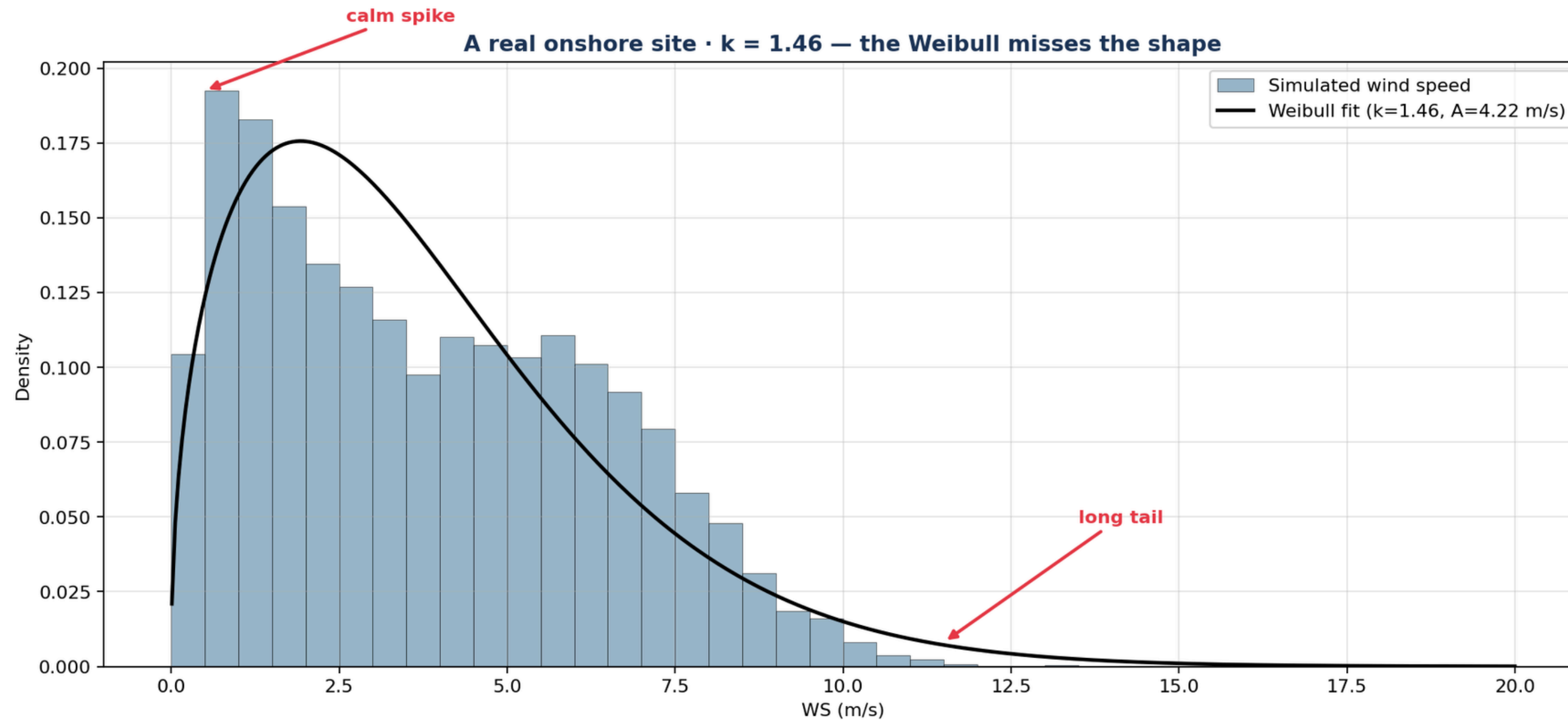
A WRG cell = one Weibull per direction sector (12 sectors) — point A



A WRG compresses each grid cell into one Weibull per direction sector — twelve curves plus a frequency table.



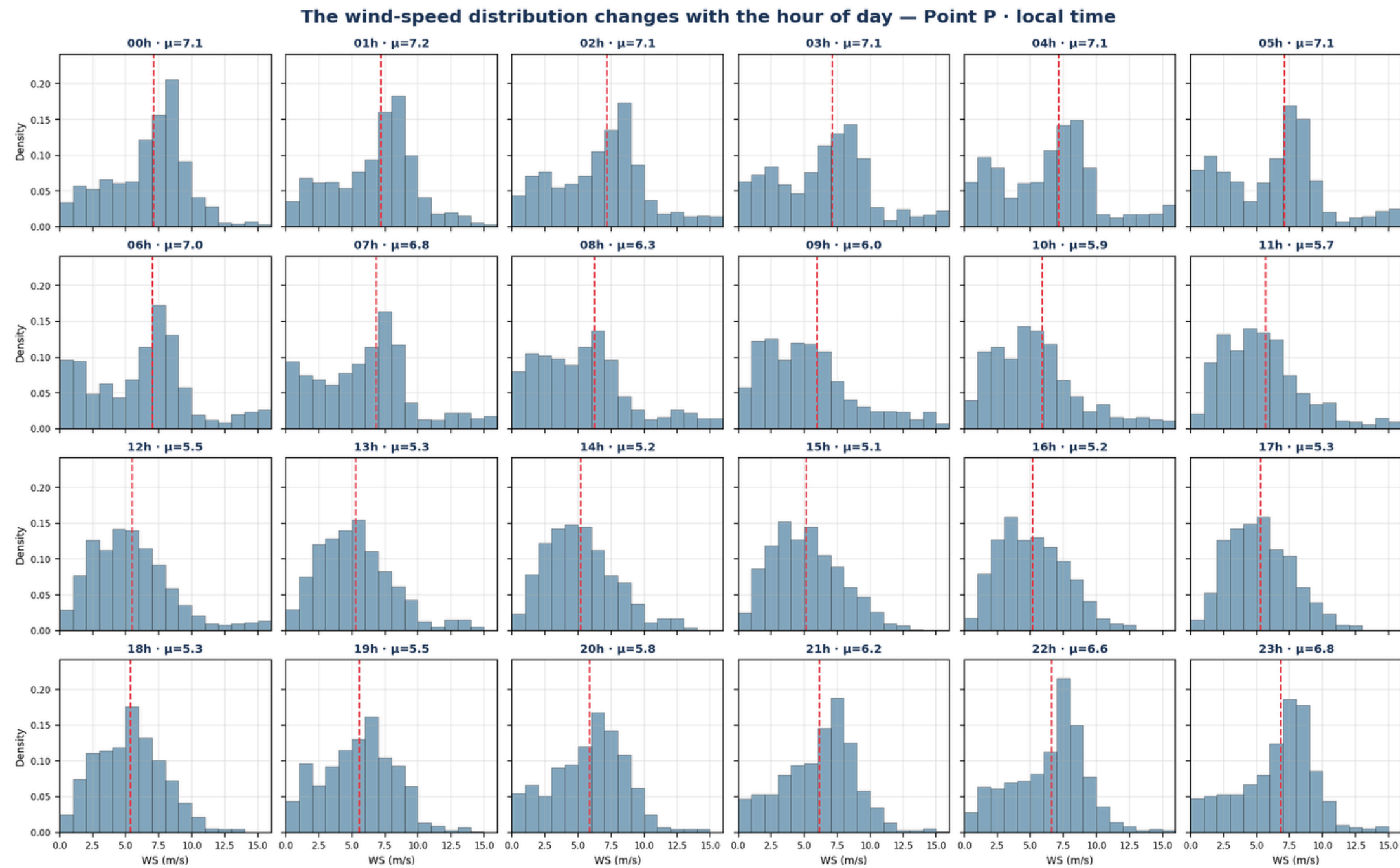
WHEN IT FAILS A WEIBULL



At this real onshore site the fit misses the calm spike and the long tail



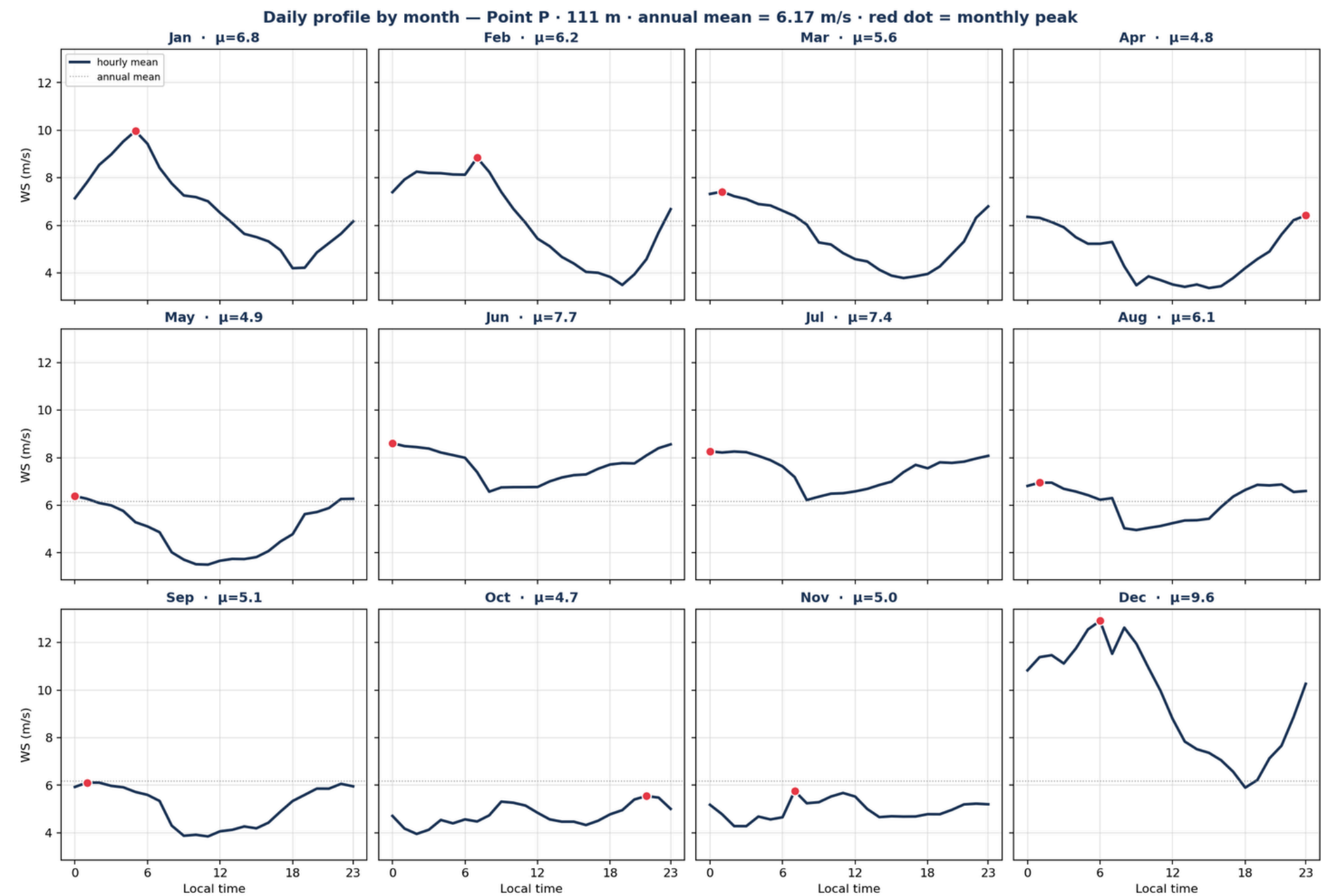
VARIABILITIES: HISTOGRAMS AT DIFFERENT HOURS



There is no single histogram: the wind-speed distribution changes hour by hour.



VARIABILITIES: DAILY CYCLES BY MONTHS

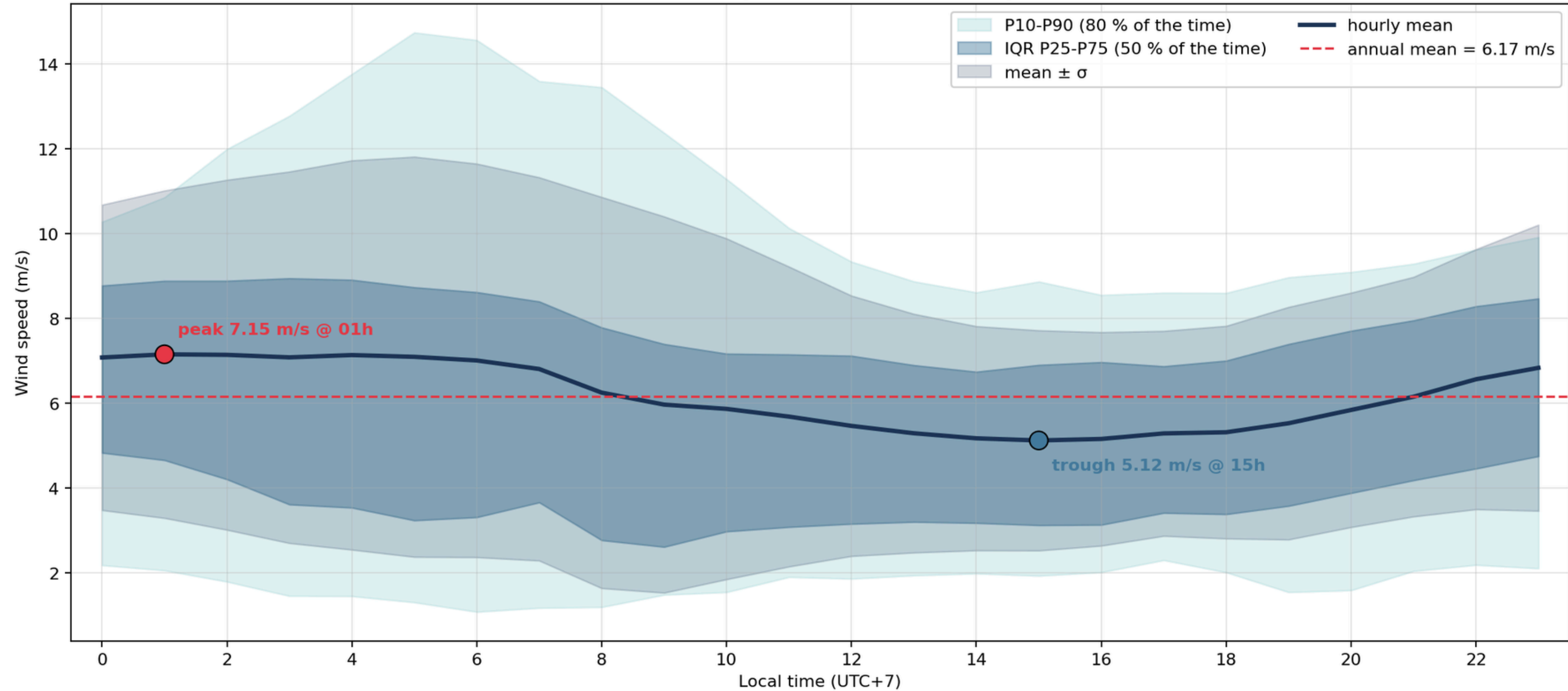


The diurnal cycle itself changes month by month across the year.



TEMPORAL VARIABILITIES LOST: DIURNAL CYCLE & SPREAD

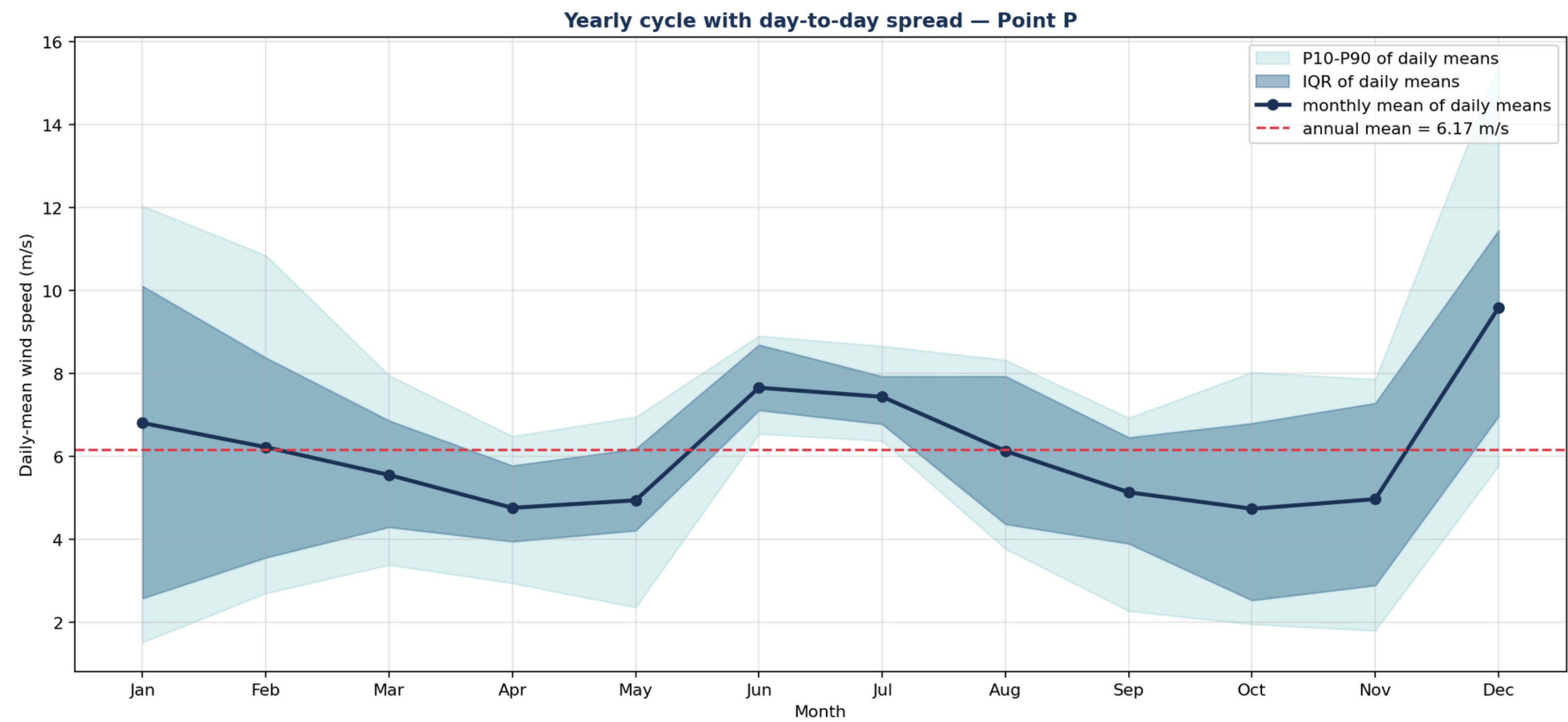
The 24 distributions collapse to one curve with spread — Point P



The 24 hourly distributions collapse into one diurnal curve — plus the spread a single mean hides.



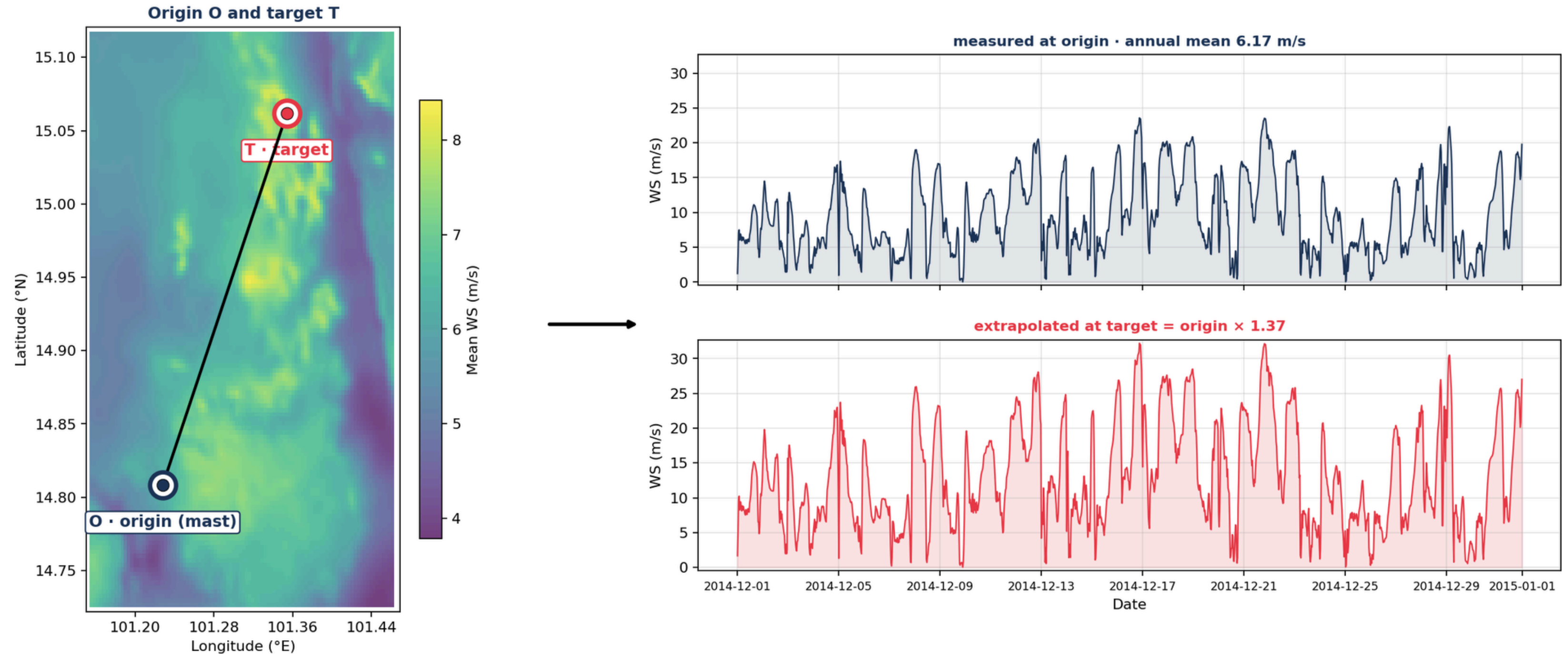
TEMPORAL VARIABILITIES LOST: YEARLY CYCLE & SPREAD



The yearly cycle, with the day-to-day spread around each month.



EXTRAPOLATION METHOD



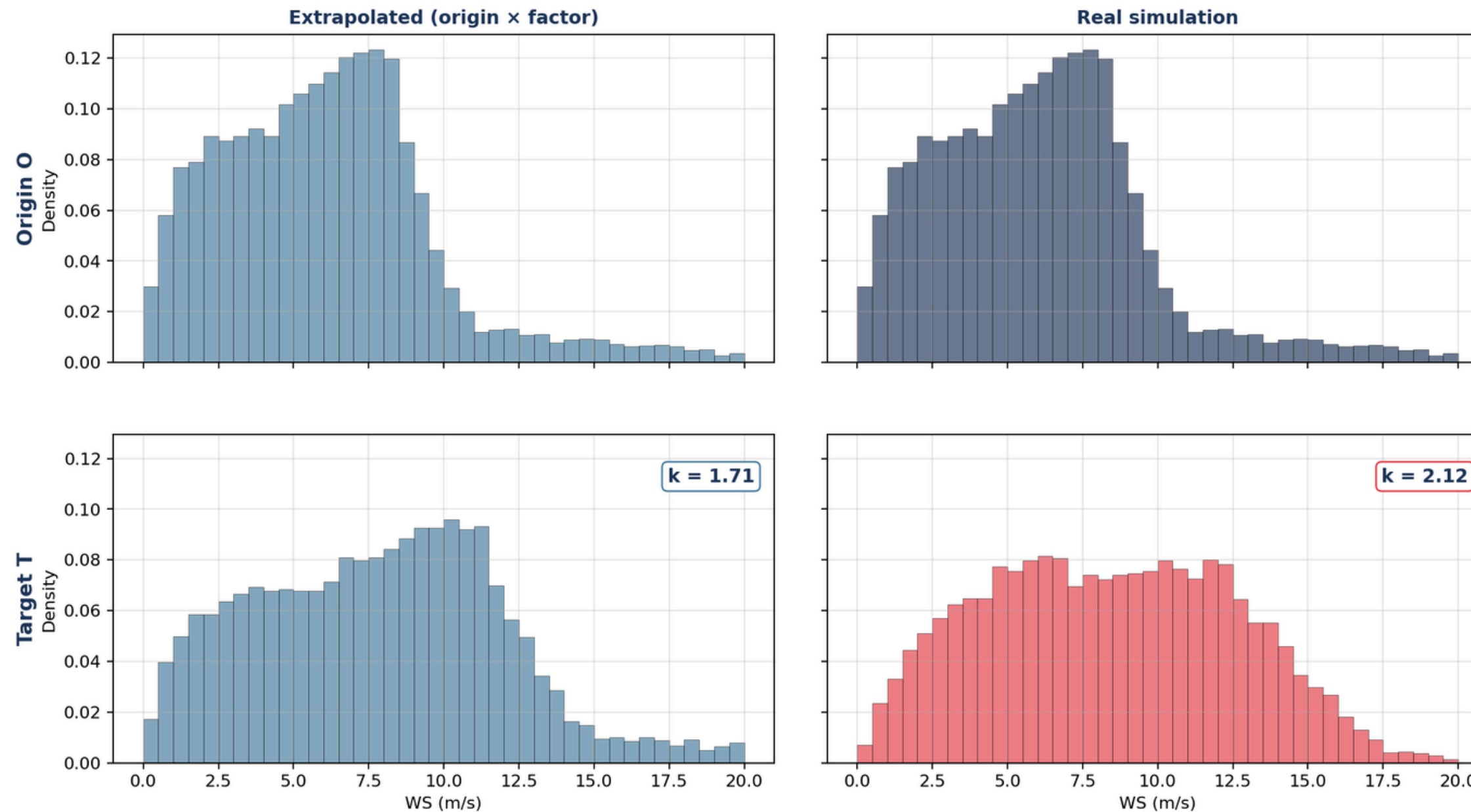
Extrapolation: take the series at the origin and scale it to the target mean — everything else is inherited.



EXTRAPOLATION METHOD: MISSING REAL SHAPE

Linear extrapolation carries the origin's shape everywhere — reality does not

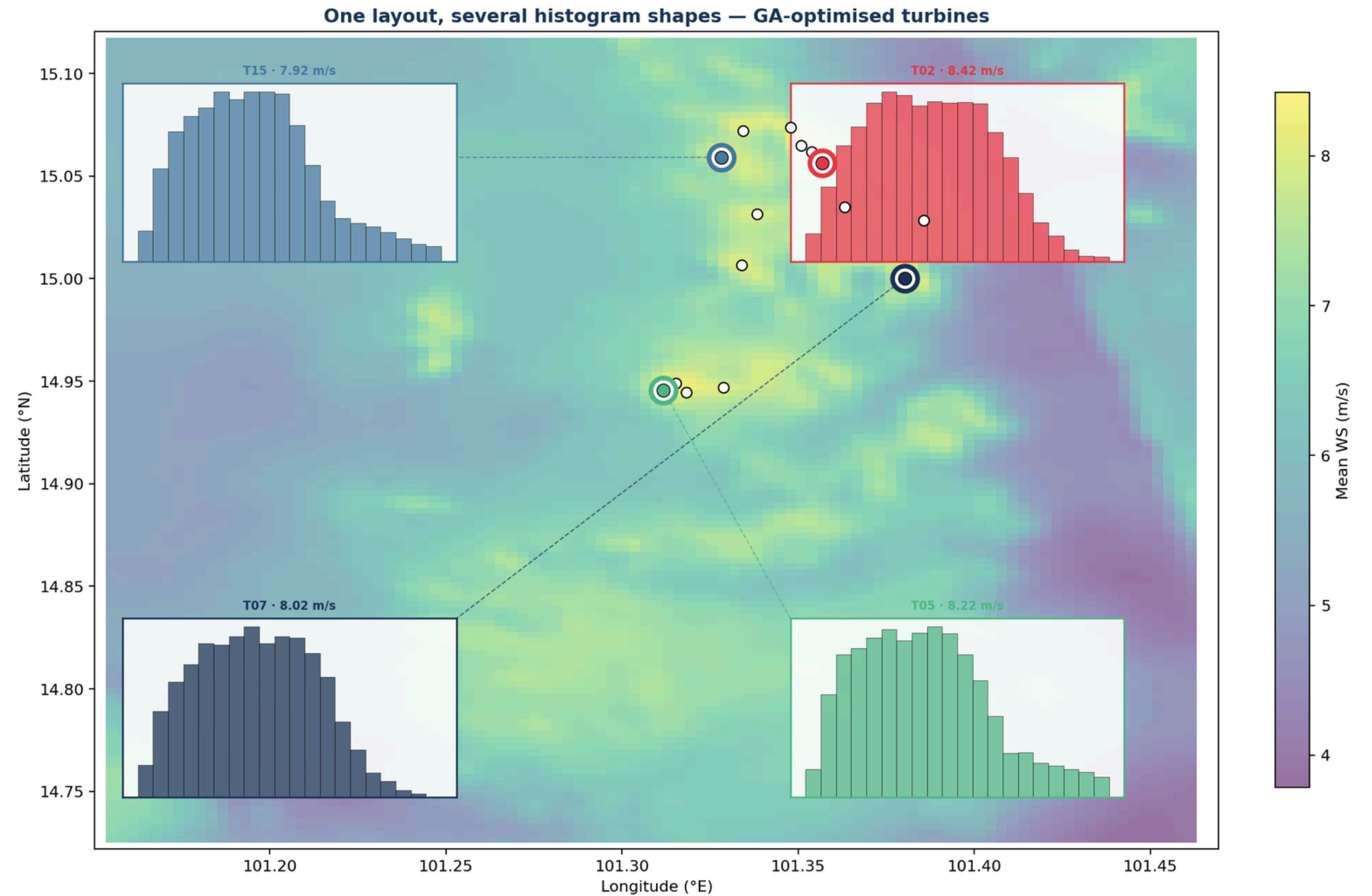
↔ identical: extrapolation is a rescale, it reproduces the origin exactly



The scaling reproduces the origin exactly — and carries its shape to the target, where reality has a different one.



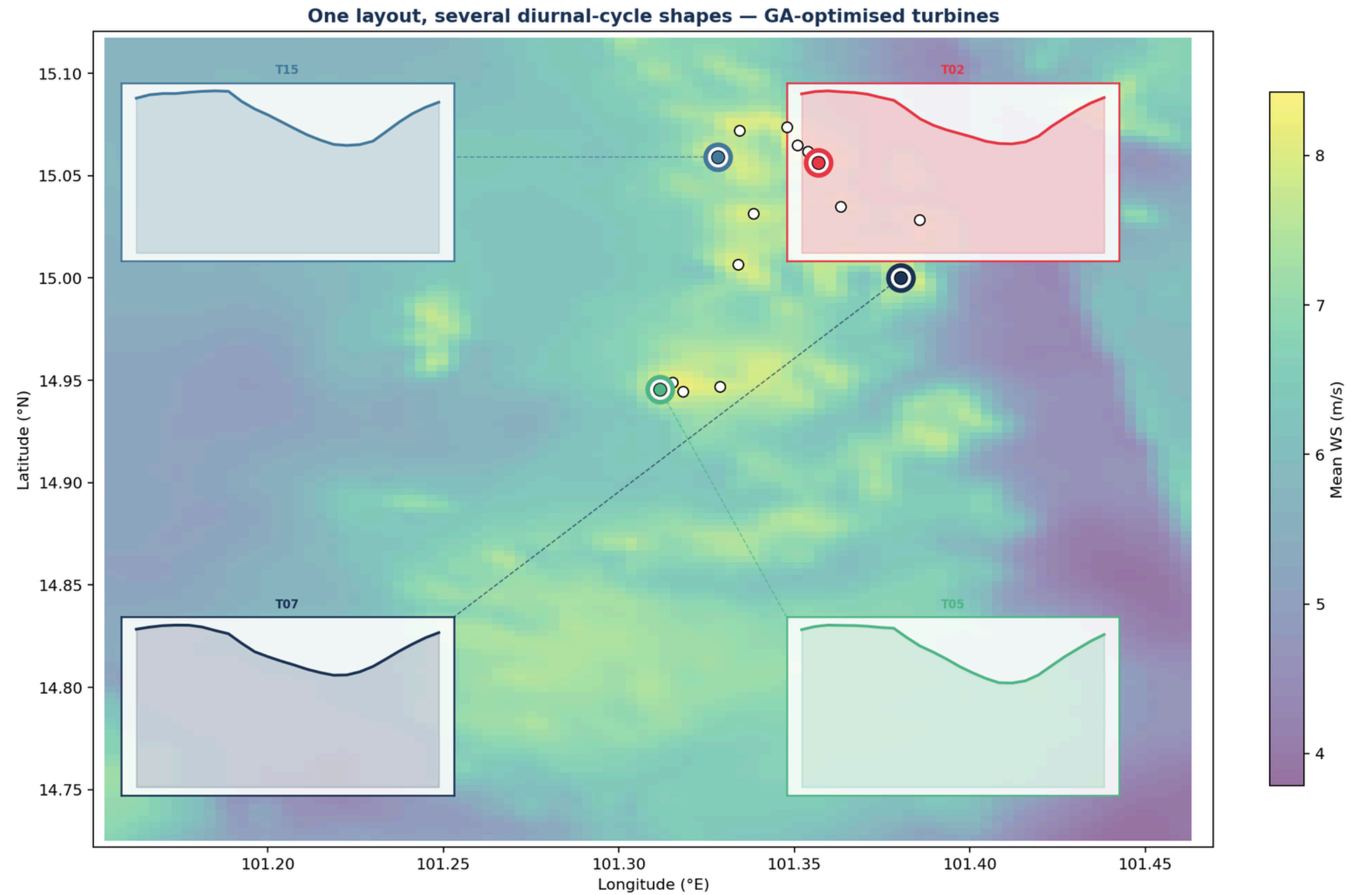
HISTOGRAM'S VARIABILTY



Within one optimised layout, turbines a few kilometres apart see different histogram shapes.



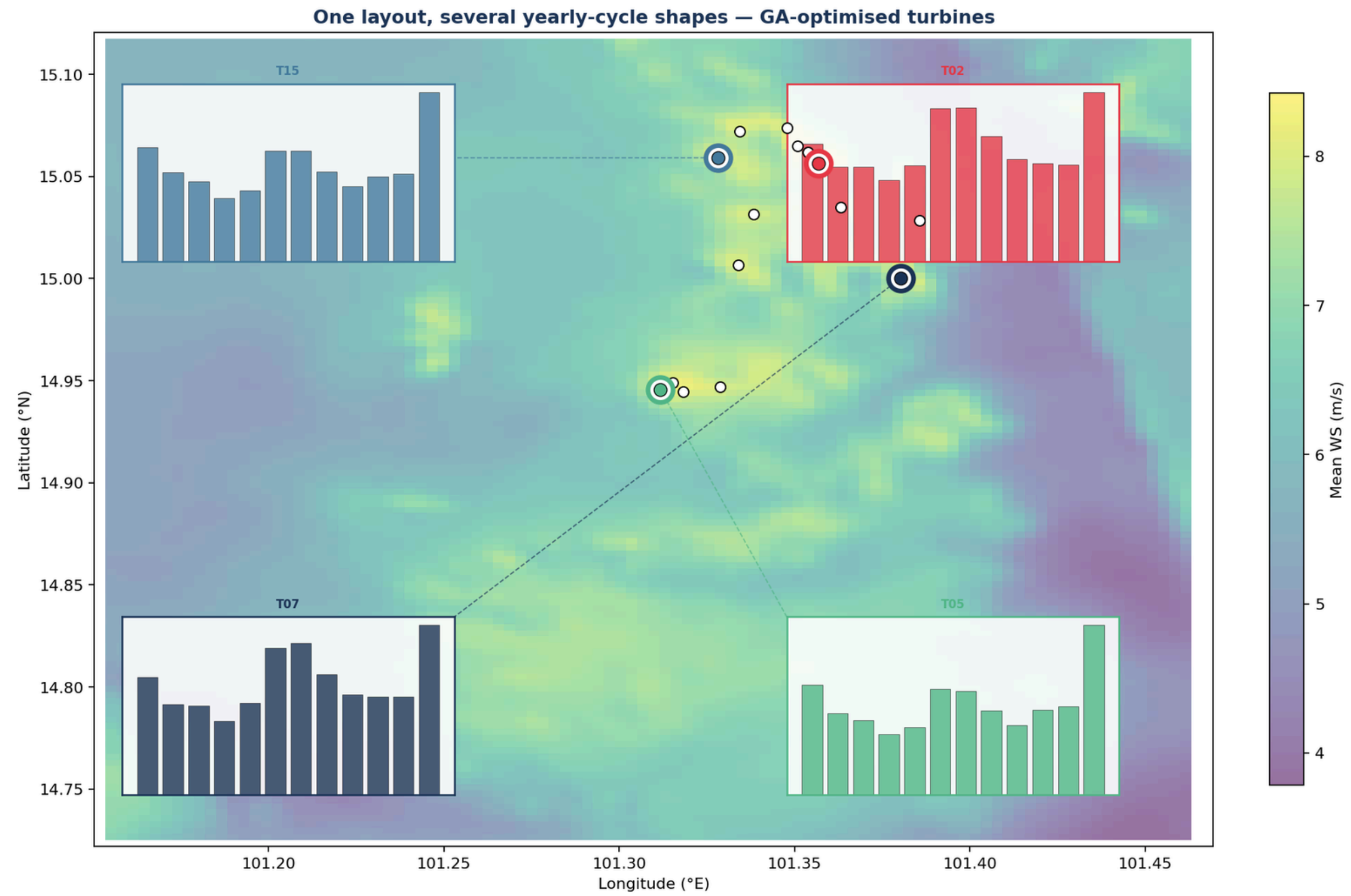
DIURNAL CYCLE VARIABILITY



The same layout also mixes different diurnal cycles



YEARLY CYCLE VARIABILITY



The timing and amplitude of the yearly cycle also shift from turbine to turbine.



SUMMARY:

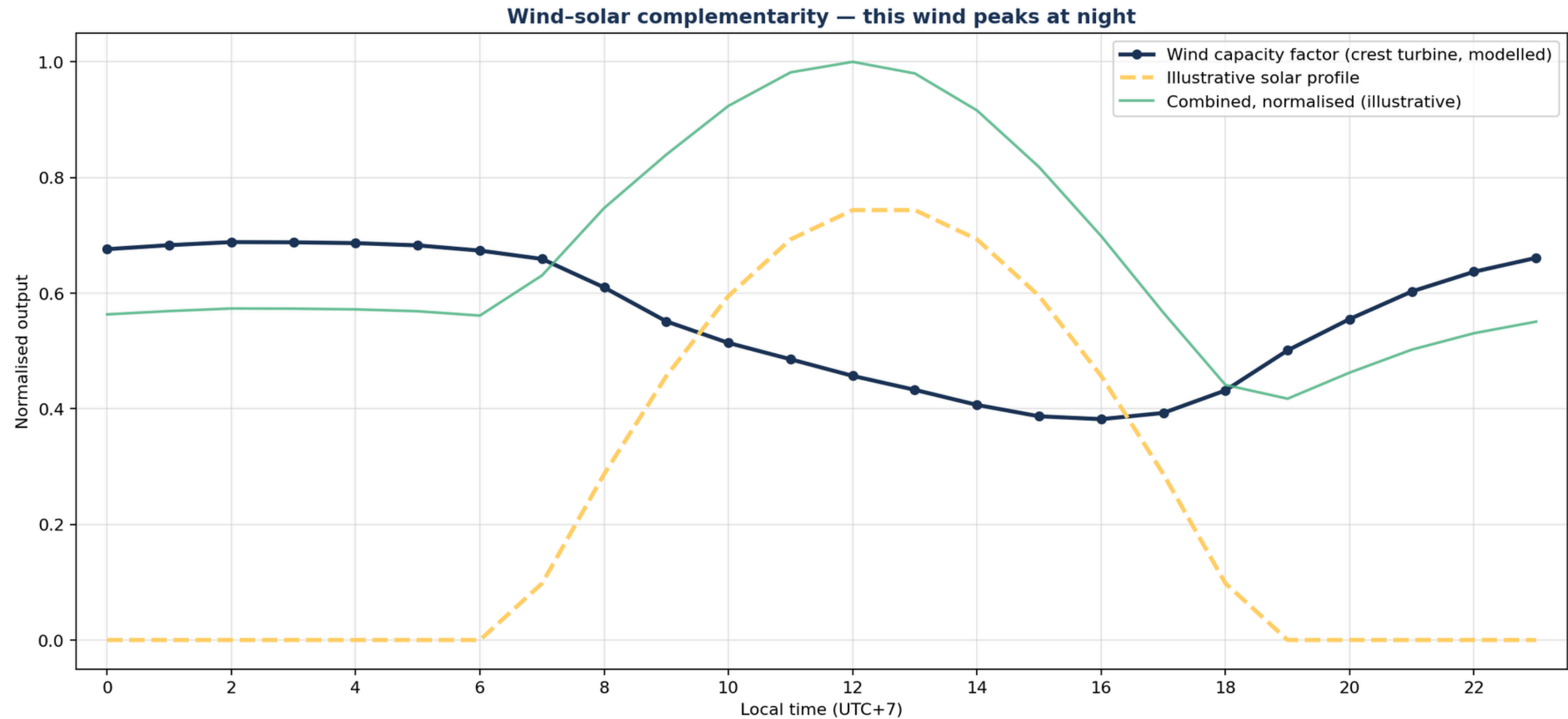
- **DIFFERENCE ON SPATIAL AND TEMPORAL VARIABILITY**
- **WRG COMPRESSES “TIME”**
- **HORIZONTAL EXTRAPOLATION LOSSES “SPATIAL VARIABILITY”**
- **SPREADS TALKS ABOUT TEMPORAL VARIABILITY AND MEAN VALUES CONFIDENCE.**



USE CASES: HAVE MORE FUN!



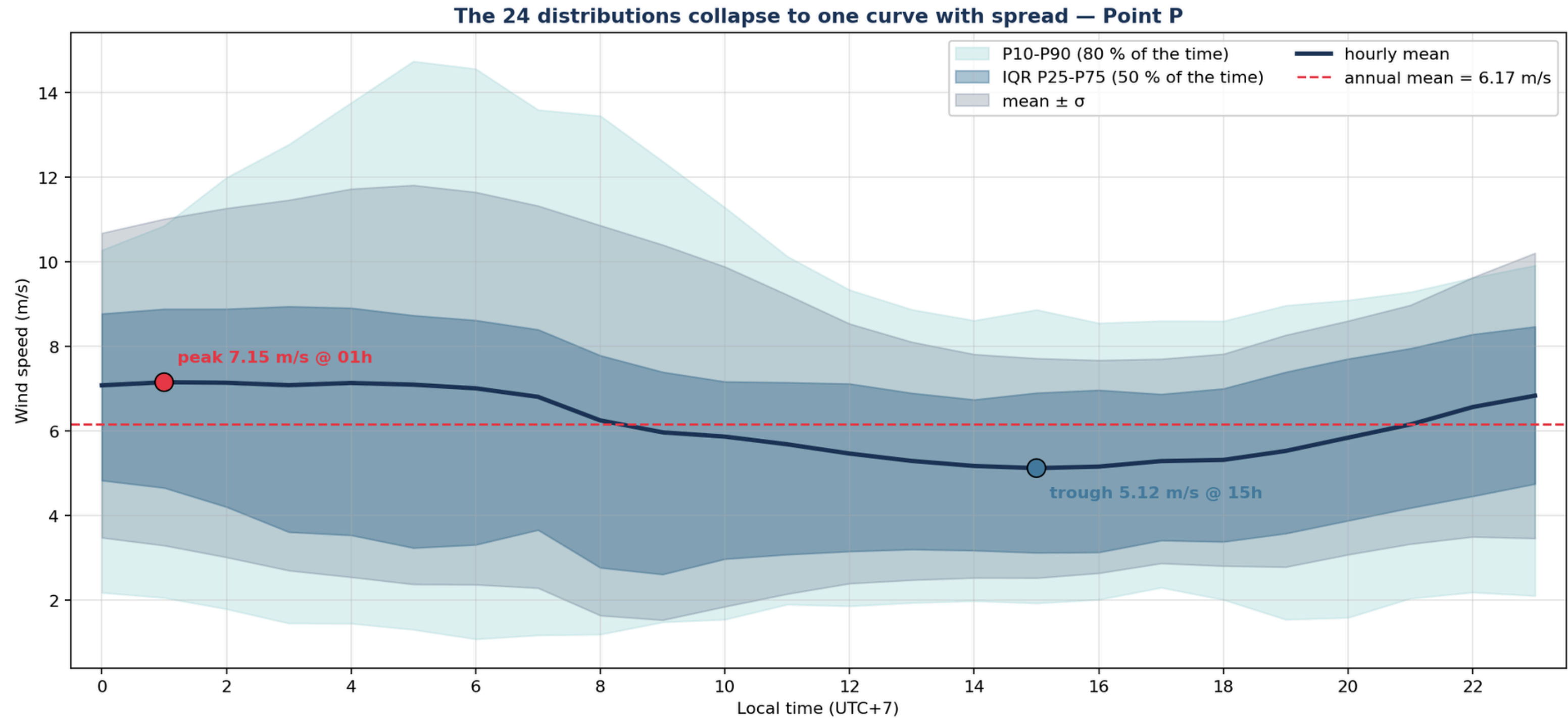
USE CASES: HYBRIDATION



At the crest the wind peaks at night — a natural complement to midday solar (illustrative profile).



USE CASES: BESS

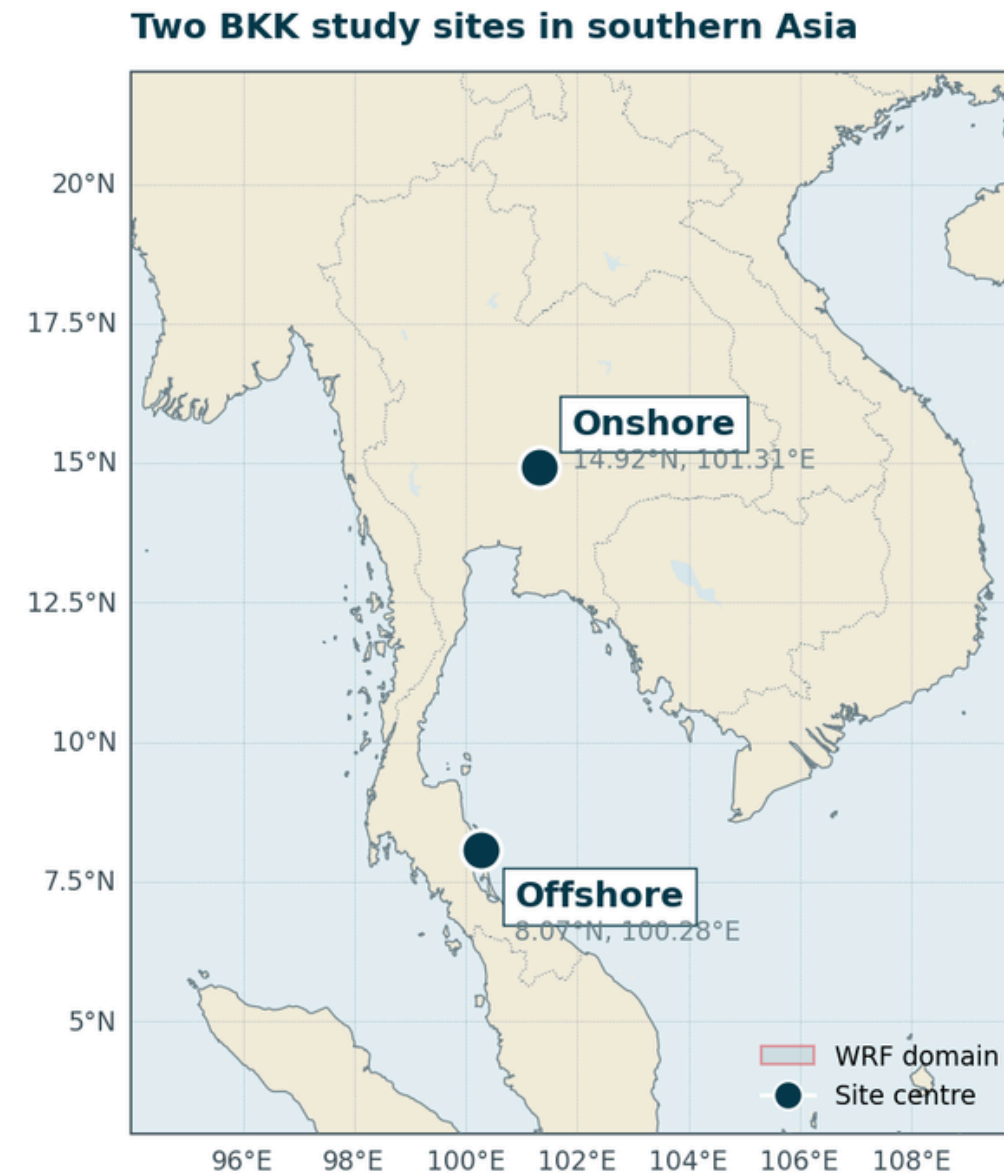


The diurnal envelope — not the mean — is what a BESS must be sized for.



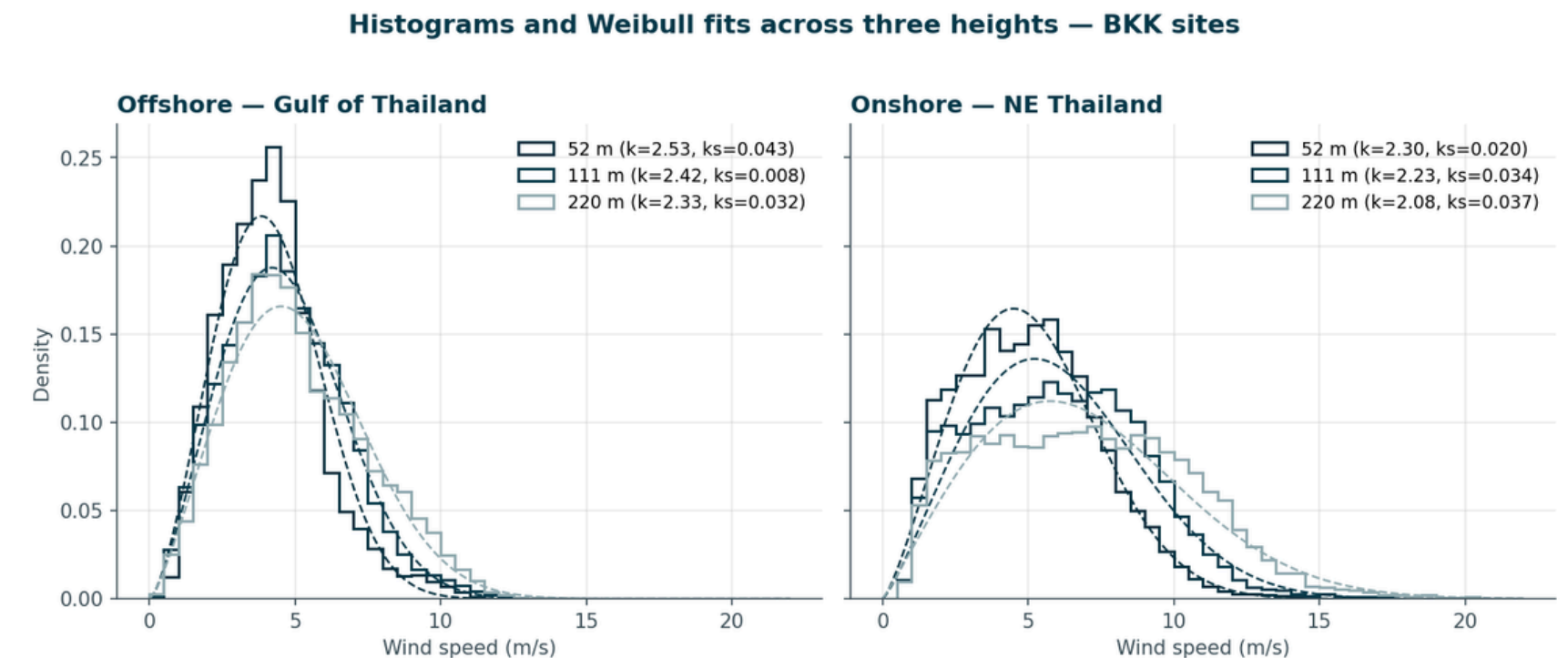
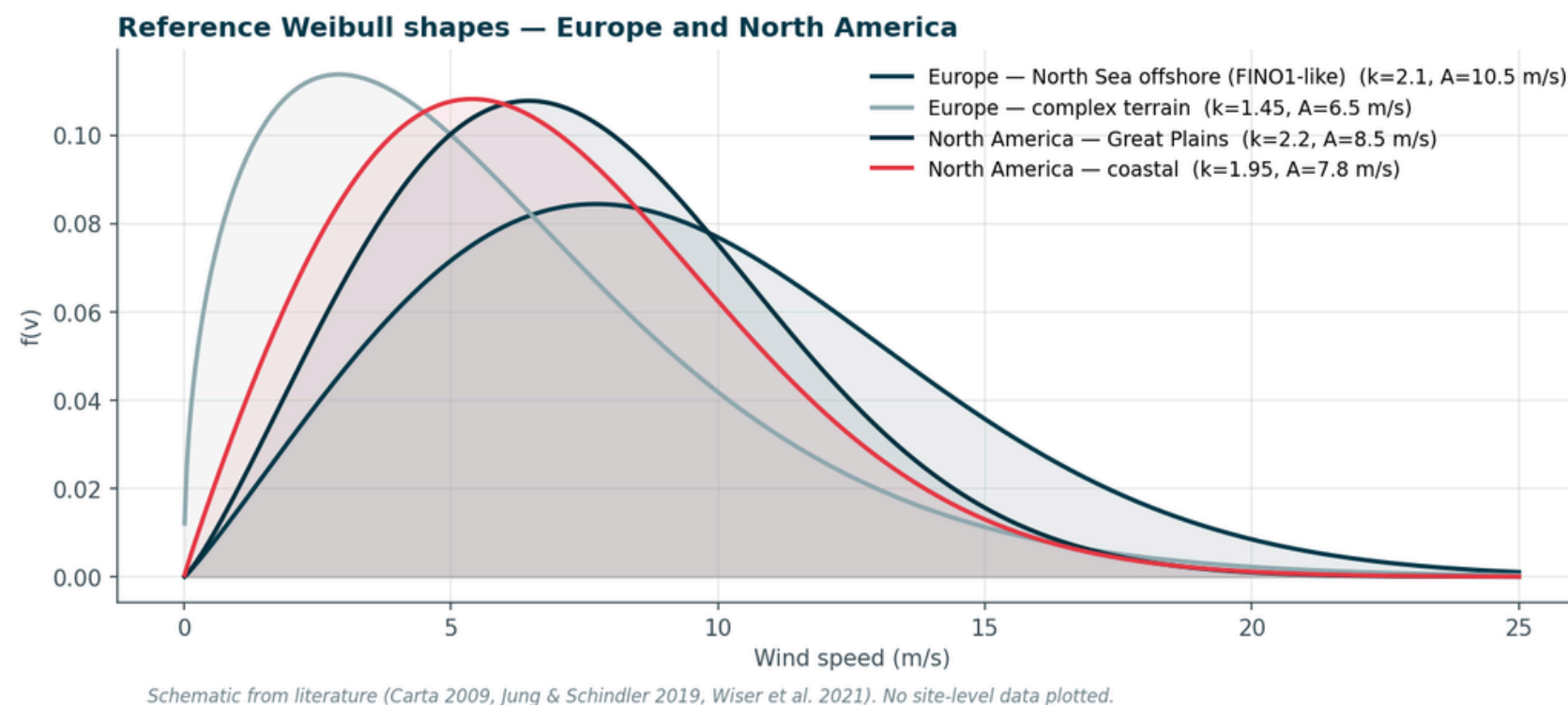
SOUTH EAST ASIA

- Growing in a mature market.
- Facing hybridisation.
- Particular electric-network dependence; months, hours,...



SOUTH EAST ASIA: CLIMATOLOGY

A very different climatology from northern latitudes: the wind is organised by the calendar and the clock, not by passing fronts — monsoon reversals set the seasons; sea breezes, mountain–valley circulations and nocturnal jets set the day.



THAT'S ANOTHER TALE BUT DETAILED DATA....

Can bring other benefits:

- Higher accuracy
- More realistic wake losses in time
- Lower uncertainties, better determined
- Higher P90

**2 sites offshore, 2 sites onshore, Europe and Thailand*



THANK YOU !

