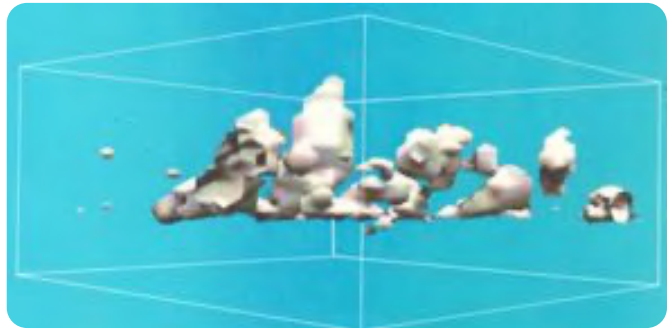
whiffle

Precision weather forecasting

How Whiffle was founded



Large Eddy Simulations have been used in academia to examine clouds and turbulence since the 1980s.

TU Delft

Dutch Atmospheric Large-Eddy Simulation (DALES) for studying atmospheric boundary layers and cloud-aerosol interactions

whiffle

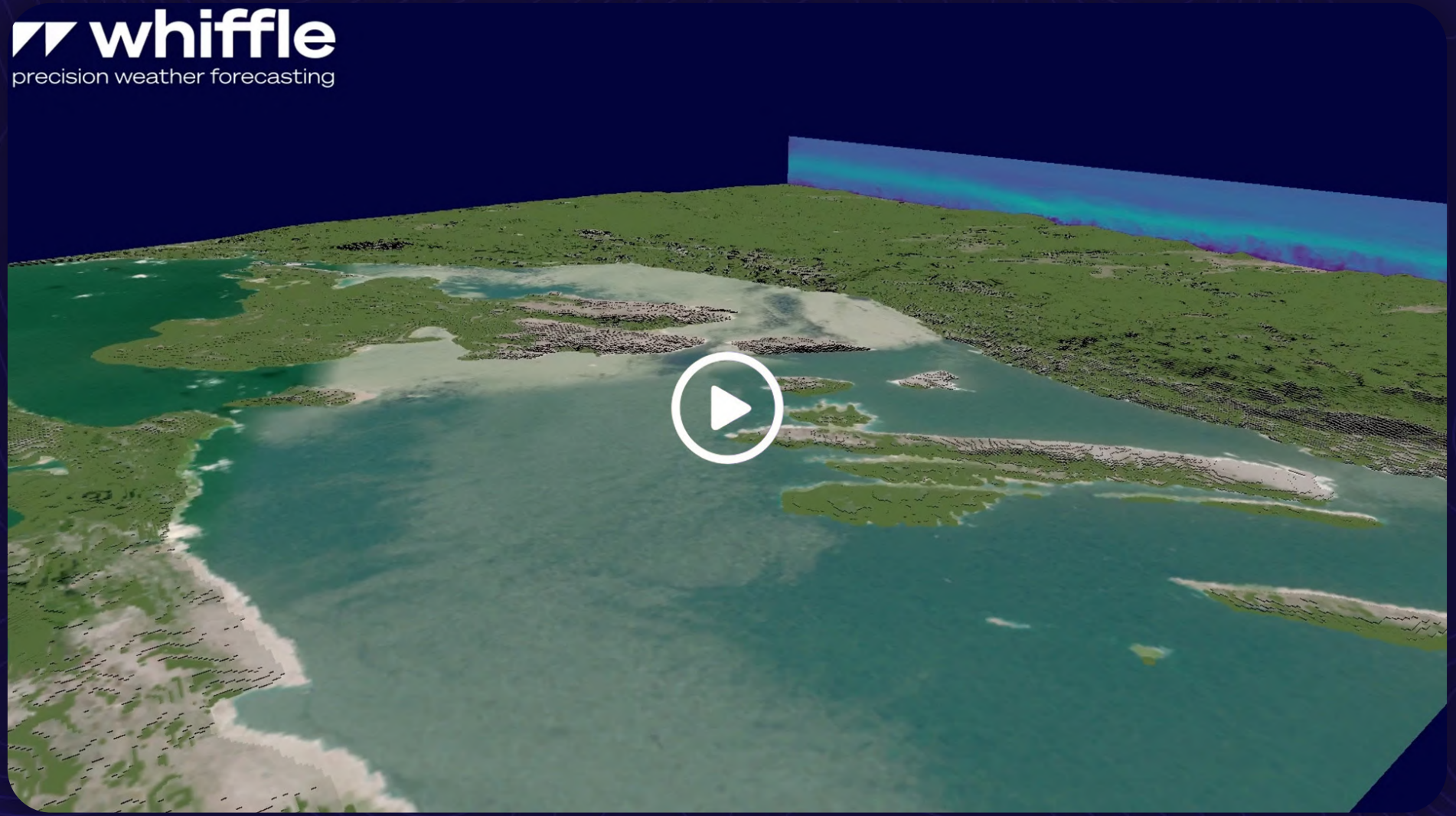
Harm Jonker

Remco Verzijlbergh

Further developing the LES code, GPU implementation and its applications

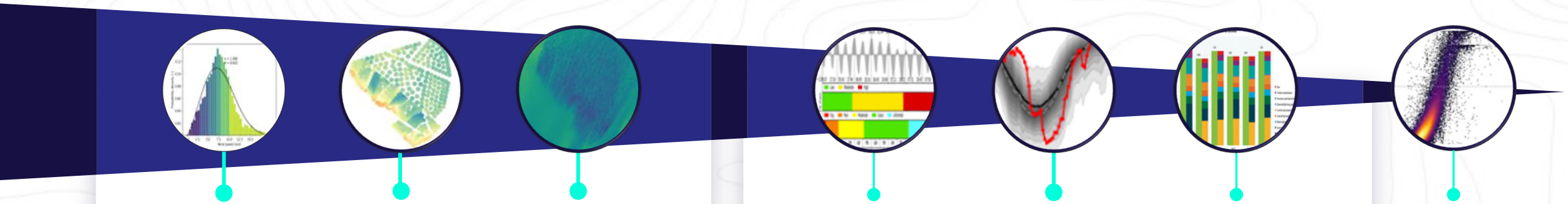
1980 - 2000 | **2000 - 2015** | **2015 - present**

Whiffle’s LES model



Link to video

There is a need to de-risk weather dependent renewable energy



Planning | **Tender bid** | **Design** | Construction | **Trade** | O&M | End-of-life decisions

Modelling

- Yield estimations rely on accurate assessments of wind resources and aerodynamic losses
- Complex terrains and large offshore sites amplify uncertainties
- Enhanced weather, turbulence, and wake models are crucial

Forecasting

- Accurate forecasting is crucial to match electricity supply and demand, avoiding imbalances
- Power producers face costs when their output contributes to imbalance
- Advanced weather models and forecasting methods are vital to reduce imbalance costs

Our solutions: Modelling and forecasting of renewable energy production

Flow and yield modelling

- More accurate wind resource estimates
- Reduce yield uncertainty
- Project developers and originators

Weather and power forecasting

- Improved forecast accuracy
- Reduce imbalance volumes
- Power traders and asset owners

Our solution: whiffle | wind

Time Series

LES-based 10-minute average data for a full year

- Extensive list of output variables for specified turbine and met mast locations and heights.
- Post processing tools available: long-term correction, plots and video, python notebook

Virtual
Met Mast

Annual Energy
Production (AEP)

Wake
Losses

Statistics

LES-based long-term representative statistics

- Wind Resource Grid (WRG): no interpolation and up to 6 heights per request
- One-to-one compatibility with standard tools like WindPRO and OpenWind.

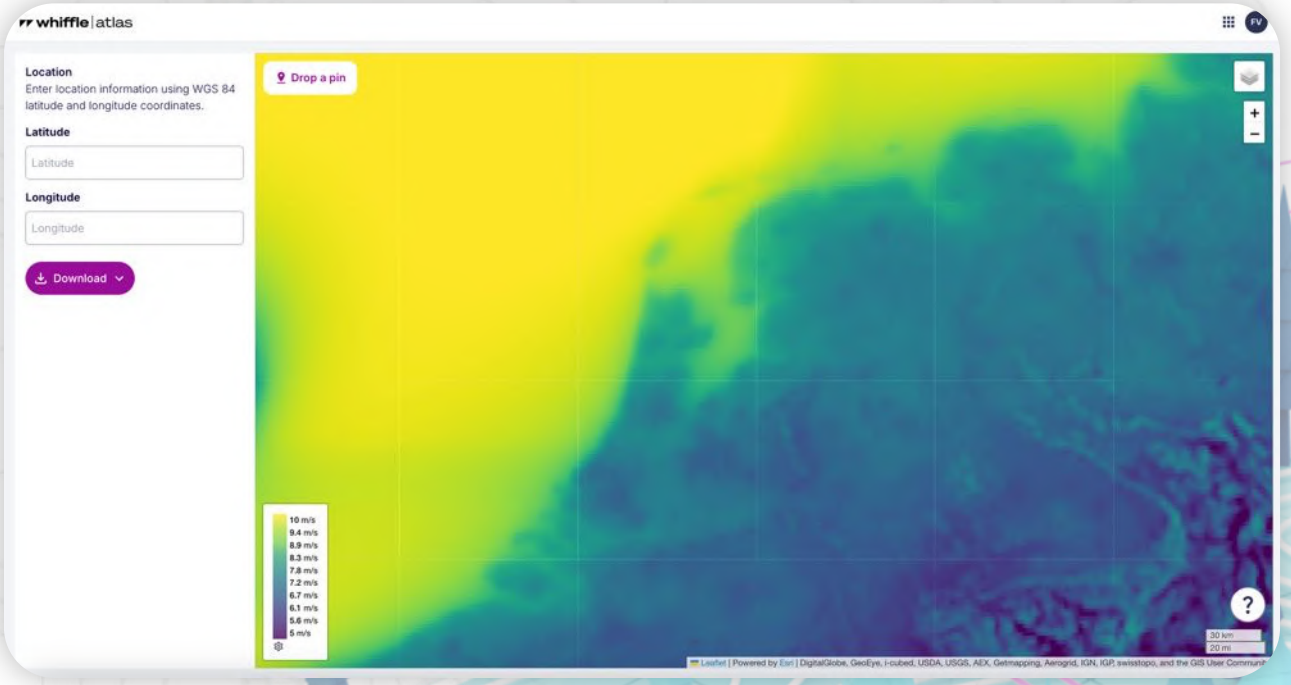
Wind Resource
Grid (WRG)

Annual Energy
Production (AEP)

Our solution: whiffle | atlas

Whiffle Atlas is a user-friendly web application that offers easy access to Whiffle's high-resolution, meso-scale weather model

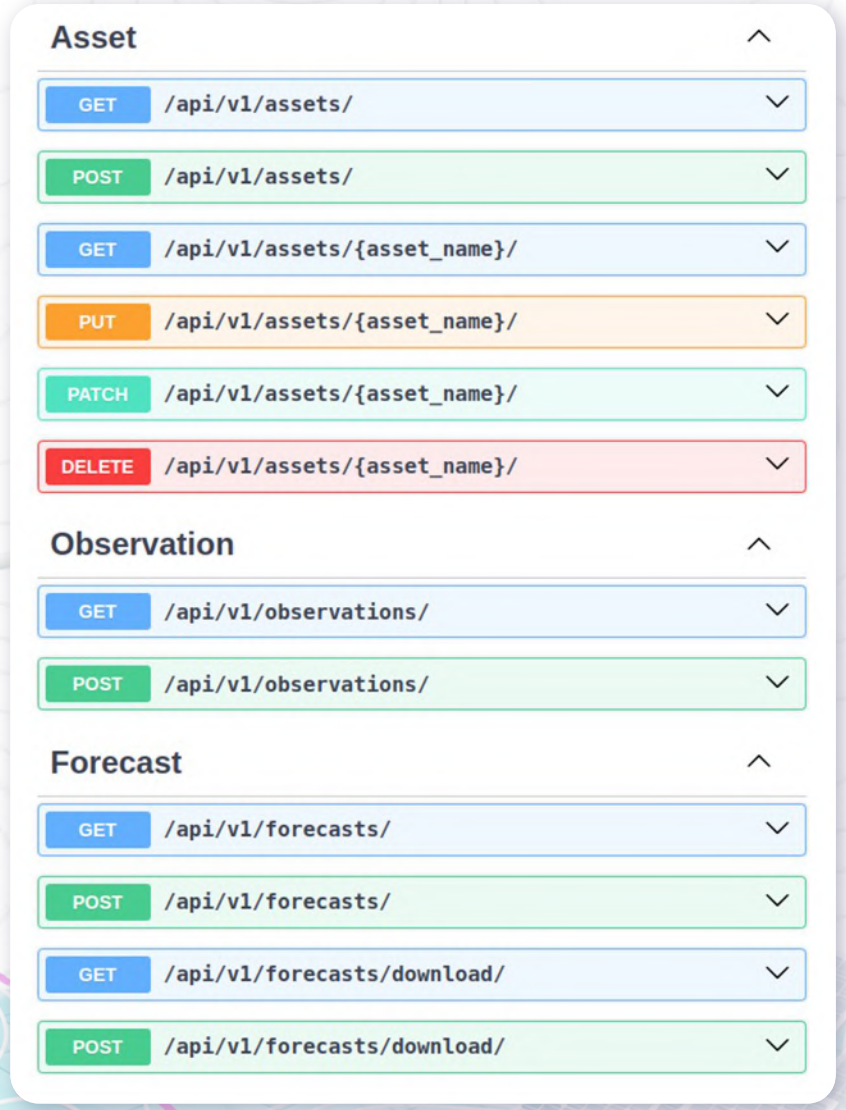
- 2 x 2 km resolution
- 20-year time series data
- Hourly time interval
- Extensive list of meteorological variables
- For specified met mast locations in .csv format
- Europe and United States (extra on demand)
- Instantaneous retrieval of data



Our solution: whiffle | forecast

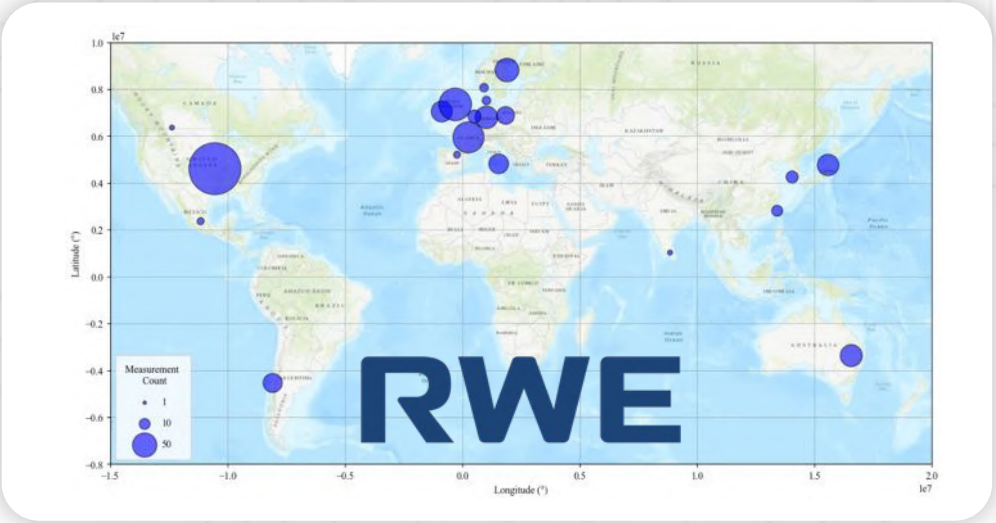
Whiffle Forecast offers access to ultra-high-resolution, LES-powered weather- and power forecasting products tailored to your needs.

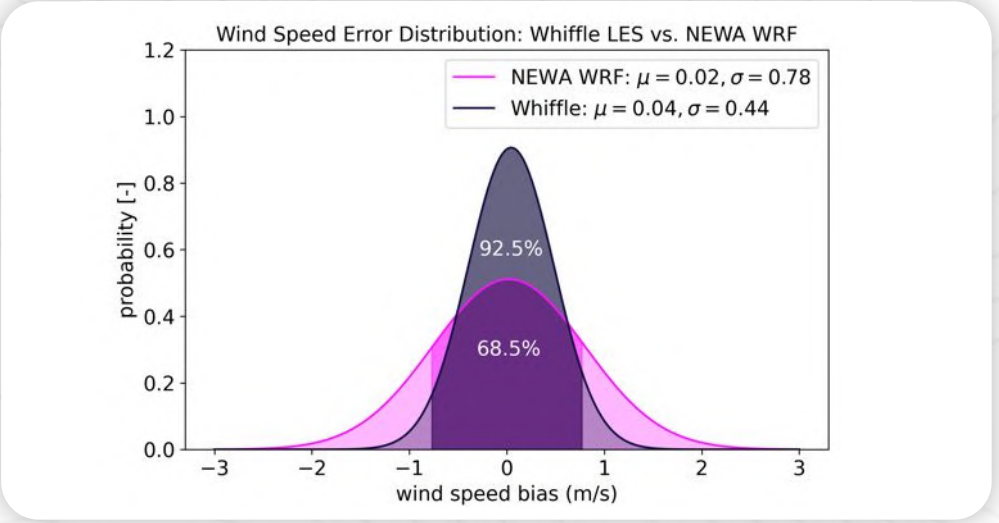
- **Meteo forecast**
  Weather forecast tailored to specific locations
- **LES forecast**
  Direct LES model output for use in ensembles
- **Wind power forecast**
  Production forecast for wind portfolios
- **Solar power forecast**
  Production forecast for solar portfolios



Whiffle model validation with RWE

- Validation of 170 sites (>300 measurement locations)
- Offshore and onshore measurements included
- The Whiffle Meso & LES model show very good performance, with standard deviations of 0.4 m/s (LES) and 0.5 m/s (Meso).
- Compared to other state-of-the-art data sets like NEWA-WRF, this a reduction of the uncertainty by a significant amount – by nearly a factor of two.
- Results were obtained in collaboration with RWE





whiffle

Some of our partners and clients

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