Using a Langevin model for the simulation of environmental conditions in an offshore wind farm

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Outline

- Introduction
- Methodology
- Data
- Results
- Conclusions
Introduction

- O&M (cost) optimization is focus of research
- Many simulation models/optimizations rely on artificially generated weather time series to test different strategies
- Novel approach to model significant wave height and wind speed
- Langevin process:
  - Equations fitted to the data
  - Used to generate artificial weather
Langevin process

Deterministic contribution

\[ F = D^{(1)} \]

Stochastic contribution

\[ G = \sqrt{D^{(2)}} \Gamma_t \]
**Data**

**ECMWF:**
- Re-analysis
- 6h resolution
- Dogger Bank wind farm
- 37 years

**Fino 1:**
- Measurement from met-mast and buoy
- 10min/30min means
- Alpha Ventus wind farm
- 6 years
Results II

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Langevin process for weather modeling
Results III

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Results IV

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Results V

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Results VI

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Langevin process for weather modeling
Conclusions

- Langevin process is a good alternative
- Properties of waves represented very well (Distribution, Persistence)
- Higher sampling frequency $\rightarrow$ better model
- 2D Langevin process for correlation (?)
Thank you for your attention

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