

## Context and background

- Modelling electricity **grids** with a large proportion of **renewables**
- Focusing on **power transmission** between different regions
- Using **PyPSA-Eur** - an open model of a European power grid [1]
- Using **ML** techniques for speed up to analyze large amount of scenarios



[1] Jonas Hörsch, Fabian Hofmann, David Schlachtberger, and Tom Brown. PyPSA-Eur: An open optimisation model of the European transmission system. arXiv:1806.01613, doi:10.1016/j.esr.2018.08.012.

## Using expired weather forecasts to supply up to 10 000 years of data

Petr Dolezal, Prof Srinivasan Keshav, Prof Emily Shuckburgh

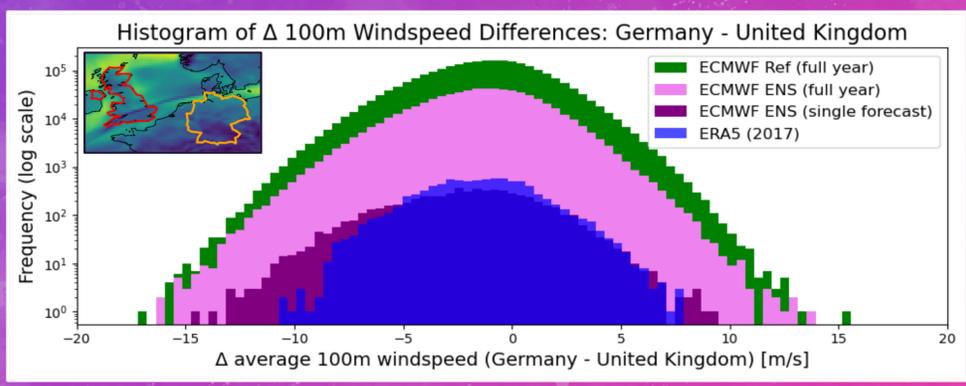
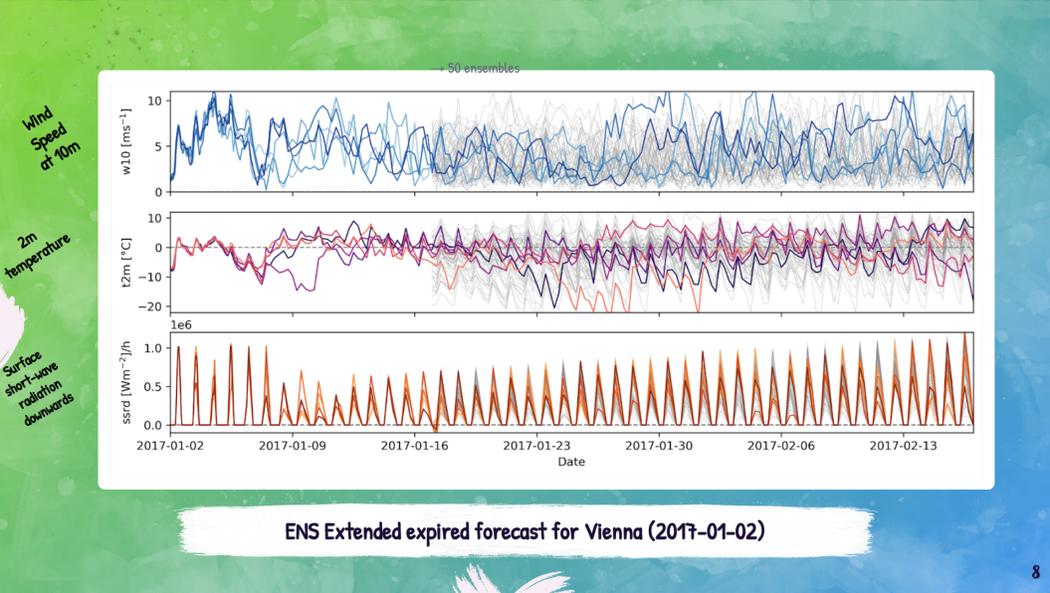
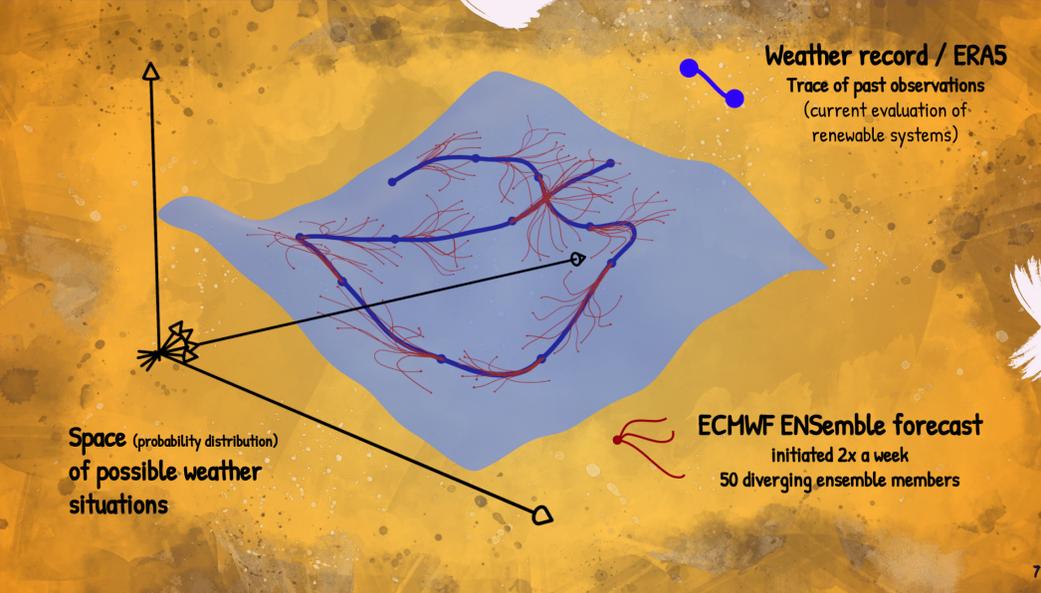
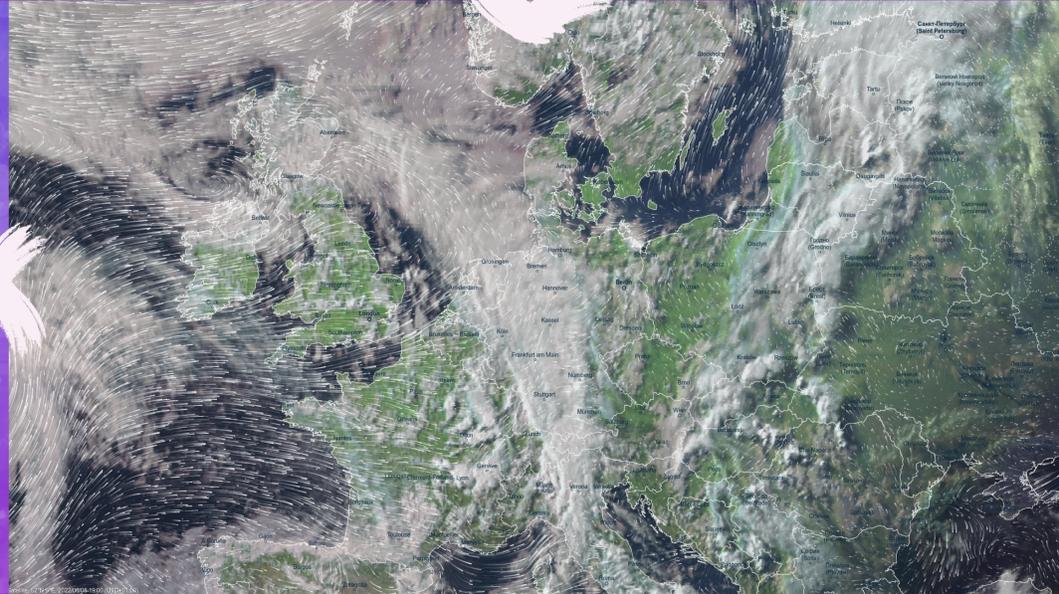
## What are expired weather forecasts?

### European Centre for Medium-Range Weather Forecasts



- HRES** - single High Resolution Forecast (10 days, #9km)
- ENS** - 51-member ensemble forecast (15 days, #18km)
- ENS Extended** - twice weekly extended to 46 days (#36km)
- ERA 5** - reanalysis: IFS physical model fitting measured data (#31 km)

Integrated Forecast System (IFS) before 2023



A far more comprehensive look on weather driving power transmission

## ENS Extended forecast

51 ensemble members ×  
2 runs per week ×  
4 weeks per run ×  
Run since 2010:  
× 12 years

## ENS Reforecast

20 initial conditions\* ×  
11 ensemble members ×  
2 runs per week ×  
4 weeks per run  
Run since 2016:  
× 6 years

**15,456 y**

\*same day of year in the past 20 years

## Collating the ENS dataset

- Past forecast runs are stored in the ECMWF MARS archive on an **offline tape** storage
- Access only through **member state** meteorological representatives (MetOffice) - or by paying for a €2000/year license
- The request for each run falls in a **queue**
- Rate of Download  $\approx$  4 months of ENS runs / week  $\approx$  130 Years eq (116 GB)
- the Archive data is under CC BY license



2023-05-14 23:51:42	Request submitted
2023-05-15 21:30:13	Processing request
2023-05-15 21:30:13	Request cost: 444,000 fields, 78,0496 bytes online, 609,218 bytes on 2 tapes
2023-05-15 21:30:13	Transferring 687.27 GB
2023-05-15 21:30:13	Transferring 4.21 GB into output grid
2023-05-15 21:41:51	Done

PD423 @ CAM . AC . UK

This work has been awarded an Oral Presentation Prize at the Royal Meteorological Society's Early Career & Student Conference 5th July 2023

www.cl.cam.ac.uk/~pd423/

