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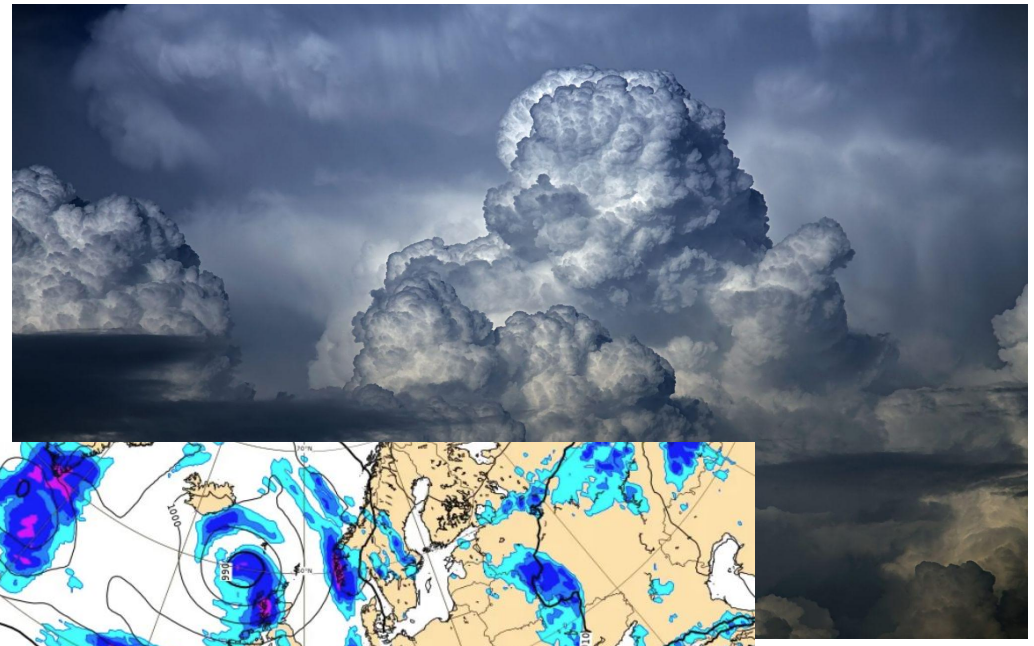
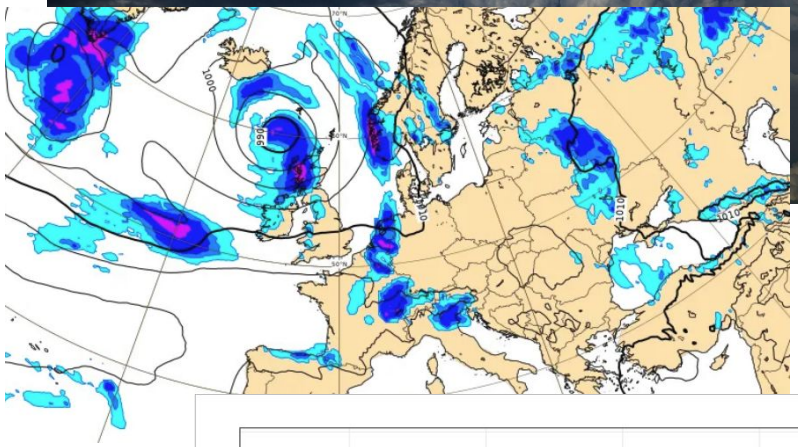
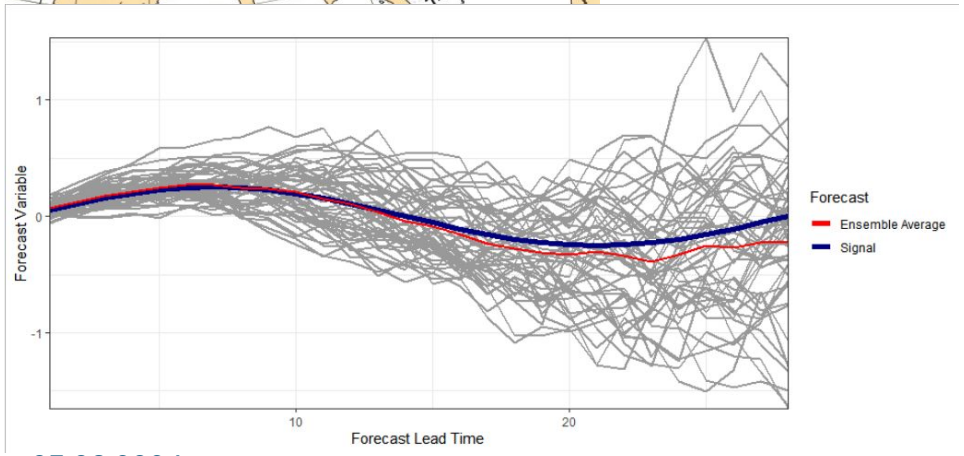




WEATHER FORECAST CASE STUDY



Luisa Reske and Rubén Vásquez

Motivation


Köln
26°
27° / 16°
Mo., 13:19
Gestern 26° 16°
Heute 0% 27° 16°
Dienstag 4 % 31° 18°
Mittwoch 24 % 25° 14°
Donnerstag 4 % 25° 17°
Freitag 16 % 25° 16°
Samstag 9 % 26° 16°
Sonntag 14 % 30° 19°


Köln
21°
31° / 17°
Di., 08:52
Gestern 27° 17°
Heute 1 % 31° 17°
Mittwoch 90 % 25° 15°
Donnerstag 18 % 25° 18°
Freitag 22 % 25° 15°
Samstag 6 % 27° 16°
Sonntag 5 % 29° 19°
Montag 24 % 34° 19°

Objectives

- Research question:
  - How does the weather forecast changed and evolved for the 18 of May in the city of Köln?
- Data processing objectives:
  - Data preprocessing, data management and data FAIRness
  - Analysis/processing and visualization of the data
  - Documentation, repository

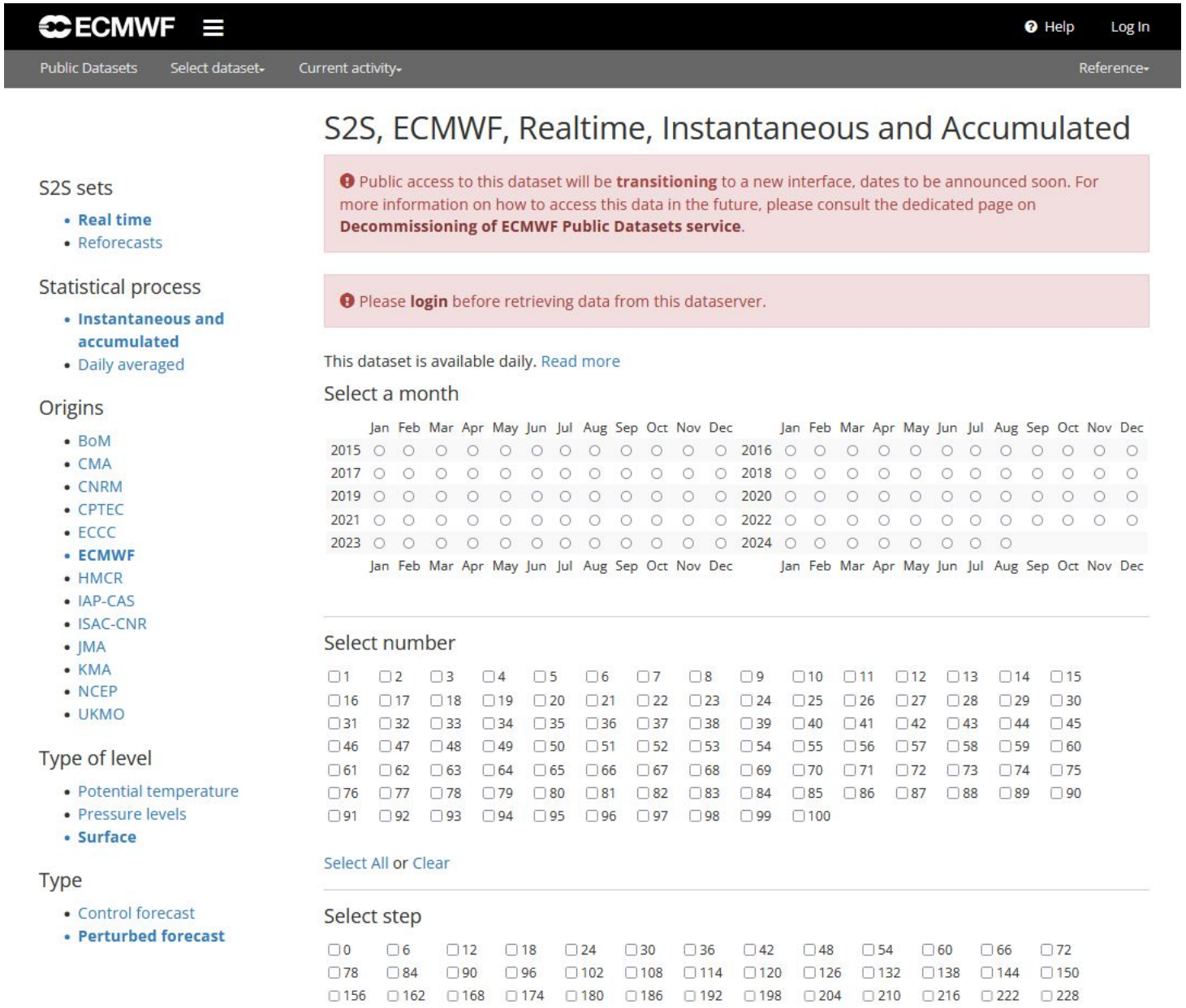
Structure

Workflow:

1. Sources investigation
2. Creation of repository, Github implementation
3. Download of information
4. Data preprocessing
5. Analysis and visualization.
6. Scripts optimization
7. Function testing
8. Documentation and wrapping

Data

- ECMWF Integrated Forecast System (IFS)
- global atmospheric model: describes dynamical evolution of atmosphere worldwide
- no model can produce precisely correct forecasts ⇒ Ensemble forecast
- access with ecmwf-api-client



Select parameter

- [ ] 10 metre U wind component
- [ ] Convective precipitation
- [ ] Mean sea level pressure
- [ ] Snowfall water equivalent
- [ ] Surface long-wave (thermal) radiation downwards
- [ ] Surface net short-wave (solar) radiation
- [ ] Surface runoff
- [ ] Surface short-wave (solar) radiation downwards
- [ ] Time-integrated northward turbulent surface stress
- [x] Total Precipitation

- [ ] 10 n
- [ ] Max
- [ ] Mini
- [ ] Surf
- [ ] Surf
- [ ] Surf
- [ ] Surf
- [ ] Time
- [ ] Top
- [ ] Wat

Select All or Clear

View data retrieval request | Retrieve GRIB

< Return to selection

request

Estimated number of fields: 87

Python script | MARS request

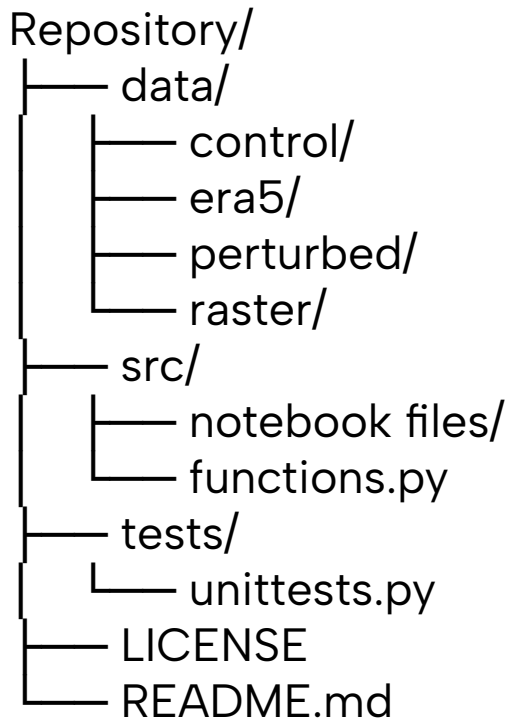
For more information on how to retrieve data programmatically, in Python, please go to Access ECMWF Public Datasets.

```
#!/usr/bin/env python
from ecmwfapi import ECMWFDataServer

server = ECMWFDataServer()

server.retrieve({
    "class": "s2",
    "dataset": "s2s",
    "date": "2024-02-01/to/2024-02-29",
    "expver": "prod",
    "levtype": "sfc",
    "model": "glob",
    "number": "1",
    "origin": "ecmf",
    "param": "228228",
    "step": "0/6/12",
    "stream": "enfo",
    "time": "00:00:00",
    "type": "pf",
    "target": "output"
})
```

Repository Structure

⇒ Link to Git

https://github.com/RubenVasquezArr/Weather_forecast_case_study/tree/main



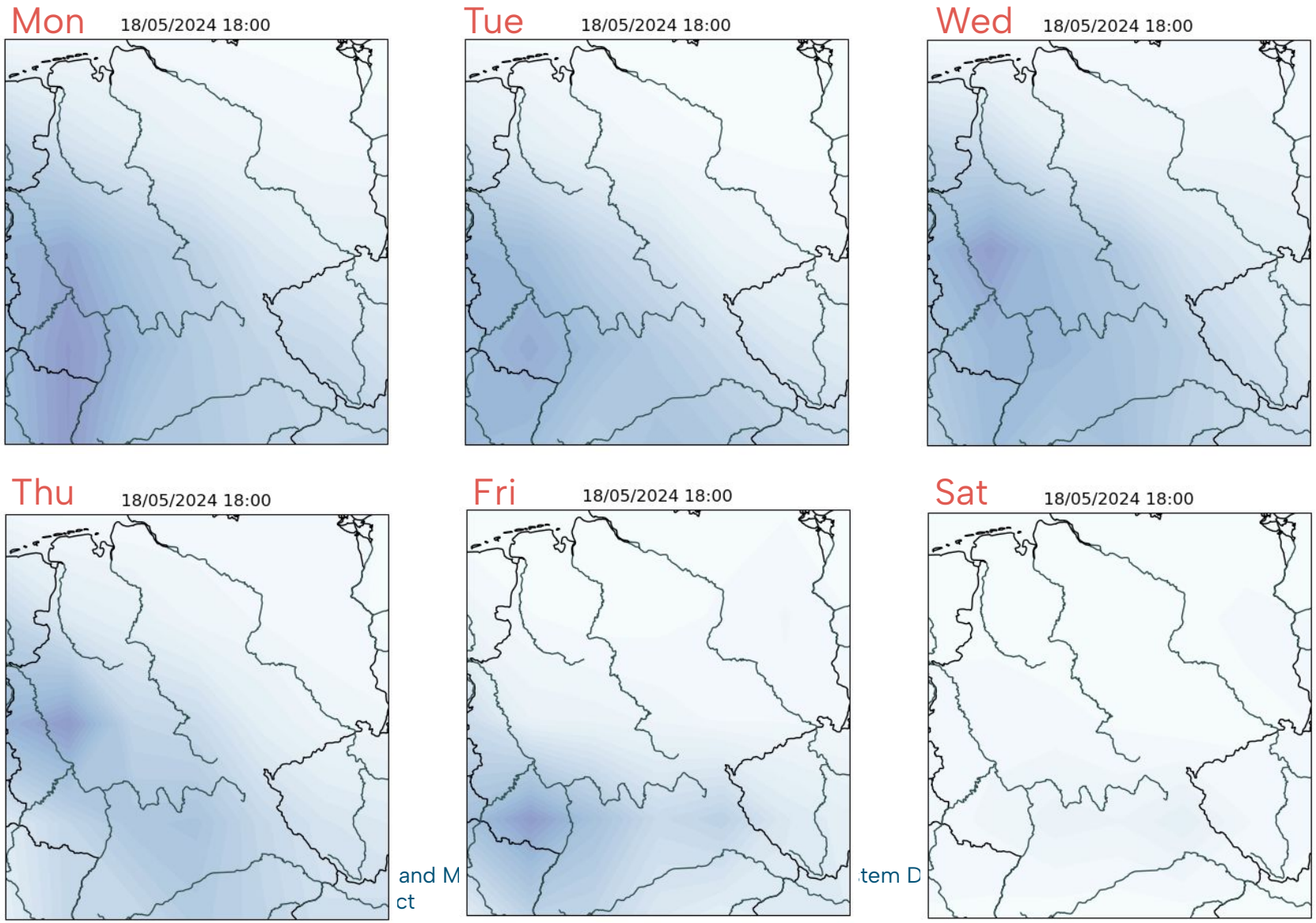
DATA ANALYSIS AND VISUALIZATION

UNIVERSITY OF COLOGNE

Institute of Geophysics and Meteorology / Fundamentals of Earth System Data Processing / Final Project

05.08.2024

Regionwide Forecast: Mean Ensemble



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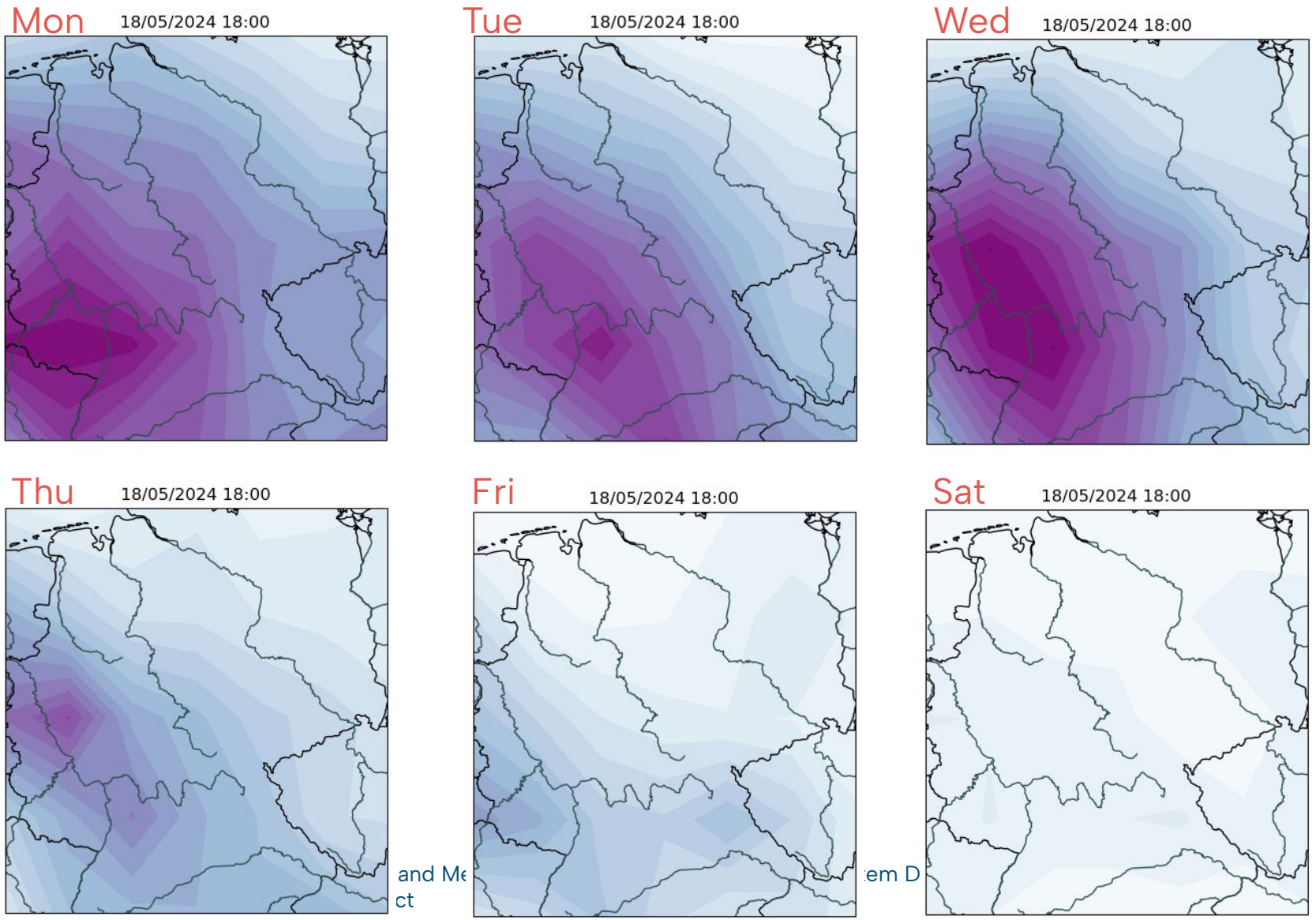
Regionwide Forecast: Standard Deviation Ensemble



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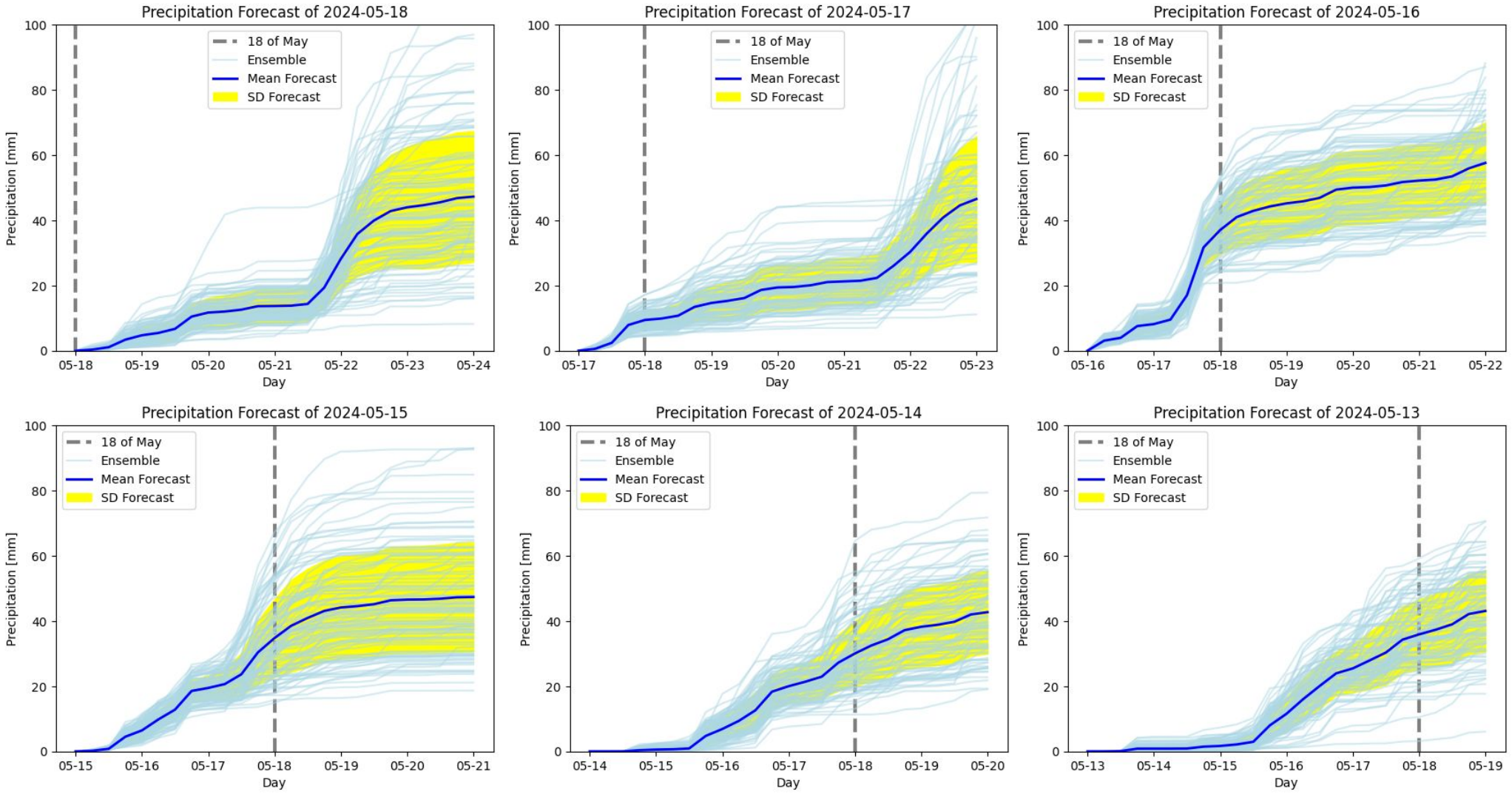
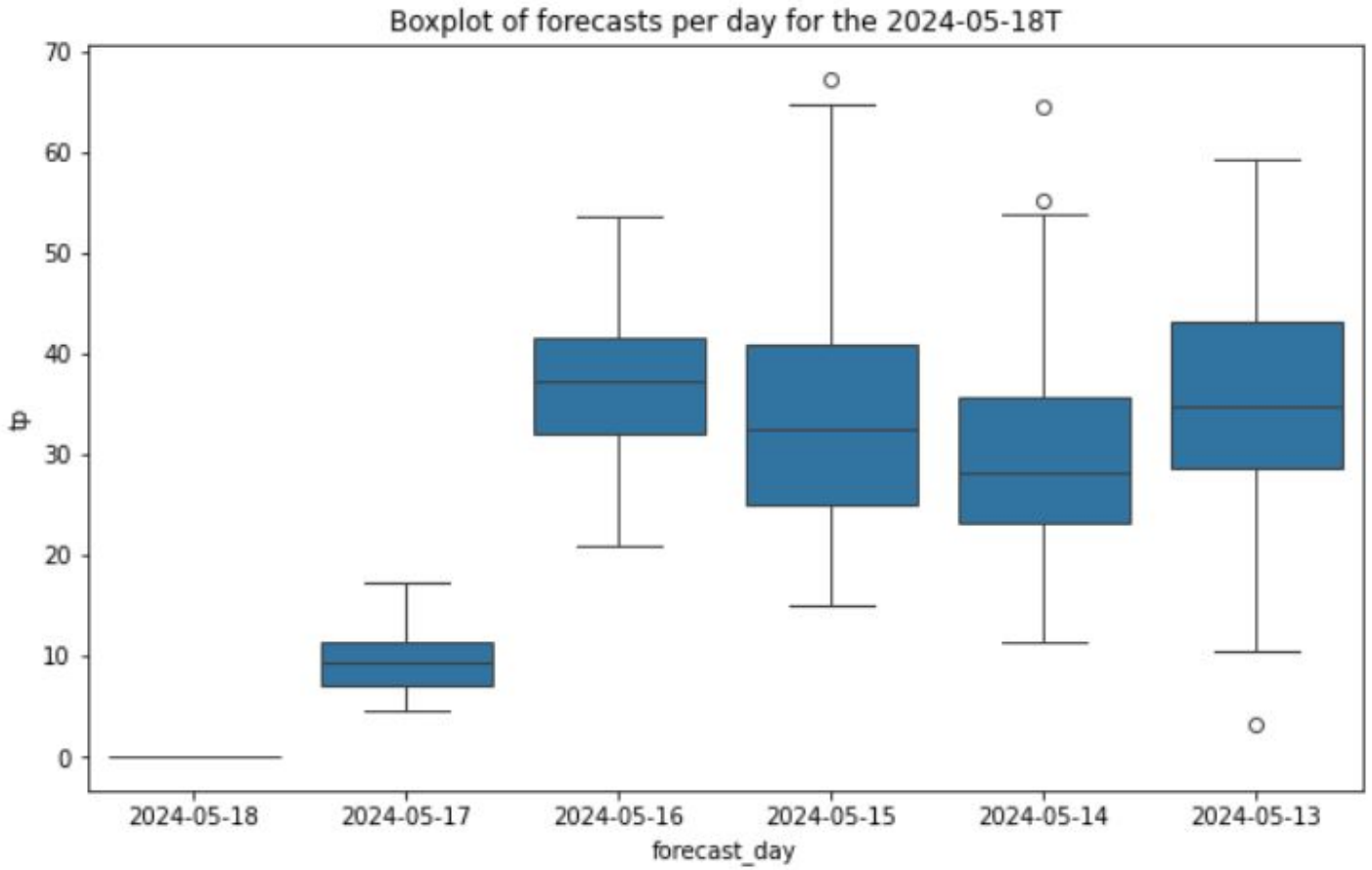
Forecast City of Cologne



Forecast City of Cologne



Comparison to Reanalysis Data

Interactive map

Conclusion

Incorrect forecasts due:

- initial conditions uncertainties
- model uncertainties
- boundary condition uncertainties
- atmosphere is a chaotic system

Further improvements:

- comparing to other forecast model (e.g. from DWD)

Conclusion to project and Issues

- Biggest challenges:
  - Information search
  - Data comprehension and processing
  - standardization of functions
- Biggest learnings:
  - Github is a powerful tool to share and co-create projects.
  - Thinking for others and the future: documentation and FAIR principles.