Institute for TMDT

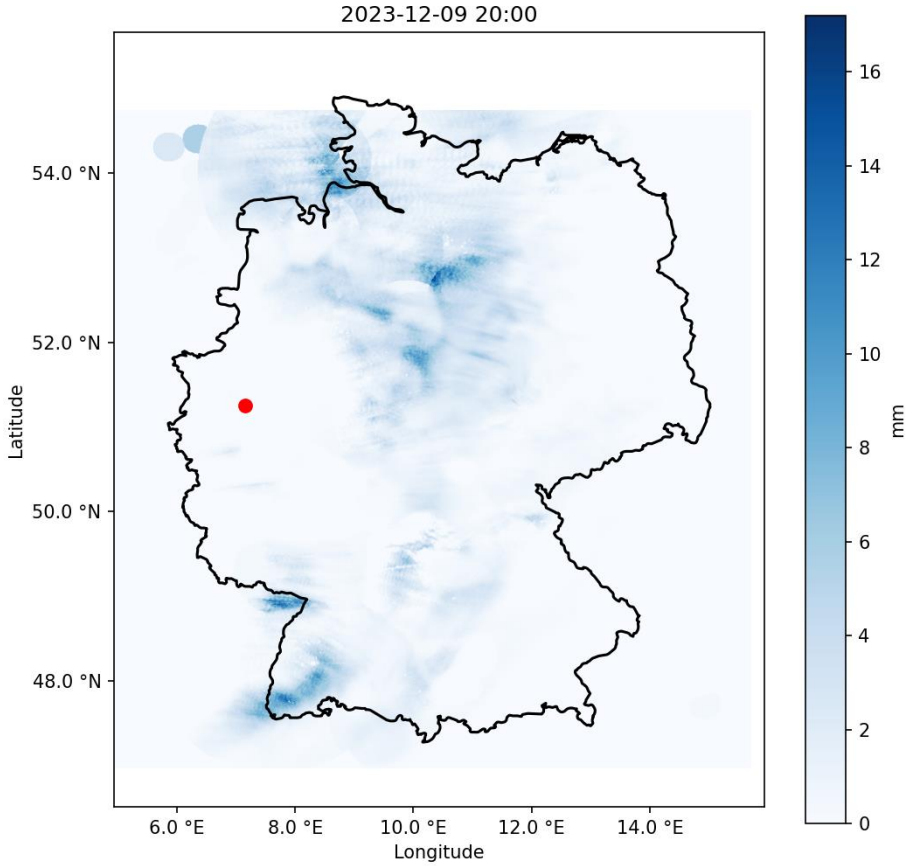
BERGISCHE UNIVERSITÄT WUPPERTAL

Data Analysis to Protect Against Climate-Driven Extremes

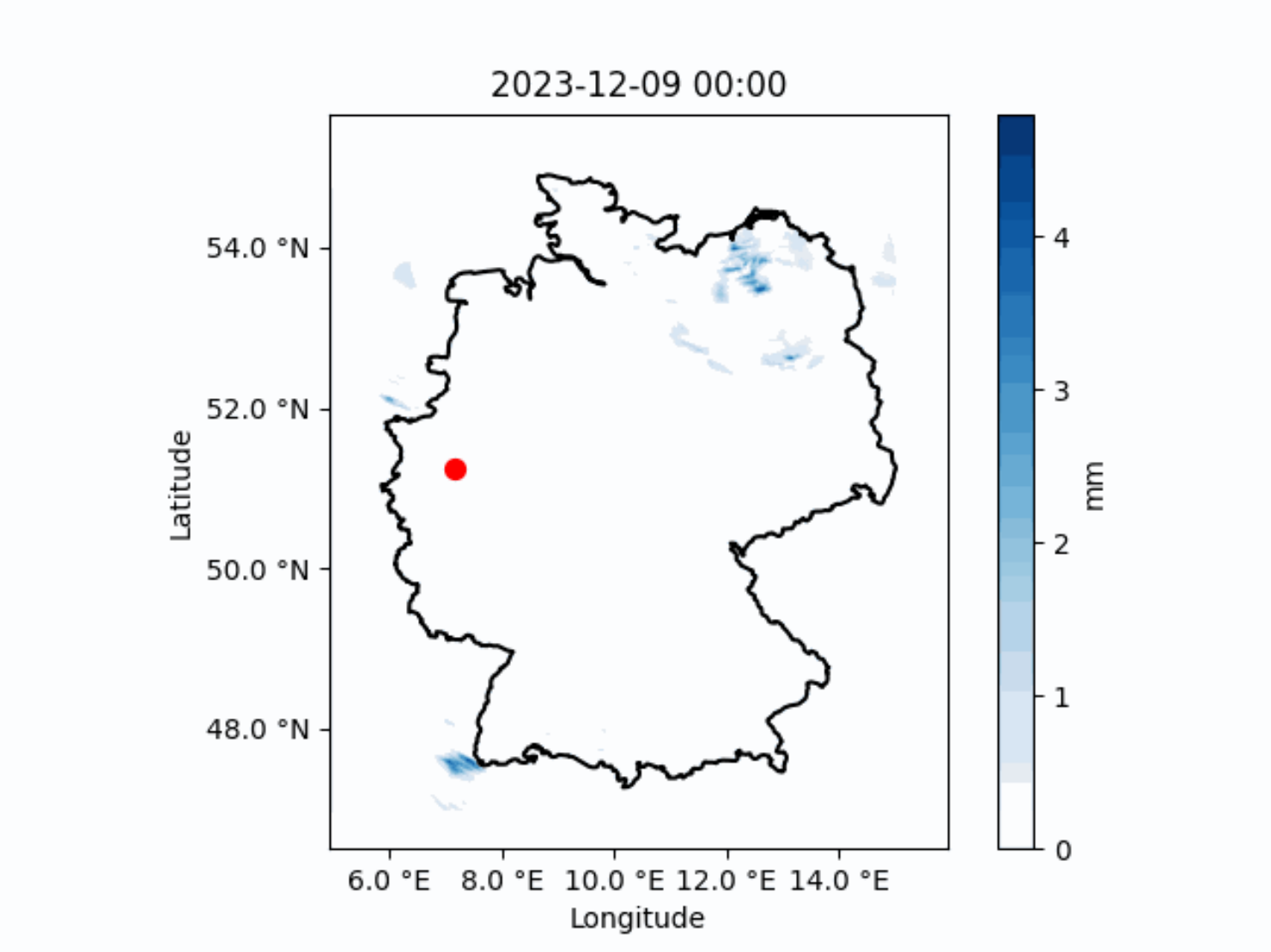
Wuppertal, 29.10.2024

The Dataset

- Preprocessed Precipitation Radar Data
- Different Coordinate Systems: Radolan, WSG84
- Huge Dataset: 9GB compressed, 344GB uncomp.
- Recording Interval: 10 minutes, hourly
- Time Range:



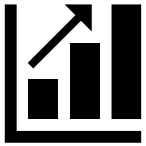
An exemplary Animation



The next Steps of the Data Analysis

Long-term Climate Trends and seasonal Trends

Weather Extremes



Predicting extreme Weather Events

Step 1: Basics

Long-term Climate Trends and Seasonal Trends

- **Changes in precipitation**: has the average amount of precipitation increased or decreased over the entire period? Are there clear trends in certain seasons or months?
- **Change in precipitation intensity**: Have heavy rainfall events become more frequent or more intense?
- **Shift in the rainy seasons**: Have the typical rainy seasons shifted? Have they become longer or shorter?
- **Changes in precipitation patterns**: Have spatial patterns in precipitation changed? Are there regions that receive more or less precipitation?

Step 2: Extremes

Weather Extremes

- **Frequency and intensity of extreme events**: How often did extreme precipitation events (e.g. heavy rain, droughts) occur? Did they become more intense?
- **Regional differences**: Do extreme events occur more frequently in certain regions?

Flood in Altenahr-Kreuzberg, July 2021
Photo: Martin Seifert

The river “Dreisam” has completely dried up 3 kilometres west of Freiburg, August 2022
Photo: Till Meinrenken

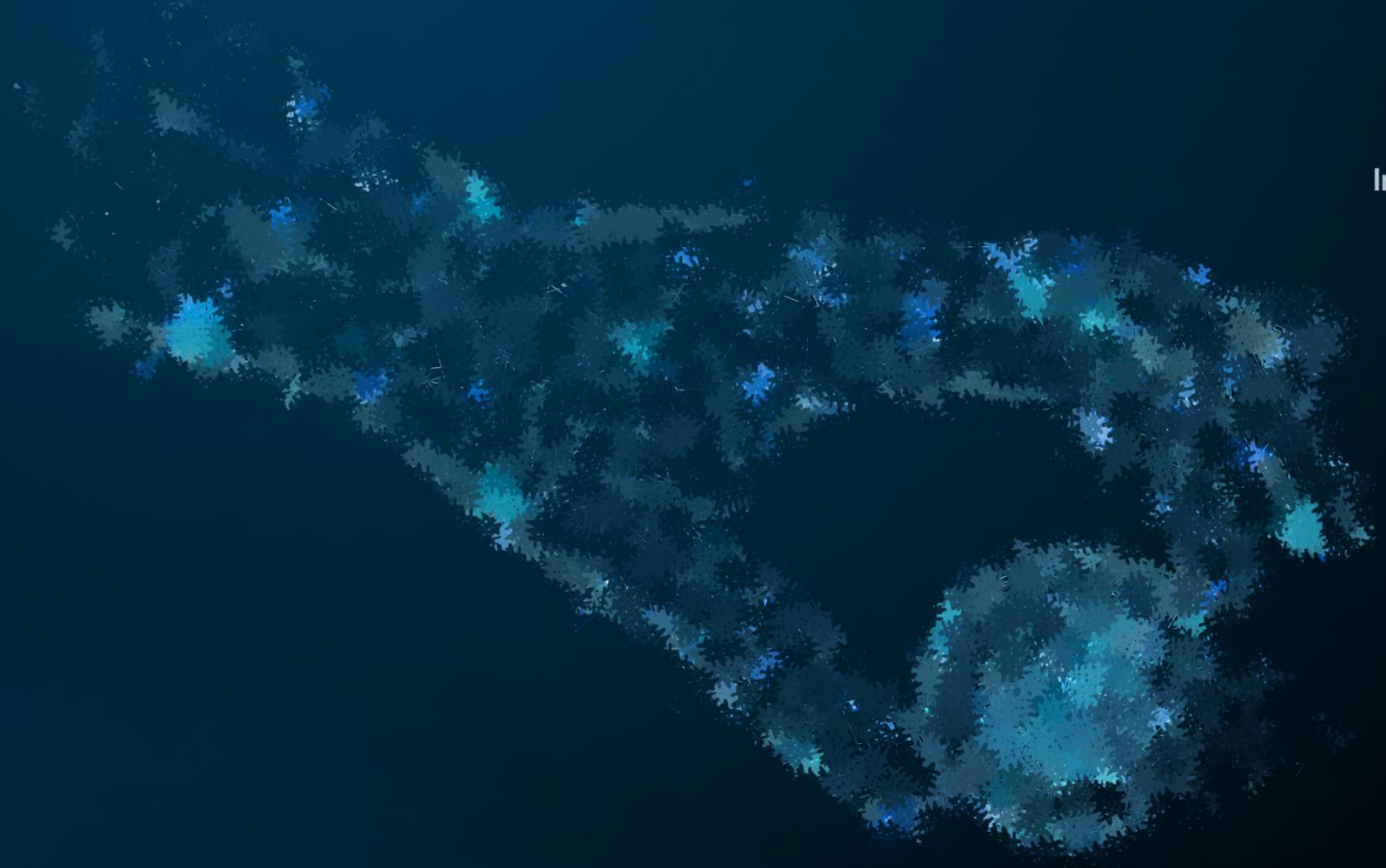
Step 3: Predictions

Predicting extreme Weather Events

- **Precipitation Patterns**: Are there any patterns before an extreme weather event that could be used to predict it?
- **Early warning systems**: Can an early warning system be built from precipitation data? Could the flood disaster of 2021 have been recognized earlier?

Expected Challenges

- **Dataset size**: parallel processing in chunks
- **Inhomogeneous data**: different time intervals and incomplete radar coverage



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Thank you for your attention

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