Real-time acquisition and processing of data from a country-wide network of commercial microwave links in Germany: Current status and challenges

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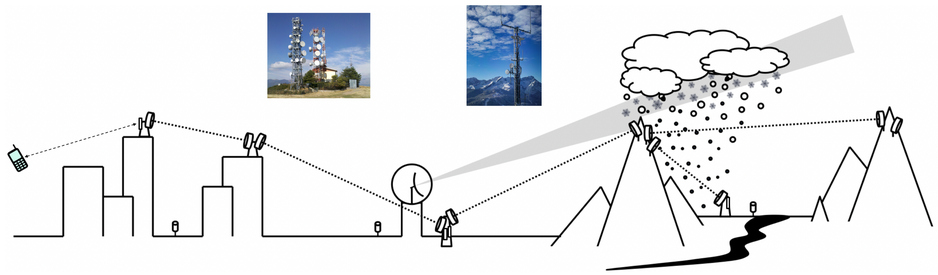
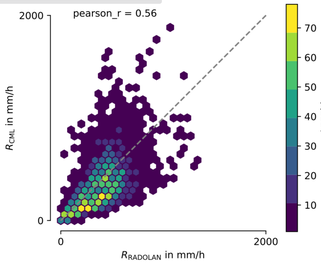
Motivation

- Rainfall observations by rain gauges and weather radars are prone to errors
- Attenuation data from commercial microwave link (CMLs) networks provides additional rainfall information
- CMLs are used to provide a large part of the backhaul of cellular networks and hence are available almost everywhere where cellular networks exist



Long-term offline performance

- We compare hourly rainfall of 4000 CMLs vs RADOLAN for one year
- Performance is good for the majority of CMLs
- Solid- or mixed-precip periods are problematic

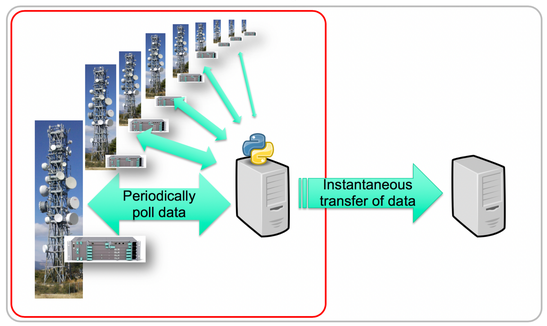


Real-time online CML-derived rainfall

Data acquisition → Real-time data processing → Visualization and delivery

Data acquisition

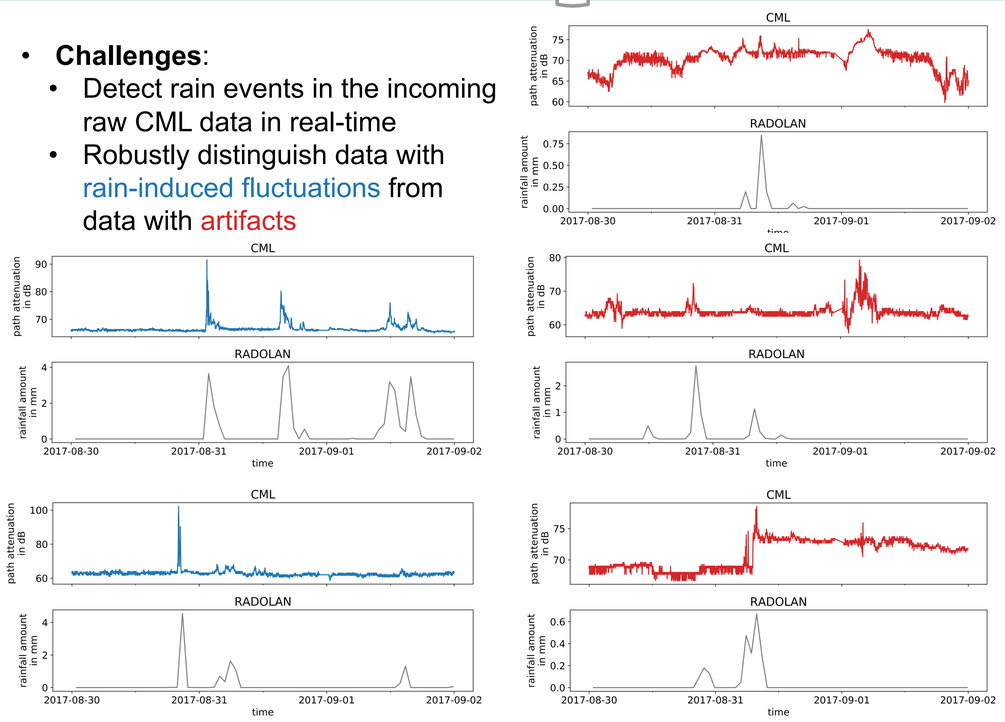
- **Challenges**:
  - Get access to data
  - Continuously acquire and forward data
  - Robustly handle failures
- **Status**
  - We operate a open-source real-time CML DAQ system (*pySNMPdaq*)
  - We continuously get data for 4000 CMLs in real-time in Germany



- **Outlook**
  - Extend DAQ to more CMLs
  - Make system more robust

Real-time data processing

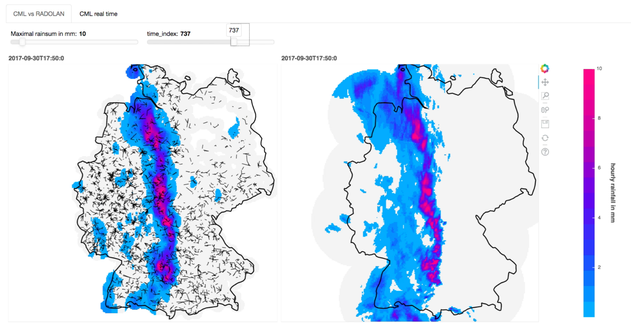
- **Challenges**:
  - Detect rain events in the incoming raw CML data in real-time
  - Robustly distinguish data with rain-induced fluctuations from data with artifacts



- **Status**
  - adaptive rolling statistics work okay, except for some artifacts
- **Outlook**:
  - We are testing machine learning and neuronal network approaches

Visualization and delivery

- **Challenges**:
  - Build and run a dynamic web-visualization
  - Include live radar data
  - Legal aspects of showing results on zoomable maps on the web
- **Status**
  - We have a working CML-vs-radar rainfall map web-viz
  - The web-viz is built using bokeh-server



- **Outlook**
  - 5-minute real-time rainfall CML-rainfall
  - Real-time merging with DWD radar data

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