Countrywide QPE from commercial microwave link networks performs great, so why is it not yet available?!
Poster with details on Tuesday
Commercial microwave link (CML) networks provide cheap additional rainfall estimation.
The relation between observed attenuation and rain rate is very robust

30 GHz

\[ A = 0.193R^{1.020} \]

one minute disdrometer data
The relation between observed attenuation $A$ and rainrate $R$ is very robust.

For 30 GHz, the relation is given by $A = 0.193R^{1.020}$.

For Radar Z-R relation, the relation is given by $Z = 200R^{1.6}$.

One minute disdrometer data is shown in the scatter plots.
CML density is mostly dependent on cell phone network coverage and roughly follows population density.

Source: GSMA
CML-rainfall can be on a par with gauge adjusted radar
CML-rainfall outperforms satellite rainfall products

Rios Gaona et al., 2017, TGRS
CML-rainfall performs great in hydrological modeling of small scale urban catchments

Event on 3\textsuperscript{rd} October 2016

Urban catchment Prague-Letnany

Source: Martin Fencl (Prague Technical University)
There are several processing challenges

- Rain event detection and filtering of erratic fluctuations
- Compensate wet antenna attenuation effect
- Derive spatial rainfall from line-integrates measurements
CML data

DAQ & Transfer

processing

application
We can use the 15-minute min/max signal levels recorded by the Network Management Systems (NMS).
We can also poll data with custom DAQ system and forward them in real-time

*Chwala et al., 2016, AMT*
CML data

DAQ & Transfer

processing

application
The first, but crucial step:
Convince a CML operator to make data available

Option 1: Money
Option 2: Show potential applications/business model
Option 3: Legislation/official guidelines

Revealing CML network structure
Data security
“Whom to ask for data access?”
We should avoid fragmentation of solutions and products

Operator 1

Operator 2

Operator 3

Operator 4

Operator 5

Science happens here

Operational processing

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One possible solution

Archived data

Real-time data

Operator 1
Operator 2
Operator 3
Operator 4
Operator 5

Science happens here

Operational processing

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??? $
Outlook
CML networks will continue to grow over the next years

Figure 5: Global and regional view on used microwave spectrum and trends

Source: Ericsson
The CML community will continue to provide open tools and standards

- Open source processing software
- Open source DAQ software
- Joint training workshops
- Joint projects
We are aiming at formulating a joint statement, e.g. as an ”opinion paper” and could use your support

Potential key messages:

1. CML attenuation data is precious. It can significantly improve rainfall observations in particular in developing countries with coarse station networks

2. The best QPE will be achieved when CML data is combined with data from other sensors

3. (Archived) CML data should be freely available for research

4. (Real-time) CML data for operational applications probably requires some kind of payment model

5. There should be a standardized way for requesting and distributing CML data
Summary

CML data

DAQ & Transfer

processing

application