VARIABILITY IN RAINFALL INFORMATION DERIVED FROM COLLOCATED MICROWAVE LINKS

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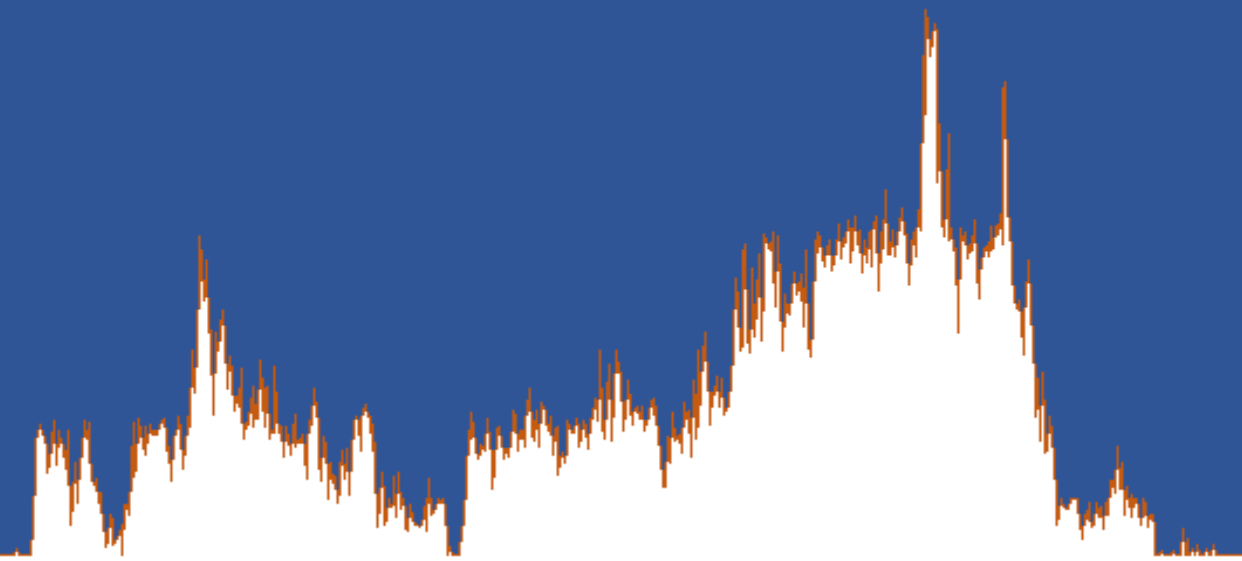
Main goal: Investigation of collocated commercial microwave links and their performance without dedicated reference measurement

Key findings: High correlation for rainfall periods, higher correlations for more intense rainfall, rainfall cumulation errors decreases for more intense rainfalls



Collocated commercial microwave links

the advantage of similar position and similar weather conditions

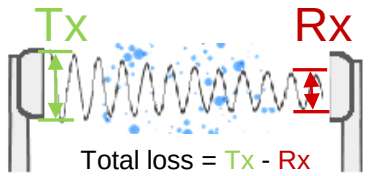
$$R = \alpha\, k^{\beta}$$

frequency, polarization, temperature, drop size distribution

known | known | unknown, but the same | unknown, but the same

$$k = max\left(\frac{A_{tot} - \mathrm{B} - A_w}{\mathrm{L}}, 0\right)$$

Similar for collocated CMLs

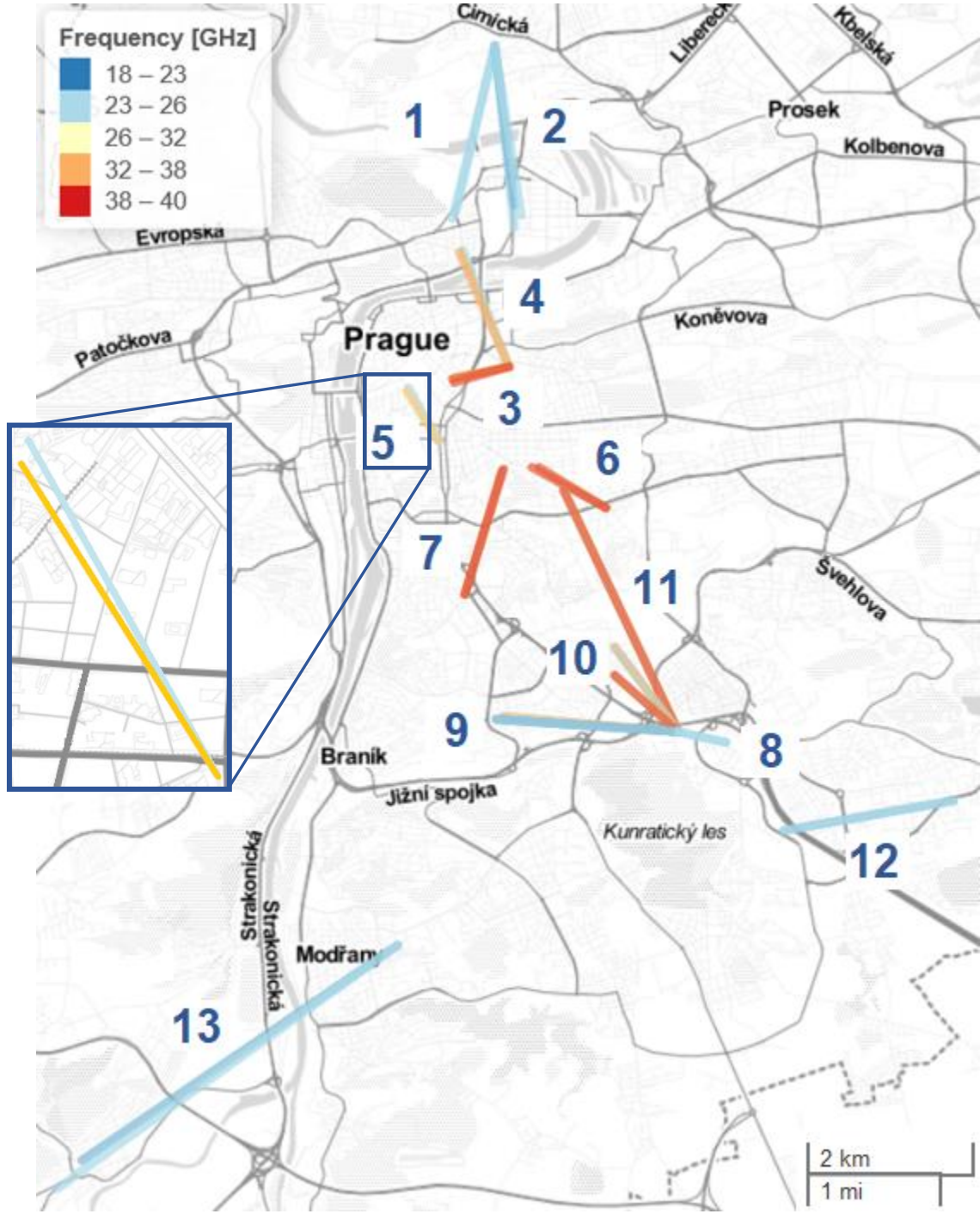


R	rainfall intensity [mm/h]
α, β	empirical parameters
A_{tot}	total attenuation [dB]
B	baseline attenuation [dB]
A_w	wet antenna attenuation [dB]
L	CML length [km]

Collocated commercial microwave links

Prague, Czech Republic

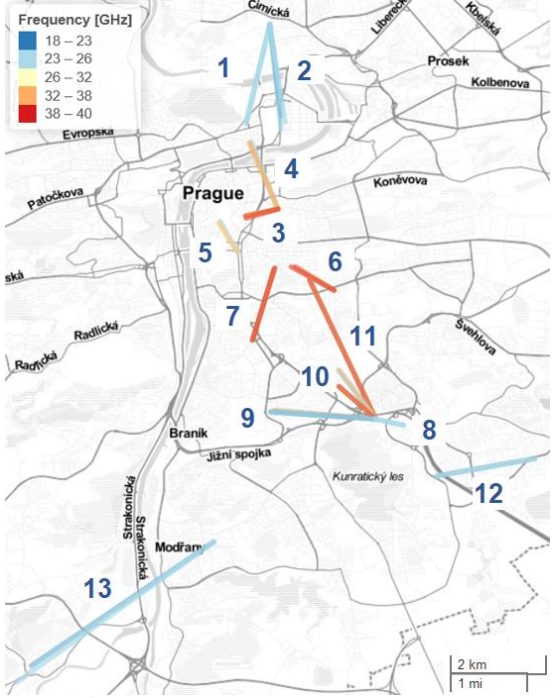
- 13 collocated groups
- CML lengths: 700 m to 5600 m
- CML frequencies: 22 GHz to 39 GHz
- 1 min timestep (aggregated from irregular sampling ~ 10 s)
- 0.3 dB quantization
- 2014 to 2016 data
  - 33 rainfall events
  - 18255 timesteps

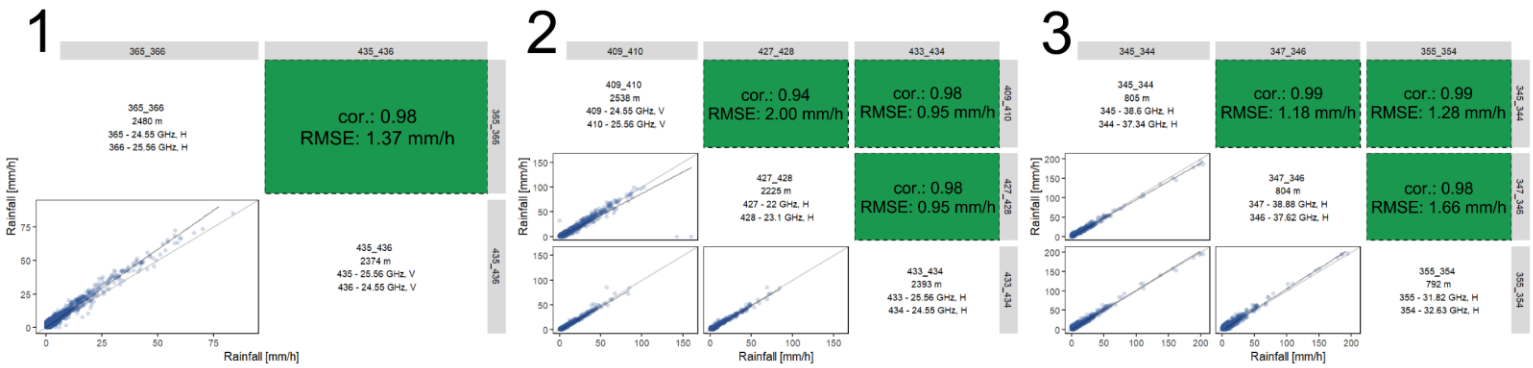


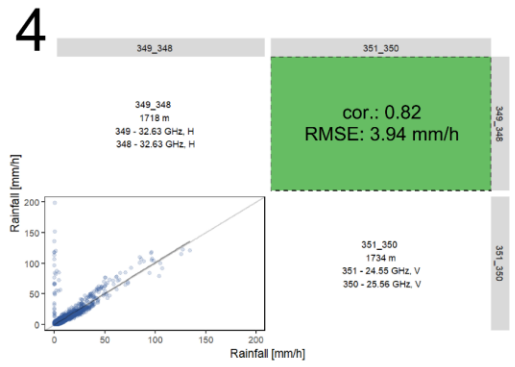
High correlations of collocated links

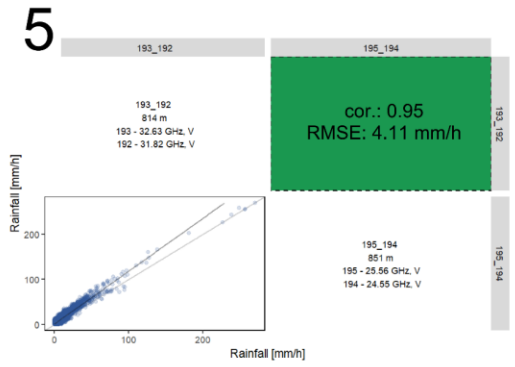
across all groups with various lengths and frequencies

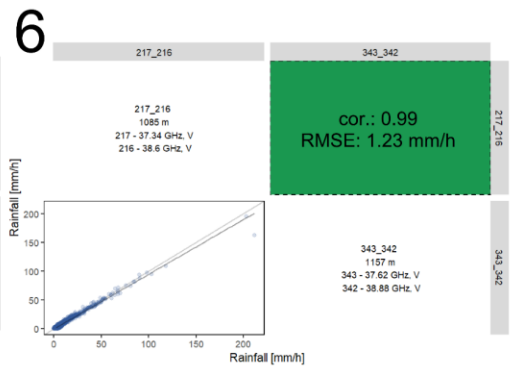
- standard CMLs pre-processing
  - 1.5 dB WAA
  - 1 % quantile - background attenuation
  - Sublinks averaging
  - ITU parameters

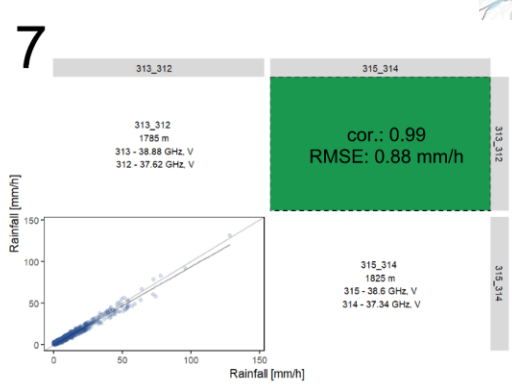


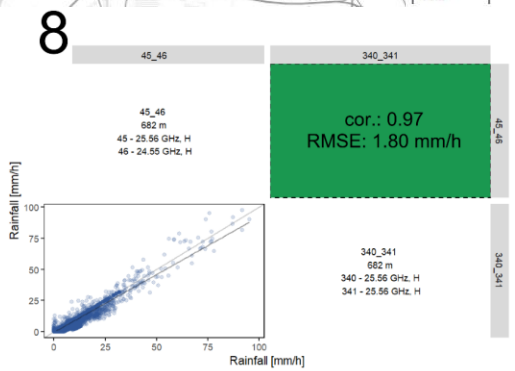


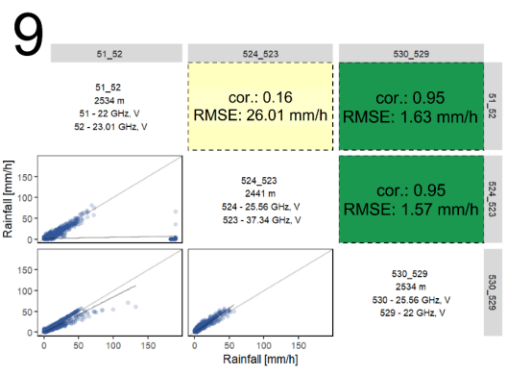


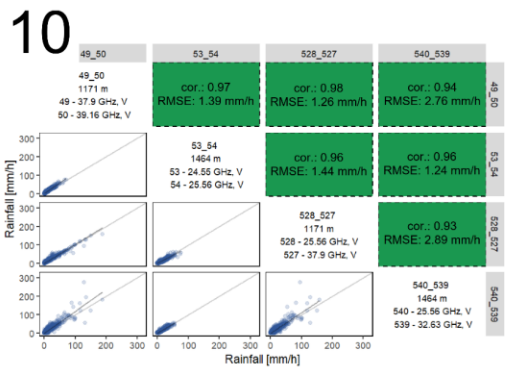


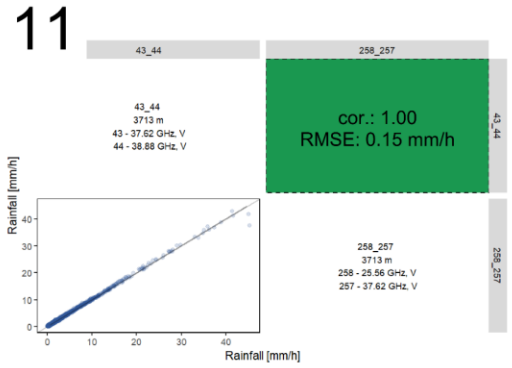


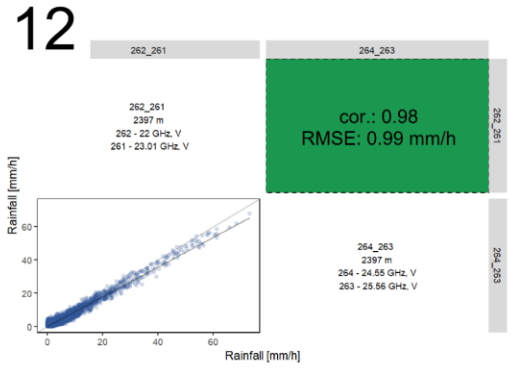


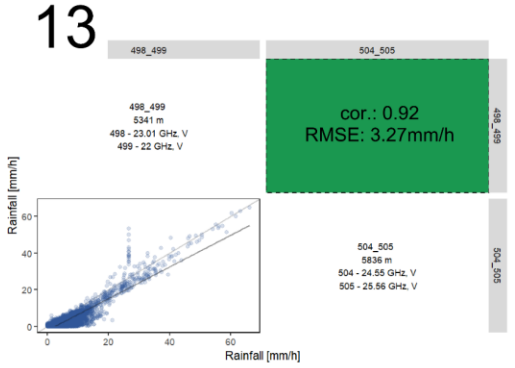




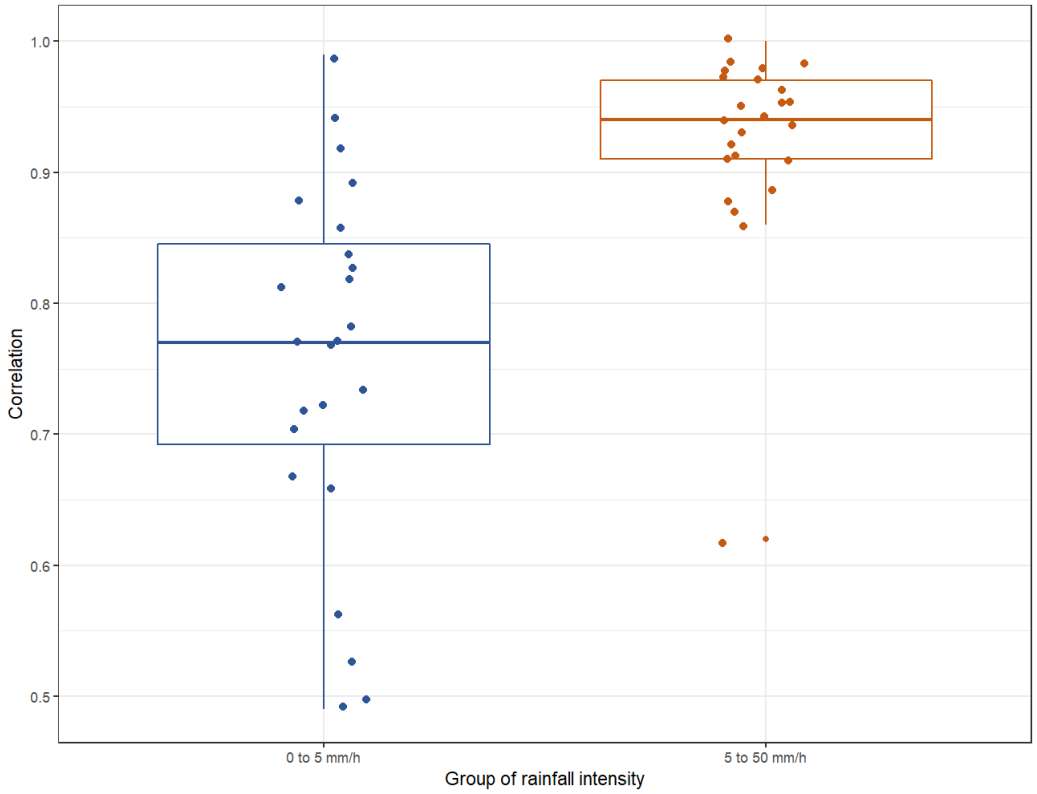




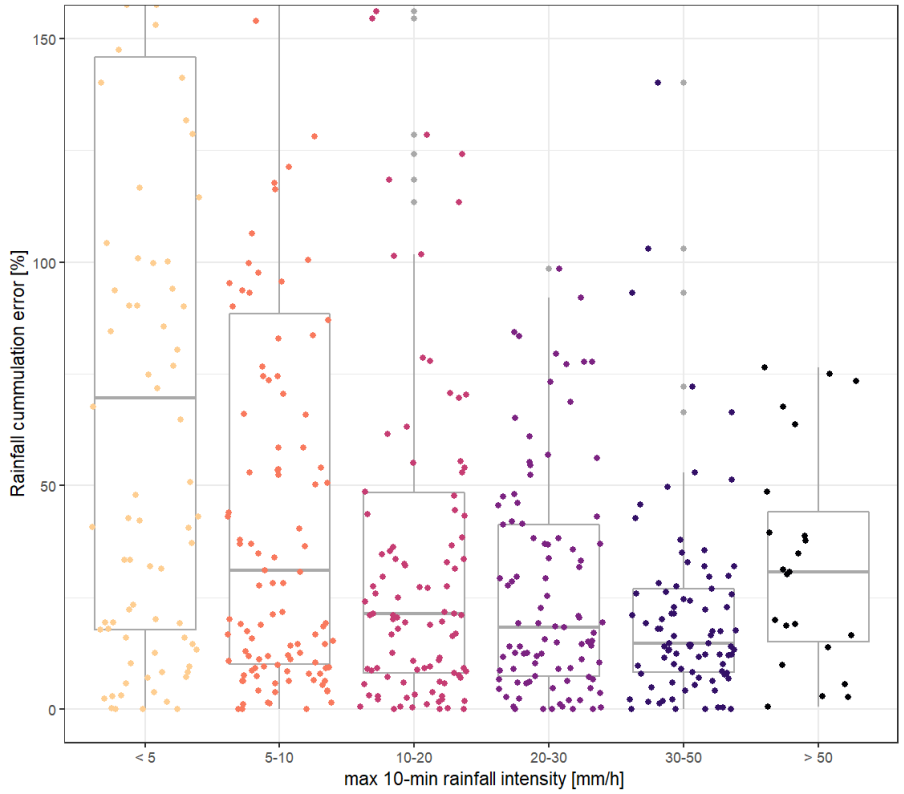




Correlation increases for higher rainfall intensities



Rainfall cumulation errors decreases for more intense rainfalls



Conclusions

- Low deviation during dry weather conditions
- High correlation (>0.95) for rainfall periods (similar as rain gauges)
- RMSE mostly around 1.7 mm/h
- Rainfall cumulation errors decreases for more intense rainfalls

Outlook

- Differences of collocated CMLs: Do they reflect the reference measurement?
- More distant CMLs: the effect of advection

References

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