Geophysical Research Abstracts
Vol. 18, EGU2016-12648, 2016
EGU General Assembly 2016
© Author(s) 2016. CC Attribution 3.0 License.

# Assessing the weather monitoring capabilities of cellular microwave link networks

Martin Fencl (1), Miroslav Vrzba (2), Jörg Rieckermann (2), and Vojtěch Bareš (1)

(1) Czech Technical University in Prague, Praha 6, Czech Republic (martin.fencl@fsv.cvut.cz), (2) Eawag: Swiss Federal Institute of Aquatic Science and Technology, Dübendorf, Switzerland

Using of microwave links for rainfall monitoring was suggested already by (Atlas and Ulbrich, 1977). However, this technique attracted broader attention of scientific community only in the recent decade, with the extensive growth of cellular microwave link (CML) networks, which form the backbone of today's cellular telecommunication infrastructure. Several studies have already shown that CMLs can be conveniently used as weather sensors and have potential to provide near-ground path-integrated observations of rainfall but also humidity or fog. However, although research is still focusing on algorithms to improve the weather sensing capabilities (Fencl et al., 2015), it is not clear how to convince cellular operators to provide the power levels of their network. One step in this direction is to show in which regions or municipalities the networks are sufficiently dense to provide/develop good services.

In this contribution we suggest a standardized approach to evaluate CML networks in terms of rainfall observation and to identify suitable regions for CML rainfall monitoring. We estimate precision of single CML based on its sensitivity to rainfall, i.e. as a function of frequency, polarization and path length. Capability of a network to capture rainfall spatial patterns is estimated from the CML coverage and path lengths considering that single CML provides path-integrated rain rates. We also search for suitable predictors for regions where no network topologies are available. We test our approach on several European networks and discuss the results. Our results show that CMLs are very dense in urban areas ($> 1$ CML/km$^2$), but less in rural areas ($< 0.02$ CML/km$^2$). We found a strong correlation between a population and CML network density (e.g. $R^2 = 0.97$ in Czech Republic), thus population could be a simple proxy to identify suitable regions for CML weather monitoring. To enable a simple and efficient assessment of the CML monitoring potential for any region worldwide, we are currently integrating our approach into open source online tool.

In summary, our results demonstrate that CML represent promising environmental observation network, suitable especially for urban rainfall monitoring. The developed approach integrated into an open source online tool can be conveniently used e.g. by local operators or authorities to evaluate the suitability of their region for CML weather monitoring and estimate the credible spatial-resolution of a CML weather monitoring product.

Atlas, D. and Ulbrich, C. W. (1977) Path- and Area-Integrated Rainfall Measurement by Microwave Attenuation in the 1–3 cm Band. Journal of Applied Meteorology, **16**(12), 1322–1331.

Fencl, M., Rieckermann, J., Sýkora, P., Stránský, D., and Bareš, V. (2015) Commercial microwave links instead of rain gauges: fiction or reality? Water Science & Technology, **71**(1), 31.

Acknowledgements to Czech Science Foundation project No. 14-22978S and Czech Technical University in Prague project No. SGS15/050/OHK1/1T/11.