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# Performance of rainfall intensity sensors based on satellite-to-earth microwave links evaluated in the City of Genoa field testbed

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This presentation describes the results obtained by the application of an innovative environmental monitoring technique able to estimate rainfall intensity in real time by processing the satellite microwave link (SML) signal. The field experimentation performed in the city of Genoa (Italy) between November 2016 and March 2019 was aimed to evaluate the performance of a new rainfall monitoring technique based on the exploitation of SML and the use of simple low power sensors (denominated SRS) to measure the electromagnetic field attenuation. The satellite that has been used during our work, Turksat 42° E, belongs to the plethora of satellites operating for television and radio channel broadcasting. The analysis took advantage of the corrected reference measurements made by two calibrated TBRG sensors and three SRS sensors installed at convenient locations. The dynamic calibration of the rain gauges was carried out at the WMO-CIMO Lead Centre "B.Castelli" on Precipitation Intensity by using an automatic calibration rig and the measurements have been processed with advanced algorithms to reduce counting errors. The experimental setup allowed a full characterization of the microwave signal trends as a function of different precipitation.
Overall, the results showed that the sensitivity of the microwave field measured by the SRS sensors to the reference rain observation has been confirmed in terms of the linear correlation. The adoption of a generalized electromagnetic model, such as ITU-R P.838, can be used to compute rainfall measurement starting from SML signal attenuation. The comparison between the rainfall amounts measured over a 10-min time interval showed a variable level of agreement between the point-scale observation of the TBRGs and the SRS sensors. The field research undertaken in this analysis supports preliminary indications that the SML technique implemented by SRS can be used to provide information on the average rainfall amounts measured along the rainy portion of the link path. In that regard, a crucial information is represented by the altitude of the troposphere melting layer that should be known in order to implement the SML technique to monitor the precipitation field in real-time.

References:

Colli, M., Stagnaro, M., Caridi, A., Lanza, L. G., Randazzo, A., Pastorino, M.,Caviglia, D. D., Delucchi, A., 2018. A Field Assessment of a Rain Estimation System Based on Satellite-to-Earth Microwave Links. IEEE Transactions on Geoscience and Remote Sensing, final manuscript accepted, published online 2018.