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Considering local network characteristics and environmental conditions improves rainfall estimates from commercial microwave links in Sri Lanka

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Abstract

To improve rainfall monitoring from Commercial Microwave Links (CMLs) in a (sub)tropical climate, we adjust several parameters in the open-source R package RAINLINK that is used to retrieve rainfall rates from signal attenuation in cellular telecommunication networks.

These parameters related to local CML network characteristics (lower frequencies, longer link paths, quasi-linear *k*-*R* relation) and to environmental conditions (large spatial rainfall variability, convective rainfall) are considered to improve rainfall estimations across Sri Lanka. The analysis is based on data from ~1100 link paths for a 3-4 month period. The resulting rainfall depth maps are validated with multiple rain gauges across Sri Lanka at the hourly and daily time scale, and compared with space-borne weather radar data.

Until now, the majority of efforts to provide rainfall estimates from CMLs have focused on temperate climates, in Western Europe, where there generally is good coverage from weather radars and a fairly dense network of rain gauges. However, the greatest potential for this 'opportunistic' source of rainfall estimation lies in those regions that lack traditional surface rainfall observations, most notably low- to middle income countries, and mountainous areas, where rain gauges are scarce or poorly maintained, and weather radars are largely unavailable.

With this study we further highlight the potential for CMLs to provide high-resolution space-time rainfall observations in the tropics for use in a wide range of hydrometeorological applications, such as forecasting rainfall-induced natural hazards (flash floods, landslides) and validating satellite rainfall products.

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