7.20 ON THE USE OF COMMERCIAL MICROWAVE LINKS FOR RAINFALL ESTIMATION IN SEMI-ARID AREAS

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The common practice for precipitation estimation involves the usage of rain gauges and weather radars. Rain gauges have been proven as good and trustworthy for liquid precipitation (i.e. rainfall) monitoring, while radar systems, on the other hand, can detect other types of precipitation as well. However, radar systems are known for accuracy issues when measuring near-ground precipitation in the distance. In addition, when monitoring rain rates in semi-arid regions and when measuring precipitation at an arid region, precipitation particles, rain, or snow flakes, may evaporate before reaching the ground. This rain and the associated evaporation are therefore entitled the Virga phenomenon and is occurring naturally when the air below the cloud is relatively dry. The virga may continue until humidity below the base of the cloud is high enough to decrease the evaporation and then, the precipitation will reach the ground. A novel method, suggested by Messer et al. in 2006, involves existing Commercial Microwave Links (CMLs) used in the backhaul communication links, for the sake of precipitation monitoring. The rain-induced-attenuation over CMLs has been the source of many studies over the past decade, and is part of an ongoing research of precipitation estimation based on the Received Signal Level (RSL) measurements. We suggest, for the first time, a method for profiling the vertical rain-rates in arid areas using a combination of several radar beams, which observe at different heights above ground along with the CMLs in order to achieve more accurate Above Ground Level (AGL) rain-rates where the Virga may affect the radar measurements of rain. This is done by estimating the cloud base level and the rain rate at the cloud base level. In addition, we suggest an approach for quantitating the Virga phenomenon, employing CMLs data in conjunction with the radar measurements. The proposed methods were validated by testing it on storm events in a semi-arid location in south-eastern Israel. Our method showed highest correlations between the estimated near ground rain intensities and the ground truth observed by the rain gauges, when compared to using weather radar or CMLs alone. This method, of measuring near ground rain rates more accurately by using measurements of both weather radar and CMLs, can assist in flash flood warnings systems for semi-arid regions, and in further expanding the study of weather phenomena in arid and semi-arid regions.