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Rainfall measurements from cellular networks microwave links : an alternative ground reference for satellite validation and hydrology in Africa .

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In many part of the Tropics the ground based gauge networks are sparse, often degrading and accessing this data for monitoring rainfall or for validating satellite products is sometime difficult. Here, an alternative rainfall measuring technique is proposed and tested in West Africa. It is based on using commercial microwave links from cellular telephone networks to detect and quantify rainfall. Rainfall monitoring based on commercial terrestrial microwave links has been tested for the first time in Burkina Faso, in Sahel. The rainfall regime is characterized by intense rainfall intensities brought by mesoscale Convective systems (MCS), generated by deep organized convection. The region is subjected to drought as well as dramatic floods associated with the intense rainfall provided by a few MCSs. The hydrometeorological risk is increasing and need to be monitored.
In collaboration with the national cellular phone operator, Telecel Faso, the attenuation on 29 km long microwave links operating at 7 GHz was monitored at 1s time rate for the monsoon season 2012. The time series of attenuation is transformed into rain rates and compared with rain gauge data. The method is successful in quantifying rainfall: 95% of the rainy days are detected. The correlation with the daily raingauge series is 0.8 and the season bias is 5%. The correlation at the 5 min time step within each event is also high. We will present the quantitative results, discuss the uncertainties and compare the time series and the 2D maps with those derived from a polarimetric radar. The results demonstrate the potential interest of exploiting national and regional wireless telecommunication networks to provide rainfall maps for various applications : urban hydrology, agro-hydrological risk monitoring, satellite validation and development of combined rainfall products. We will also present the outcome of the first international Rain Cell Africa workshop held in Ouagadougou early 2015.