



Identification of dry and rainy periods using telecommunication microwave links

Marc Schleiss and Alexis Berne
EPFL, LTE, Lausanne, Switzerland

A microwave link consists of a transmitter communicating with a receiver through a microwave signal. Such links are widely used for data exchange between base stations of mobile phone networks. Because of the high frequencies (roughly 15 to 50 GHz) used for data transmission, the link signal is attenuated when rainfall occurs along the link path. It has been shown recently, that this attenuation can be used to estimate the path-averaged rain rate. A critical issue in this procedure is the ability to separate the attenuation solely due to rainfall from the attenuation occurring during dry periods (called the baseline attenuation). The baseline attenuation itself is variable and is influenced by changes in temperature, atmospheric gases (mainly water vapor), losses during transmission and reception and possible multipath effects.

In this work, we present a real-time technique to separate dry and rainy periods as well as to estimate a variable attenuation baseline using attenuation measurements from telecommunication microwave links. The technique takes advantage of the fact that the variability of the signal during dry periods is small and bounded whereas rainy periods exhibit high variability. The proposed method is applied to 10 different rain events that occurred in 2008-2009 and to 4 different links near Paris, France. Measurements taken by a C-band weather radar located about 30 km from the links are used as a reference. The performance of this new technique is compared to those of existing techniques proposed in the literature. The new technique is shown to produce good results and to perform better in general despite some limitations in case of light rainfall for which the signal to noise ratio is too low.