

Ecoacoustics: a new source of information on rainfall to complement satellite in data scarce regions

R.S. Xavier, A. Fleischmann, M. Gosset, M. Kacou, T.G. Silva, T. F. Maciel

Accurate and high-resolution precipitation measurements remain a challenging task, especially in regions with sparse ground observations. This has been a long-term issue for satellite rainfall assessment in the tropical regions. In this talk, we will discuss the potential of an audio-based approach for rainfall detection and monitoring. The idea is to analyze the spectral signature of audio recordings to differentiate rain from background noise and quantify its intensity. We first tested the method in the Amazon basin with promising results in comparisons with rain gauges based on 5-minute timesteps time series, with a very good ability to detect rain (POD above 90% and FAR below 5%) and good results in terms of rain rate estimation (with r^2 above 0.8). However, the initial method, based on random forest, is subject to uncertainties and highly sensitive to training data. Investigations are in progress to improve the rainfall estimation with a more physically based algorithm and to diversify the dataset. We will present these new results based on datasets collected in the Central Amazon (Brazil), Côte d'Ivoire, and France. They indicate that our proposed approach can capture the temporal variability of rainfall with strong agreement to ground observations across diverse environments and a fine temporal resolution (mm/5 min). These findings highlight the potential of low-cost passive acoustic monitoring to complement satellite-based precipitation products, particularly in remote regions where conventional tools are not feasible.