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Publication date
2018

Document Version
Final published version

Published in
Geophysical Research Abstracts (online)

Geophysical Research Abstracts
Vol. 20, EGU2018-7667-1, 2018
EGU General Assembly 2018

Intervalometer: Testing the performance of a simple acoustic disdrometer to measure rainfall

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For water management in general, it is of high importance to know where, when an how much rain is falling. Especially in urban areas, where water management is of more economic and social import, it is hard to measure the rainfall due to a lack of measurements at the ground. In order to provide a dense gauge network, the sensors need to be reliable, cheap and easy to maintain. The intervalometer aims to cater to this demand. Following (Uijlenhoet and Stricker 1999), all rainfall related parameters can be tied together using one parameter Λ (mm^{-1}), which characterizes the raindrop size distribution (DSD). This parameter can subsequently be related to the raindrop arrival rate $\rho_A\,(m^{-2}\cdot s^{-1})$ at a surface $A\,(m^2)$. The raindrop arrival rate can be measured by registering the intervals between the drops hitting a piezo element. The concept of the Intervalometer is tested by using data acquired in Bago, Myanamar (monsoon season) and in the Netherlands. The DSD, the rain rate, and the rain depth are calibrated and validated with respect to other rain gauges present (e.g. disdrometer, tipping bucket). It is assessed that the validation sets of the rain rate and rain depth show a high coefficient of correlation of respectively $R^2 > 0.85$ and $R^2 > 0.98$. In addition the root mean square errors are limited to less than $1\,mm$ per hour. The low costs and the simplicity of the Intervalometer show a high potential for providing a dense rain gauge network in areas where there is an increasing demand.

This project is co-funded by the European Union through Project 776691 “TWIGA”.