

Validation of Expert and Citizen Science-based Smartphone Discharge Data

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Abstract: In the last decade, new ways of environmental monitoring have been emerging with the development of smart technology. Among them, citizen science (CS) has been introduced as a novel framework to generate environmental knowledge. In many parts of the world, the lack of reliable river discharge data is a major constraint for operational water management, despite the governmental efforts to improve the existing monitoring systems. This constraint can partially be alleviated through CS and the use of cost-effective smartphone technology. In this study, we tested the publicly available smartphone application "Discharge" to monitor streamflow in Belgium and Tunisia using two different strategies: via an expert user; and by a group of everyday citizens. The use of two types of operators allows evaluating the performances of the app in terms of operator skills. We used a step-by-step CS approach to engage and train citizens on using the application at two locations in Tunisia. In Belgium, an expert user of the app performed measurements of a series of hydrological events at three sites. The collected daily data were compared with data from reference stations at every location. Results yield a significant correlation between CS data and the reference stations in Tunisia. Similarly, expert measurements in Belgium yield a strong agreement with the reference data. Linear regression analysis and errors assessment were used to validate the quality of CS and expert user data. It is concluded that the expert user delivered slightly higher quality of discharge than everyday citizens. This indicates the robustness of the measurement tool as well as the usefulness of the CS training program. We conclude that CS can be considered as a promising monitoring approach for obtaining reliable discharge data, for complementing existing discharge monitoring systems, and also for engaging local communities to innovate the water resources management process.

Keywords: Citizen Science; Discharge; Smartphone application; Validation; Environmental monitoring