Can small reservoirs be useful to gauge stream runoff ?

Jérôme Molenat, Cécile Dagès, Juliette Burtin, Maroua Bouteffeha, Insaf Mekki

Geophysical Research Abstracts
Vol. 20, EGU2018-8566, 2018
EGU General Assembly 2018

Can small reservoirs be useful to gauge stream runoff ?

Jerome Molénat (1), Cécile Dagés (1), Juliette Burtin (1), Maroua Bouteffeha (2), and Insaf Mekki (3)

(1) LISAH, Univ Montpellier, INRA, IRD, SupAgro, Montpellier France, (2) ENIT-LMHE, Tunis El Manar University, Tunisia, (3) INRGREF, Ariana, Tunisia

Measurement of stream runoff in remote regions, especially in Southern countries, is still a major challenge. In arid and semi-arid regions, small reservoirs have been built for decades. The initial roles of these reservoirs can be manifold: water storage for agricultural use, flood storage area, sediment retention,... These reservoirs can also be used as runoff gauges by remotely measurement of their surface areas and water height (Liebe et al., 2005). The principle is to estimate the stream runoff from reservoir water balance considering that all terms (evaporation, percolation, rainfall, pumping for irrigation or other human use, reservoir water volume) are known or measured. The stream runoff is then estimated as the default term in the mass balance. Different sources of error affect then the stream runoff estimation: errors in evaporation and rainfall rate measurements, in reservoir water height measurement, in percolation estimation... So far, the issue of uncertainty has been not heavily examined.
In this work, we analyze the interests and shortcomings of small reservoirs as stream runoff gauges. More specifically, we aim i) at comparing stream runoff derived from reservoir water monitoring with measurements made more classicaly with a weir gauging station, ii) at quantifying the total uncertainty in stream runoff estimation derived from reservoir water monitoring and ii) at analyzing and quantifying the weight of the different sources of error in the total uncertainty in the estimation. The sensitivities of the different sources of errors are quantified for annual, monthly, and daily time periods with the intent of identifying the key sources impacting the stream runoff estimation. The study is based on the Kamech catchment (Tunisia), catchment belonging to OMERE observatory and to OZCAR, the French network of Critical Zone Observatories.

Liebe, J. R., N. van de Giesen, M. Andreini, M. T. Walter, and T. S. Steenhuis (2009), Determining watershed response in data poor environments with remotely sensed small reservoirs as runoff gauges, Water Resour. Res., 45, W07410, doi:10.1029/2008WR007369.