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Comparing hydrological signatures of small agricultural catchments using uncertain data provided by a soft hydrological monitoring

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Discharge estimation is one of the greatest challenge for every hydrologist as it is the most classical hydrological variable used in hydrological studies. The key lies in the rating curves and the way they were built: based on field measurements or using physical equations as the Manning-Strickler relation... However, as we all know, data and associated uncertainty deeply impact the veracity of such rating curves that could have serious consequences on data interpretation. And, of all things, this affects every catchment in the world, not only the gauged catchments but also and especially the poorly gauged ones that account for the larger part of the catchment of the world.

This study investigates how to compare hydrological behaviour of 11 small (0.1 to 0.6 km2) poorly gauged catchments considering uncertainty associated to their rating curves. It shows how important the uncertainty can be using Manning equation and focus on its parameter: the roughness coefficient. Innovative work has been performed under controlled experimental conditions to estimate the Manning coefficient values for the different cover types observed in studied streams: non-aquatic vegetations.

The results show that estimated flow rates using suitable roughness coefficients highly differ from those we should have obtained if we only considered the common values given in the literature. Moreover, it highlights how it could also affect all derived hydrological indicators commonly used to compare hydrological behaviour. Data of rainfall and water depth at a catchment's outlet were recorded using automatic logging equipment during 2008-2009. The hydrological regime is intermittent and the annual precipitation ranged between 569 and 727 mm. Discharge was then estimated using Manning's equation and channel cross-section measurements.

Even if discharge uncertainty is high, the results show significant variability between catchment's responses that allows for catchment classification. It also provides significant insight into the hydrological processes operating in small ephemeral stream systems and highlights similarities/dissimilarities between catchments.