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Supporting transparency and uncertainty analysis of derived hydrological data through development of common exchange formats

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Many derived hydrological data sets, such as river discharge, are based on relationships (ratings) built up over time through observations of related phenomenon, such as river level. The derived data have often been treated as actual observations neglecting the underlying procedure used to develop the relationship[1]. There is an increased interest in exposing the underlying assumptions in derived hydrological data[2], and more generally in environmental data[3], with a view to more consistent estimation and understanding of the uncertainty in such data.

It has been argued[4] that the lack of available information on rating relationships, and the associated observational data, is one of the major contributors to the problem of transparency of hydrological models. Members of the joint WMO/OGC Hydrology Domain Working Group are developing an exchange format, WaterML2.0 part 2, to address exchange of rating tables, gaugings (observations) and cross-section information with a view to enhancing transparency of derived hydrological data. Improving the availability and definition of the rating relationships, and related metadata, will improve transparency, and support the estimation of uncertainty.

The work thus far has focused on harmonizing structures for representing rating tables of sufficient resolution to allow linear interpolation between points. This choice was based on the complexity in the number of curve representations within the domain and across data holders. A reusable data-structure has been developed to express information critical to understanding uncertainty by representing metadata relating to measurement sites and phenomenon ranges. For example, changes in controlling channel bottom features over a range of river levels, or expressing upper and lower limits for extrapolation of a rating curve. The group is continuing to explore the essential information to include in data exchange to allow users to assess the uncertainty associated with rating curves; working to strike a balance between capturing actual assessments of uncertainty and/or quality and providing the necessary information that allows experts to perform their own assessment.

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[2]Hamilton, A. S., & Moore, R. D. (2012). Quantifying Uncertainty in Streamflow Records. *Canadian Water Resources Journal*, 37(1), 3-21.

[3]Whitfield, P. H. (2012). Why the provenance of data matters: assessing "fitness for purpose" for environmental data. *Canadian Water Resources Journal*, 37(1), 23-36.

[4]Beven, K., & Westerberg, I. (2011). On red herrings and real herrings: disinformation and information in hydrological inference. *Hydrological Processes*, 25(10), 1676-1680.