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Dynamic rating curve assessment for hydrometric stations computation of the associated uncertainties: Quality and station management indicators

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Whether we talk about safety reasons, energy production or regulation, water resources management is one of EDF's (French hydropower company) main concerns. To meet these needs, since the fifties EDF-DTG operates a hydrometric network that includes more than 350 hydrometric stations. The data collected allow real time monitoring of rivers (hydro meteorological forecasts at points of interests), as well as hydrological studies and the sizing of structures. Ensuring the quality of stream flow data is a priority.

A rating curve is used to indirectly estimate the discharge in rivers based on water level measurements. The discharge values obtained from a rating curve include uncertainties related to the direct stage-discharge measurements (gaugings) used to build the curves, the quality of fit of the curve to these measurements and the constant changes in the river bed morphology. Moreover, the uncertainty of discharges estimated from a rating curve increases with the "age" of the rating curve. The level of uncertainty at a given point in time is therefore particularly difficult to assess.

Moreover, the current capacity to produce a rating curve is not suited to the frequency of change of the stage-discharge relationship. The actual method does not take into consideration the variation of the flow conditions and the modifications of the river bed which occur due to natural processes such as erosion, sedimentation and seasonal vegetation growth.

A « dynamic » method has been developed to compute rating curves while calculating associated uncertainties, thus making it possible to regenerate streamflow data with uncertainty estimates. The method is based on historical gaugings at hydrometric stations. A rating curve is computed for each gauging and a model of the uncertainty is fitted for each of them. The model of uncertainty takes into account the uncertainties in the measurement of the water level, the quality of fit of the curve, the uncertainty of gaugings and the increase of the uncertainty of discharge estimates with the age of the rating curve computed with a variographic analysis (Jalbert et al., 2011). The presented dynamic method can answer important questions in the field of hydrometry such as « How many gaugings a year are required to produce streamflow data with an average uncertainty of X% ? » and « When and in what range of water flow rates should these gaugings be carried out ? ».