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Multi-Streamgauge Validation of a Semi-Distributed Hydrological Model in a Large Dryland Region in Brazil

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This paper presents a new methodology to regionalise (semi-)distributed hydrological models, when streamflow series are scarce. The rationale was to calibrate a universal set of parameters for all catchments of interest in a multi-objective manner. Moreover, an approach to infer the sources of uncertainty, i.e. parameter, structure, geo-data and time series, was developed. The methodology was applied to a set of 12 streamgauges in the State of Ceará, 148,000 km2, located in Brazilian semiarid North-east, which has high demand on hydrological studies for water resources management, but also problems with scarce streamflow data. The study periods were 2000-2010 and 1985-1995. The median Nash-Sutcliffe coefficient was 0.77 for the validation and 0.80 for the calibration, which can be considered a good simulation result for monthly semiarid streamflows. However, model structure uncertainty, possibly because of a disregarding of river-aquifer processes, caused relevant model performance difference between two geographically different zones. Moreover, this work suggests a model uncertainty decreasing from 1985-1995 to 2000-2010 due to time series and geo-data, which may explain the higher model performance in 2000-2010.