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LFSTAT - An R-Package for Low-Flow Analysis

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When analysing daily streamflow data focusing on low flow and drought, the state of the art is well documented in the Manual on Low-Flow Estimation and Prediction [1] published by the WMO. While it is clear what has to be done, it is not so clear how to preform the analysis and make the calculation as reproducible as possible. Our software solution expands the high preforming statistical open source software package R to analyse daily stream flow data focusing on low-flows. As command-line based programs are not everyone's preference, we also offer a plug-in for the R-Commander, an easy to use graphical user interface (GUI) to analyse data in R.

Functionality includes estimation of the most important low-flow indices. Beside standardly used flow indices also BFI and Recession constants can be computed. The main applications of L-moment based Extreme value analysis and regional frequency analysis (RFA) are available. Calculation of streamflow deficits is another important feature. The most common graphics are prepared and can easily be modified according to the users preferences. Graphics include hydrographs for different periods, flexible streamflow deficit plots, baseflow visualisation, flow duration curves as well as double mass curves just to name a few.

The package uses a S3-class called lfobj (low-flow objects). Once this objects are created, analysis can be preformed by mouse-click, and a script can be saved to make the analysis easy reproducible. At the moment we are offering implementation of all major methods proposed in the WMO manual on Low-flow Estimation and Predictions. Future plans include e.g. report export in odt-file using odf-weave. We hope to offer a tool to ease and structure the analysis of stream flow data focusing on low-flows and to make analysis transparent and communicable. The package is designed for hydrological research and water management practice, but can also be used in teaching students the first steps in low-flow hydrology.

References:

[1] Gustard, Alan; Demuth, Siegfried, (eds.) Manual on Low-flow Estimation and Prediction. Geneva, Switzerland, World Meteorological Organization, (Operational Hydrology Report No. 50, WMO-No. 1029).