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# visCOS: An R-package to evaluate model performance of hydrological models

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The evaluation of model performance is a central part of (hydrological) modelling. Much attention has been given to the development of evaluation criteria and diagnostic frameworks. (Klemeš, 1986; Gupta et al., 2008; among many others). Nevertheless, many applications exist for which objective functions do not yet provide satisfying summaries. Thus, the necessity to visualize results arises in order to explore a wider range of model capacities, be it strengths or deficiencies.

Visualizations are usually devised for specific projects and these efforts are often not distributed to a broader community (e.g. via open source software packages). Hence, the opportunity to explicitly discuss a state-of-the-art presentation technique is often missed. We therefore present a comprehensive R-package for evaluating model performance by visualizing and exploring different aspects of hydrological time-series. The presented package comprises a set of useful plots and visualization methods, which complement existing packages, such as hydroGOF (Zambrano-Bigiarini et al., 2012). It is derived from practical applications of the hydrological models COSERO and COSEROreg (Kling et al., 2014). visCOS, providing an interface in R, represents an easy-to-use software package for visualizing and assessing model performance and can be implemented in the process of model calibration or model development.

The package provides functions to load hydrological data into R, clean the data, process, visualize, explore and finally save the results in a consistent way. Together with an interactive zoom function of the time series, an online calculation of the objective functions for variable time-windows is included. Common hydrological objective functions, such as the Nash-Sutcliffe Efficiency and the Kling-Gupta Efficiency, can also be evaluated and visualized in different ways for defined sub-periods like hydrological years or seasonal sections.

Many hydrologists use long-term water-balances as a pivotal tool in model evaluation. They allow inferences about different systematic model-shortcomings and are an efficient way for communicating these in practice (Schulz et al., 2015). The evaluation and construction of such water balances is implemented with the presented package.

During the (manual) calibration of a model or in the scope of model development, many model runs and iterations are necessary. Thus, users are often interested in comparing different model results in a visual way in order to learn about the model and to analyse parameter-changes on the output. A method to illuminate these differences and the evolution of changes is also included.

References:

• Gupta, H.V.; Wagener, T.; Liu, Y. (2008): Reconciling theory with observations: elements of a diagnostic approach to model evaluation, Hydrol. Process. 22, doi: 10.1002/hyp.6989.

• Klemeš, V. (1986): Operational testing of hydrological simulation models, Hydrolog. Sci. J., doi: 10.1080/02626668609491024.

• Kling, H.; Stanzel, P.; Fuchs, M.; and Nachtnebel, H. P. (2014): Performance of the COSERO precipitation-runoff model under non-stationary conditions in basins with different climates, Hydrolog. Sci. J., doi: 10.1080/02626667.2014.959956.

• Schulz, K., Herrnegger, M., Wesemann, J., Klotz, D. Senoner, T. (2015): Kalibrierung COSERO – Mur für Pro Vis, Verbund Trading GmbH (Abteilung STG), final report, Institute of Water Management, Hydrology and Hydraulic Engineering, University of Natural Resources and Applied Life Sciences, Vienna, Austria, 217pp.

• Zambrano-Bigiarini, M; Bellin, A. (2010): Comparing Goodness-of-fit Measures for Calibration of Models Focused on Extreme Events. European Geosciences Union (EGU), Geophysical Research Abstracts 14, EGU2012-11549-1.