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Hydrol. Earth Syst. Sci., 5, 13-26, 2001
www.hydrol-earth-syst-sci.net/5/13/2001/

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A framework for development and application of hydrological models

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Abstract. Many existing hydrological modelling procedures do not make best use of available information, resulting in non-minimal uncertainties in model structure and parameters, and a lack of detailed information regarding model behaviour. A framework is required that balances the level of model complexity supported by the available data with the level of performance suitable for the desired application. Tools are needed that make optimal use of the information available in the data to identify model structure and parameters, and that allow a detailed analysis of model behaviour. This should result in appropriate levels of model complexity as a function of available data, hydrological system characteristics and modelling purpose. This paper introduces an analytical framework to achieve this, and tools to use within it, based on a multi-objective approach to model calibration and analysis. The utility of the framework is demonstrated with an example from the field of rainfall-runoff modelling.

Keywords: hydrological modelling, multi-objective calibration, model complexity, parameter identifiability

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Citation: Wagener, T., Boyle, D. P., Lees, M. J., Wheater, H. S., Gupta, H. V., and Sorooshian, S.: A framework for development and application of hydrological models, Hydrol. Earth Syst. Sci., 5, 13-26, 2001. [Bibtex](#) [EndNote](#) [Reference Manager](#)

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