

Risks in hydrological modelling due to uncertainties in discharge determination

**MARTIJN J. BOOIJ¹, SANDER P. M. VAN DEN TILLAART^{1,2}
& MAARTEN S. KROL¹**

¹ *Department of Water Engineering and Management, University of Twente, Enschede, The Netherlands*
m.j.booi@utwente.nl

² *Water Board Rijn and IJssel, Doetinchem, The Netherlands*

Abstract Uncertainties in discharge determination may have serious consequences for hydrological modelling and resulting discharge predictions affecting flood and drought risk assessment and decision making. The aim of this study is to quantify the effect of discharge errors on parameters and performance of a conceptual hydrological model for discharge prediction applied to two catchments. Four error sources in discharge determination are considered: a combination of systematic and random measurement errors without autocorrelation; random measurement errors with autocorrelation; hysteresis in the discharge-water level relation; and effects of an outdated discharge–water level relation. Results show that systematic errors and an outdated discharge–water level relation have a considerable influence on model performance, while other error sources have a small to negligible effect. The effects of errors on parameters are large if the effects on model performance are large, and *vice versa*. Parameters controlling the water balance are influenced by systematic errors, and parameters related to the shape of the hydrograph are influenced by random errors. Large effects of discharge errors on model performance and parameters should be taken into account when using discharge predictions for risk assessment and decision making.

Key words uncertainty; discharge determination; hydrological modelling; model calibration; SCEM-UA; Meuse River