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Master Thesis Abstract

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Analysis of Copula-based Infilling on a High Temporal Scale in a Real Time Scenario

In this study artificial gaps were created on a high resolution discharge-time series in a real time scenario to analyse the infilling efficiency of the newly developed copula-based infilling tool. The copula-based infilling efficiency was compared against flood routing technique via VMOD program. Three sections namely upstream, intermediate and downstream section were analysed in the catchment of Sofia, Bulgaria. In these sections seven measuring stations were chosen for analysis and the infilling was done on real and synthetic events (HQ100 D60). Infilling with flood routing was evidently superior on the intermediate and downstream sections than the normal copula based infilling on the peak region, whereas infilling on lower flow was far more superior with copula-based infilling. Several new ideas were tested in the copula-based tool in order to improve the infilling performance at peak regions. The concept of time lag, censored discharge, and station preference were tested individually and also in combination to observe the changes in infilling efficiency. The newly introduced ideas improved the copula-based infilling by a large margin, Nash-Sutcliffe efficiency recorded an increase from 0.29 to 0.69 with the new ideas at the analysed station. Copula-based infilling offers a plethora of possibilities to improve the streamflow infilling. Infilling with copula is robust as it does not rely on directly next upstream or downstream stations for infilling, it rather infills the discharge using all the stations in the catchment. Infilling via flood routing starts to deteriorate when more than one station go offline consecutively, in these scenarios copula-based infilling heavily outshines flood routing based infilling. The investigation concludes with an outlook of the potential to improve copula-based infilling for a discharge-time hydrological series.

Keywords: Copula, flood routing, infilling comparison