River parametrisation of the JULES land surface model for improved runoff routing at the global scale.

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The JULES land surface model has a wide ranging application in studying different processes of the earth system including hydrological modeling [1]. Our aim is to tune the existing configuration of the global river routing scheme at 0.5° spatial resolution [2] and improve river flow simulation performance at finer temporal scales. To do so, we develop a factorial experiment of varying effective river velocity and meander coefficient, components of the Total Runoff Integrating Pathways (TRIP) river routing scheme. We test and adjust best performing configurations at the basin scale based on observations from GRDC 230 stations that exhibiting a variety of hydroclimatic and physiographic conditions. The analysis was focused on watersheds of near-natural conditions [3] to avoid potential influences of human management on river flow. The HydroATLAS database [4] was employed to identify basin scale descriptive hydro-environmental indicators that could be associated with the components of the TRIP. These indicators summarize hydrologic and physiographic characteristics of the drainage area of each flow gauge. For each basin we select the best performing set of TRIP parameters per basin resulting to the optimal efficiency of river flow simulation based on the Nash–Sutcliffe and Kling–Gupta efficiency metrics. We find that better performance is driven predominantly by characteristics related to the stream gradient and terrain slope. These indicators can serve as descriptors for extrapolating the adjustment of TRIP parameters for global land configurations at 0.5° spatial resolution using regression models.