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Modelling of channel transmission loss processes in semi-arid catchments of southern Africa using the Pitman Model

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Water availability is a one of the current major societal issues facing the world. The ability to understand and quantify the impact of key hydrological processes on the availability of water resources is therefore integral to ensuring equitable and sustainable resource management. Channel transmission losses are an 'under-researched' hydrological process that affects resource availability in many semi-arid regions such as the Limpopo River Basin in southern Africa, where the loss processes amount to approximately 30 percent of the water balance. To improve the understanding of these loss processes and test the capability of modelling routines, three approaches using the Pitman model are applied to selected alluvial aquifer environments to determine their effects on regional water resources. The three approaches are an explicit transmission loss function, the use of a wetland function to represent channel-floodplain storage exchanges and the use of a 'dummy' reservoir to represent floodplain storage and evapotranspiration losses. Results indicate that all three approaches are able to simulate channel transmission losses with differing impacts on the regional flows. A determination of which method best represents the channel transmission losses process requires further testing in a study area that has reliable observed historical records.

Keywords: Hydrological modelling, Limpopo River Basin, Modelling uncertainty, Sensitivity analysis