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Master Thesis Abstract

of **Siddharth Seshan**

Conceptual Modelling of a Small Semi-Arid Catchment

An increase in demand for food production due to population growth and increased globalization, has resulted in an intensive adoption of agriculture. Agriculture is the highest consumer of global freshwater supplies, and irrigated agriculture is only expanding, which is putting a severe strain on an already constrained global water situation. This poses a challenge to certain water scarce regions without adequate water supplies, such as semi-arid regions. Though they receive adequate annual rainfall, it is unevenly distributed, spatially and temporally. Therefore, irrigation is often implemented to fill the deficit. Additionally, management of water resources is recommended to be downscaled to the small-scale catchment level, as this can provide more sustainable solutions to water resources challenges, as compared to the conventional approach of large-scale river basin management. It is recognised that irrigation has hydrological and qualitative impacts on our water uses, however there is a need of knowledge to quantify these impacts. This can be performed through a cost-effective method such as hydrological conceptual modelling. However, for small-scale and semi-arid catchments, the risk of overparameterization and arbitrariness in model structure poses as a great challenge in developing conceptual models. Additionally, the low quality and availability of meteorological input data is prominent for small-scale catchments. Therefore, there is a need to further investigate model complexities and the optimal model structure required to achieve high model performance for small-scale catchments. Simultaneously, the importance of temporal resolution for modelling highly responsive catchments requires quantitative attention in assessing its importance. A small-scale semiarid catchment in north-east Spain was evaluated as a study area for this research. A downward approach was utilized in the investigation of model complexity, and various data processing strategies were adopted to explore the importance of temporal resolution. It was found that the most complex model of a semi-distributed approach, discretised based on land use along with two spilling buckets, had the best model performance, as well as good representation of the catchment hydrology. However, a lumped model approach with two spilling buckets also provided good model performance. Temporal resolution has been concluded to be crucial for the modelling of small-scale catchments and is a limiting factor in ensuring high model performance of conceptual models for small-scale catchments