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Easy to Use Workflows for Catchment Modelling: Towards Reproducible Model Studies

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Easy to Use Workflows for Catchment Modelling: Towards Reproducible Model Studies

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Abstract: Catchment scale hydrological models have a variety of users with different technical backgrounds. These users often need to adapt their model before it can be applied to their case study. To this end, most catchment models use a Graphical User Interface (GUI) to allow direct manipulation of the models. While a GUI is generally easy to use for novice users, it opens many sources of irreproducible research in the scientific community. Here we present a workflow for the Soil and Water Assessment Tool (SWAT) that promotes reproducible model studies while remaining user-friendly for both novice and expert users. The python-based wrapper uses pre-processed input data and a namelist file to build the QSWAT model and run it without further user interaction. We then apply this environment to the Blue Nile catchment and show that it yields almost the exact same results as building the QSWAT model through the GUI. Our results indicate benefits using the automated workflow over the GUI in reproducing earlier results and implementing changes to an existing set-up while saving time in the model building process. All the while, the model configuration can still be viewed and modified in the GUI. We conclude that workflows can help reduce cases of irreproducible research in catchment modelling and offer benefits for researchers building upon existing model configurations. Workflows also open up the opportunities for using high performance infrastructure for large catchment model setup without losing interoperability with GUIs. (*This workflow is publicly available on GitHub: https://github.com/VUB-HYDR/2018_Chawanda_etal_EMS*)

Keywords: SWAT; reproducibility; hydrology; modelling; workflows.