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| Title of the project: Comparison of hydrological modelling R packages | |
| Assignment no.: 36.17 | Internal/ external: internal and external Irstea |
| Head graduation committee: dr. ir. Martijn J. Booij | Daily advisor: dr. Guillaume Thirel (Irstea) |
| Name(s) of participating companies or institutes: Irstea, France and TU Wien (dr. Juraj Parajka and dr. Alberto Viglione), Austria | Start of the project: spring 2018 |
| Required courses: Hydrology (195400100), Mathematical Physics of Water Systems (195400900) | |
| <p>Short description and objective of the project: Hydrological modelling is a powerful tool for engineering as well as research purposes. It enables analysing the processes describing the rainfall-runoff relationship, simulating discharges where no gauging stations are available, making predictions or anticipating the impact of climate change on the water cycle. R is a free software environment that is available on the main platforms. In R, free packages, i.e. libraries of functions with a determined goal, are developed at universities and others institutes or companies. More specifically, the use of R and the number of packages aimed at the science of hydrology are increasingly growing. For example, Irstea and TU Wien developed their own R packages, which contain the hydrological models they developed, respectively airGR (Coron et al., 2017) including GR4J and TUWmodel (Viglione and Parajka, 2016) based on HBV.</p> <p>The main objective of the project is to analyse the diverse hydrological modelling R packages that exist. These packages propose models that have different spatial or temporal resolutions, data requirements and concepts. The student will be asked to identify the different packages that allow making simulations of discharge, especially at the daily time step. The characteristics of these packages and models will need to be identified. Finally, the performances of the packages will be analysed within a common framework in terms of error metrics and computational time. The student will be partly based at Irstea in Antony, France and if necessary, a stay at TU Wien (Austria) will be organised.</p> <p>Short description of research approach: The first step will be to take in charge airGR and TUWmodel. Then, it will be necessary to identify all the available R packages and to analyse their characteristics. The third step will be to define a framework that will allow comparing them and to prepare the database that will be used for it (Irstea and TU Wien already have their databases, which could be useful for this step). Finally, the packages will be run and their outputs will be analysed.</p> <p>A report will be written in English. If the results deserve it, an article will be written and submitted to a peer-reviewed journal.</p> <p>The requirements to the candidate are:</p> <ul style="list-style-type: none"> • Strong skills and motivation in R programming • Strong skills in hydrological modelling • Good skills in team working • Good writing skills <p>References</p> | |

- Coron, L., Thirel, G., Delaigue, O., Perrin, C. and Andréassian, V., 2017. The suite of lumped GR hydrological models in an R package. *Environmental Modelling and Software*, 94, 166-171, DOI: 10.1016/j.envsoft.2017.05.002.
- Viglione, A. and Parajka, J., 2016. TUWmodel: Lumped hydrological model for education purposes. R package version 0.1-8. <https://CRAN.R-project.org/package=TUWmodel>.