



Using R in Hydrology: recent developments and future directions

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The open-source programming language R has gained a central place in the hydrological sciences over the last decade, driven by the availability of diverse hydro-climatological data archives and the development of open-source computational tools. The growth of R's usage in hydrology is reflected in the number of newly published hydrological packages, the strengthening of online user communities, and the popularity of training courses and events.

In this paper, we explore the benefits and advantages of R's usage in hydrology, such as the democratisation of data science and numerical literacy, the enhancement of reproducible research and open science, the access to statistical tools, the ease of connecting R to and from other languages, and the support provided by a growing community. We provide an overview of important packages at every step of the hydrological workflow, from the retrieval of hydro-meteorological data, to spatial analysis and cartography, statistics, hydrological modeling, and the design of static and dynamic graphics, presentations and documents. We discuss some of the challenges that arise when using R in hydrology and useful tools to overcome these challenges, including the use of hydrological libraries, documentation and vignettes, the role of the RStudio IDE in facilitating hydrological learning, and the Big Data and parallel computing paradigm in hydrology. Last, this paper provides a potential roadmap for the future of R in hydrology, with R packages as a driver of hydrological progress, APIs providing enhanced data acquisition and provision, enhanced teaching of hydrology in R, and the continued growth of the community via short courses and events.