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Prediction of flow intermittence in Drying River Networks using a process-based hydrological model

Annika Künne[1], Louise Mimeau[2], Flora Branger[2], and Sven Kralisch[1]
[1]Geographic Information Science Group, Institute of Geography, Friedrich Schiller University Jena, Löbdergraben 32, 07743 Jena, Germany (annika.kuenne@uni-jena.de)
[2]INRAE, UR RiverLy, 5 rue de la Doua, CS 20244, 69625 Villeurbanne CEDEX, France

Intermittent rivers and ephemeral streams (IRES) account for about half of the world's river networks and are considered to increase under climate change and growing anthropogenic water use. However, the hydrological mechanisms that control the spatio-temporal flow patterns in IRES and their effects on the expansion and contraction of stream segments are not fully understood. Discharge measurements mainly exist for gauging stations, which are often located downstream and
in the rivers' main stems. They are often less impacted by flow intermittence than headwaters and smaller river channels. In consequence, impacts of climate change and anthropogenic alterations on
hydrological process dynamics in IRES cannot easily be analysed, neither the influences of climate change and human water use on IRES be quantified.
Within the framework of the Horizon 2020 project DRYvER on Drying River Networks and Climate Change, we try to tackle this challenge by developing methods and tools using the JAMS modelling framework and J2K model family to assess hydrological process interactions at high spatial and temporal resolutions, which include the scale of small reaches (about 50 ha catchment size). For that purpose, we developed process-based hydrological models for six mesoscaled river basins between 200 km² and 350 km² in different European countries (Croatia, Czech Republic, Finland, France, Hungary, Spain). At the same time, we used data from field measurements and a citizens science application to validate our models at the reach scale. In this study we analyse the ability of our hydrological model to represent observed temporal and spatial dynamics of flow intermittence at high resolution, and develop adaptations that allows using these models in an upscaling step to estimate the impacts of future climatic changes and anthropogenic water consumption on flow intermittence all over Europe.