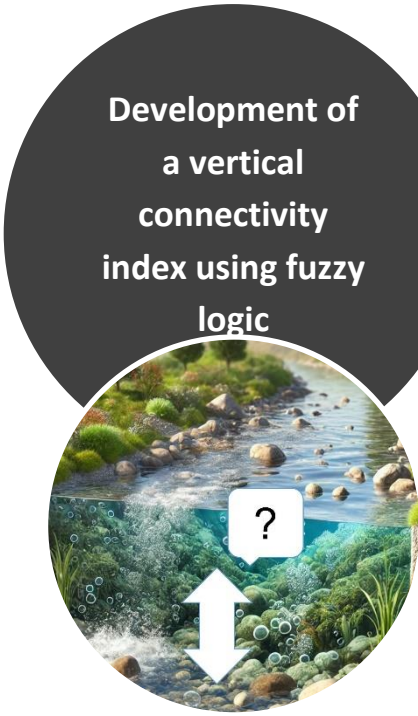
Universität Stuttgart

IWS Department of Hydraulic Engineering and Water Resources Management
Prof. Dr.-Ing. Silke Wieprecht

M.Sc. Topic

"Development of a vertical connectivity index using fuzzy logic"



Background

Connectivity in rivers describes the movement of mass and energy between spatially defined extents of a river corridor. Multiple rivers around the world suffered alterations to natural connectivity due to anthropogenic pressures related to hydropower generation, land use, or navigation. For instance, the vertical exchange of surface and interstitial water in the hyporheic zone, the exchange zone between surface water and groundwater, can be impaired if naturally coarse, permeable riverbeds are clogged by infiltrating fine sediments. Although sedimentary riverbed clogging is a strong factor reducing vertical connectivity, other factors (e.g. microbial activity) can play a dominant role, too. Quantifying vertical connectivity is key for defining clear objectives of sustainable restoration measures. Yet, current approaches are based on fuzzy-logic indexes only reflecting the degree of riverbed clogging (Schwindt et al., 2023), and therefore need verification and potentially alterations before they can be used as vertical connectivity indicator in other river types. This Thesis topic addresses this challenge by identifying relevant vertical connectivity processes, using information available in the literature to build fuzzy rules, extending an existing algorithm to create an index that reflects vertical connectivity in a wide spectrum of fluvial settings.

Thesis Overview

1. Complete a literature review on vertical connectivity and relevant processes, incl. clogging
2. Extend the existing fuzzy-logic framework of the degree of clogging with additional rules that accommodate other types of rivers (Programming in Python)
3. Apply the novel code in study sites at the Rhine river

Desirable Skills

- Completed in-depth course work in hydraulic engineering, particularly regarding fluvial morphology
- Knowledge in Python is of advantage

Apply now!

Please send a few lines on why you would like to work on this topic:
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