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Modelling local trend of bedrock topography by inverse modelling of Poisson's equation

Nils-Otto Kitterød[1] and Étienne Leblois[2]
[1]Norwegian University of Life Sciences, Environmental Sciences and Natural Resource Management, P.Box 5003, N-1432 Ås, Norway, and INRAE, RiverLy Research Unit, Catchment Hydrology Team, Centre de Lyon-Villeurbanne, 5 rue de la Doua BP 32108, F-69626 Ville
[2]INRAE, RiverLy Research Unit, Catchment Hydrology Team, Centre de Lyon-Villeurbanne, 5 rue de la Doua BP 32108, F-69626 Villeurbanne Cedex, France.

Bedrock topography and sediment thickness can be modelled as stochastic functions in space. These two functions are important for water storage and runoff and they are therefore essential to understand hydrological response to drought and extreme rainfall events. Digital information from remote sensing, geological mapping, and public databases comprise information which make it possible to control the estimation uncertainty. Depending on the geological history, the bedrock topography might have a complex structure in space. We present results from a case study where bedrock outcrops were exposed small patchy areas and with some scattered point information from a public well database. We modelled the estimation uncertainty by standard geostatistical methods (kriging and co-kriging), and the results showed that by including information of the outcrop locations, we were able to reduce the estimation uncertainty (Kitterød, 2017). In addition to the kriging approach, we explored numerical solutions of the Poisson equation. By this method, we modelled the bedrock surface by fitting a parabolic function to sediment thickness. This was done by inverse modelling of a global load parameter in the Poisson equation. For future research, we suggest to substituting the constant load parameter by a stochastic function in space.

References:

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