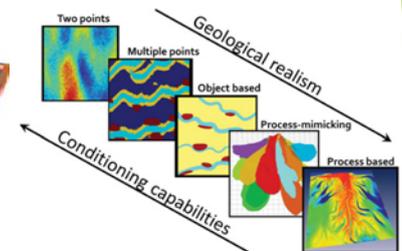
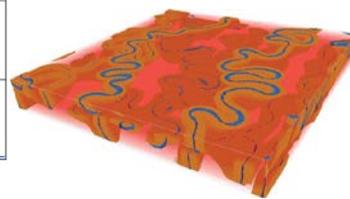
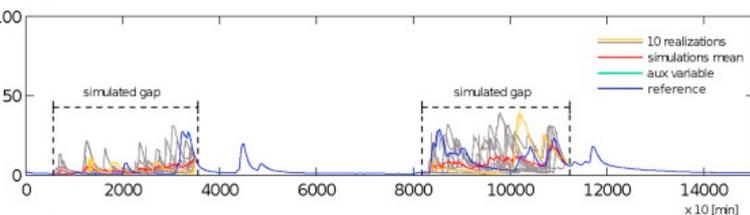




## Gap-filling of (geo)environmental time series by using high order geostatistics methods

### About

Complete (geo)environmental time series are necessary for water resources management and modeling. The principal aim of time series analysis is to describe the history of movement in time of some variable such as the rate of flow in a river, rainfall in a region, pollution concentration in air or etc. This can be challenging in data scarce environments where data gaps are ubiquitous. In many applications, repetitive gaps can have unfortunate consequences including ineffective model calibration, unreliable timing of peak flows, and biased statistics. So, as a solution for infilling the gaps it is possible to use high order geostatistics methods such as multiple point statistics (MPS) algorithms which are count as non-parametric stochastic approaches. MPS use of the patterns contained inside a training data set to reproduce the complexity of the missing data. This topic is an attempt for reconstruction of the (geo)environmental time series while considering several missing data scenarios, as well as a comparative test against another traditional infilling models.



### Tasks

- Doing a literature review
- Pre-processing a real-case application dataset (e.g. rainfall datasets, water table or etc.)
- Designing different synthetic scenarios in the framework of a gap-filling problem
- Using the **DeeSse** as an advanced multiple-point statistics (MPS) code allowing to simulate spatial fields or time series based on training data sets
- Statistical analysis, comparison the results and making a critical discussion

### Publications to get started

- Oriani F, Borghi A, Straubhaar J, Mariethoz G, Renard P (2016). Missing data simulation inside flow rate time-series using multiple-point statistics. *Environmental Modelling and Software* 86, 264-276, doi: 10.1016/j.envsoft.2016.10.002.
- Dembélé M, Oriani F, Tumbulto J, Mariethoz G, Schaeffli B (2019). Gap-filling of daily streamflow time series using Direct Sampling in various hydroclimatic settings, *Journal of Hydrology*, 569: 573-586, doi: 10.1016/j.jhydrol.2018.11.076.

### Requirements

- Familiar with programming languages
- Enthusiasm for working in the field of environmental modeling, hydro(geo)logy and geostatistics

### Supervisors

Hesam Soltan Mohammadi ([hesam.soltan-mohammadi@geo.uni-halle.de](mailto:hesam.soltan-mohammadi@geo.uni-halle.de))

Prof. Peter Bayer ([peter.bayer@geo.uni-halle.de](mailto:peter.bayer@geo.uni-halle.de))

For further discussion or if you have any questions please do not hesitate to contact us.