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Geostatistical interpolation of runoff

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We have analysed spatio-temporal variograms of catchment runoff. The sample variograms were calculated on the basis of 20 years of quarter hourly runoff data from about 600 catchments in Austria. We have fitted three spatio-temporal variogram models independently to the spatio-temporal sample variograms of catchment precipitation and runoff for three different catchment size classes, small, medium and large. The models were an exponential model, a model proposed by Cressie and Huang, and a product-sum model. We found that the exponential model and the product-sum model provided similarly good fits, with the exponential model being slightly better.

Runoff at the outlet can be seen as an aggregation of point precipitation both in time and space. We have used this concept when fitting regularised variograms jointly to the spatio-temporal sample variograms of the three catchment size classes. From this we were able to back-calculate a spatio-temporal variogram of point runoff. Here, all the three models provided equally good fits.

One of the back-calculated point variograms of runoff was then used to interpolate runoff from a group of 20 catchments in the Innviertel region, Austria. This region is quite homogenous regarding annual specific discharge. We have then interpolated runoff time series in this region using kriging with varying support. The results were satisfying, we were able to reproduce the time series with high accuracy.