Geostatistical estimation of runoff time series

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Geostatistical methods have been used to a limited extent for estimation along stream
networks. Interpolation of runoff characteristics are more complicated than the tradi-
tional random variables estimated by geostatistical methods, as the measurements have
a more complicated support, and many catchments are nested. Skøien et al. (2006) pre-
sented the model Top-kriging which takes these effects into account for interpolation
of stream flow characteristics (exemplified by the 100 year flood). The method is here
extended to estimate runoff time series.

The time series for a location without observations is found as a weighted average of
the surrounding observations. The weights are found for each location assuming that
the catchments can be approximated as spatio-temporal filters (Skøien and Blöschl
2006). For cross-validation purposes, the Top-kriging method was used to generate 10
years time series of hourly runoff for 17 catchments in the Innviertel region in Austria.
The resulting time series were examined in sense of model efficiencies and runoff
dynamics. Estimated time series of daily runoff were compared with estimated time
series from a deterministic rainfall-runoff model. The Top-kriging method generated
time series with considerably higher model efficiencies than the deterministic model.

Skøien, J. O. and Blöschl, G., 2006. Catchments as space-time filters - a joint spatio-
temporal geostatistical analysis of runoff and precipitation. Hydrology and Earth Sys-
tem Sciences, 10: 645-662.

Skøien, J.O., Merz, R. and Blöschl, G., 2006. Top-kriging - geostatistics on stream
networks. Hydrology and Earth System Sciences, 10: 277-287.