Responses on the Referees 3 comments on the submitted manuscript "Geostatistical interpolation by Quantile Kriging" hess-2018-276

We are very thankful for your remarks and reply on them below:

RC 3:

The article presents an interesting approach to kriging with skewed variables and to non-stationarity: i) For every single location the distribution over time is estimated and quantiles are estimated. ii) To the quantiles of a given time-step a Beta-distribution is fit-ted. iii) The quantiles of the Beta-distribution are transformed by a Normal-Score trans-formation into standard Gaussian variables. iv) Ordinary kriging of the transformed variables. v) Backtransformation of the kriging results to the original scale

One to my opinion main result now is that the variance of the prediction is dependent on the data values themselves, too, and not as in ordinary kriging only dependent on the kriging location. The methodology reminds me somewhat to trans-Gaussian kriging, where you have a similar effect, with the difference that you are still stationary. Maybe you could a little bit comment on this and also on the relationship to copulas.

A3.1: The interpolation of the beta distributed distribution function values can be seen as a Trans-Gaussian Kriging. Trans-Gaussian Kriging (Spöck et al., 2009) can also be interpreted as a Gaussian copula based linear interpolation.

Reference:

- Spöck, G., Kazianka, H. & Pilz, J. (2009). Modeling and Interpolation of Non-Gaussian Spatial Data: A Comparative Study. Dept. of Statistics, Alpen-Adria Universität, Klagenfurt. https://www.stat.aau.at/Tagungen/statgis/2009/StatGIS2009_Spoeck_2.pdf

Non-stationarity comes into play because you estimate at each spatial location the quantiles separately. You calculate quantiles, and quantiles are always related to copulas,- is there also here a relationship to copulas? Please, elaborate on that. I am also not completely sure, why you need the Beta-distribution at all and not directly calculate the Normal-Score transformation.

A3.2: compare to reply on comment 4 from Referee 1: we used the Beta-distribution due to its definition on the interval [0,1], thus avoiding conditioning of the resulting distribution at the extremes of 0 and 1.