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Influence of parameter estimation uncertainty in Kriging: Part 2 - Test and case study applications

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Abstract. The theoretical approach introduced in Part 1 is applied to a numerical example and to the case of yearly average precipitation estimation over the Veneto Region in Italy. The proposed methodology was used to assess the effects of parameter estimation uncertainty on Kriging estimates and on their estimated error variance. The Maximum Likelihood (ML) estimator proposed in Part 1, was applied to the zero mean deviations from yearly average precipitation over the Veneto Region in Italy, obtained after the elimination of a non-linear drift with elevation. Three different semi-variogram models were used, namely the exponential, the Gaussian and the modified spherical, and the relevant biases as well as the increases in variance have been assessed. A numerical example was also conducted to demonstrate how the procedure leads to unbiased estimates of the random functions. One hundred sets of 82 observations were generated by means of the exponential model on the basis of the parameter values identified for the Veneto Region rainfall problem and taken as characterising the true underlining process. The values of parameter and the consequent cross-validation errors, were estimated from each sample. The cross-validation errors were first computed in the classical way and then corrected with the procedure derived in Part 1. Both sets, original and corrected, were then tested, by means of the Likelihood ratio test, against the null hypothesis of deriving from a zero mean process with unknown covariance. The results of the experiment clearly show the effectiveness of the proposed approach.

Keywords: yearly rainfall, maximum likelihood, Kriging, parameter estimation uncertainty

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