Errata

Publication II

The difference between local and global sensitivity analysis approaches has been erroneously introduced. Thus, the beginning of section 2.2 should be changed to the following: “In local sensitivity analysis (LSA) small perturbations are introduced around the reference value of a factor, commonly with straightforward methods such as one factor at a time (OFAT), where one factor value is changed while others remain fixed to their reference value. LSA is computationally efficient and easy to implement. The main drawback of LSA is that non-linear models will have sensitivities that depend on the reference value. The second drawback of using a LSA approach is that factor interactions are not considered. Although global sensitivity analysis (GSA) requires significantly more computing power compared to LSA, implementing GSA gives the benefit of the doubt that all the effects are accounted for, even the ones that are unexpected by the experiment designer.”

In the same section, the statement "... simulation data is used for the surrogate modeling instead of analytical representation, which would be unnecessarily complex.“ Should be only "... simulation data is used for the surrogate modeling.“, since some models cannot be expressed with an analytical expression.

In addition, the Polynomial Chaos Expansion (PCE) should not be described as an extensions multiple linear regression, but rather as the following: “PCE is a spectral projection surrogate modeling technique, which can be implemented in a non-intrusive manner. Non-intrusive surrogate models consider the original model as a “black box”, which means that only the input and output values are known. The PCE of that model is presented as,

$$Y \approx \tilde{f}^{PCE}(X) = \sum_{\alpha \in A} \gamma_\alpha \Psi\alpha(X) \tag{5.1}$$

where $\psi_\alpha(X)$ are multivariate polynomials that are orthogonal in respect to one another, which have the corresponding coefficients γ_α. α is a multi-index, whose size is determined by the number of inputs k and maximum univariate polynomial degree of less than equal to p, which together determine the subset A. The truncation of the otherwise infinite degree of polynomials is the “standard truncation scheme”, when the maximum polynomial degree p is set by the modeler. The multi-indices indicate the polynomial degree of the uni-

variate polynomials that construct the multivariate polynomials $\Psi_\alpha(X)$. The maximum polynomial degree p was set to 10."

Unlike stated in the article, the least angle regression method does not limit the degree of the PCE, but it is used to decrease the size and complexity of the PCE model by only retaining the meaningful terms, to form a sparse PCE. The sparse PCE is generated based on the comparison of cross-validation error estimations of the PCE model while increasing the number of terms included in the model.

On page 435, the statement "In Fig. 3, the leave-one-out is shown as a function of PCE models of increasing degree.", should be "... as a function of LAR iterations".

In Fig. 5 caption, the results of the PCE model evaluations claim to be more consistent. However, the PCE model simply had more evaluations resulting in a smoother distribution.

The error bars in Fig. 6 are presented on the sensitivity indices, yet the way they are computed is missing from the article. Thus, the following should be added to page 435, at the end of section 2.3. "The accuracy of the sensitivity indices is measured with bootstrapping. Bootstrapping is similarly a re-sampling method such as cross-validation, with the exception that the bootstrap is generated from the original dataset with replacement. This means that the size of the dataset remains the same for the bootstrap model, but some samples occur twice or more while others are omitted. The error bars of the sensitivity indices presented here are within 90% confidence interval of 100 bootstrapping iterations."

Publication III

Equation (20) has a formatting error. The second-order effects computation should be explained more clearly, such as in section "3.4.6 Estimation of second-order effects" of this dissertation.

Moreover, the second-order effects are normalized erroneously and should be recalculated. Figure 17 b) in Publication III should be the same as Figure 4.12. The higher order effects also do not need to be assumed to be dominated by second-order effects as stated in the article.