Geophysical Research Abstracts,
Vol. 10, EGU2008-A-08686, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-08686
EGU General Assembly 2008

1 Rainfall-Runoff Modelling using Gaussian Processes

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During the last decade the number of publications on the field of kernel machines has increased enormously. Widely known are studies on Support Vector Machines (SVM), much activity was also spent on applying Gaussian processes to problems on the area of machine learning. This method represents an universal and practical approach to learning with kernel machines. Because of its solid statistical foundation learning with Gaussian processes has advantages over other empirical approaches concerning interpretability of model predictions. It also offers an established framework for model selection and subsequent model setup.

Because of ongoing theoretical and practical developments during the last years, Gaussian processes are nowadays considered as a serious alternative in the area of supervised learning. Because of their promising characteristics these methods are especially suited for Rainfall-Runoff-Modelling. Nevertheless, so far they have not attracted much interest in this domain.

The Gaussian process regression is based on the assumption that observations follow a normally distributed stochastic process. This leads to the conclusion, that new observations do not change the probability distribution of earlier ones. Based on this simple property Gaussian process regression allows predictions for unknown values. This paper describes an application of a Gaussian process regression based simulation model

on the River Ouse dataset. The results show that this model is very well suited for an automated short-term runoff prediction which is only based on measured precipitation and runoff.