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Streamflow forecasts are important tools for flood warning and reservoir management, but they are often associated with considerable uncertainties. In order to be a good basis for decision making, it is therefore important that these forecasts are accompanied by a description and quantification of their uncertainty.

In recent years, a strong focus has been put on the development of probabilistic streamflow forecasts, which give a probability distribution of the future streamflow value instead of a single value forecast. This represents a quantitative description of the uncertainty and therefore forms an optimal basis for deriving decisions based on these forecasts. For such probabilistic streamflow forecast systems, an integral part is constituted by a so called uncertainty processor, a statistical approach that describes the errors of the simulated streamflow derived from a hydrological model.

In this dissertation, different uncertainty processors that are based on a certain type of statistical model, an autoregressive error model, have been investigated. The study was carried out in 55 catchments in Norway with long series of observed streamflow from 1961 to 2005. Thereby, different aspects of the uncertainty processors were investigated in order to identify the statistical formulations that lead to an enhanced performance of the uncertainty processors.

Based on these investigations, the statistical model was further developed with an approach labeled moving distribution approach. This approach leads to a further improvement of the uncertainty processors. At the same time, it is very flexible, as it makes only minimal assumptions about the statistical behavior of the simulation errors. The approach is therefore very suitable for operational streamflow forecasting where flexible approaches with limited assumptions are preferred.