



A Vector-Autoregressive "co-shiftable" Weathergenerator for Hydrodynamic Modeling of Lakes

Dirk Schlabing (1), Maria Magdalena Eder (1), Marieke Frassl (2), Karsten Rinke (3), and Andras Bardossy (1)

(1) University of Stuttgart, Germany (dirk.schlabing@iws.uni-stuttgart.de), (2) University of Constance, Limnological Institute, Constance, Germany, (3) Helmholtz Centre for Environmental Research - UFZ, Magdeburg, Germany

To use simulation as a tool to investigate the impact of possible climatic changes on lakes, suitable input data is needed. Using vector-autoregressive processes fitted to measured data, one can produce multivariate time series. These can be adjusted to reflect changes in meteorological conditions. However, simply changing values of one variable (e.g. increasing the mean of the temperature) treats the variables as being independent and thus neglects the dependency structure between them.

To overcome such problems, a vector-autoregressive weather generator is developed to generate multivariate time series that retain the statistical properties of the original data. The seasonalities, as well as covariances, auto- and cross-covariances are to be reproduced in synthetic time series.

Furthermore, to study the impact of changing climatic conditions on lakes, first and/or second order moments of the temperature are modified while still trying to maintain the dependency structure. In this sense, the weather generator is "co-shiftable", meaning that changes in one variable will cause the other variables to change accordingly to the covariance matrix of the measured data.

The variables in question are air temperature, humidity, long- and shortwave radiance and wind. The Vector-Autoregressive Weathergenerator (VG) is primarily being designed to provide the means to model "What if?"-scenarios. For a work that uses VG and is mainly directed towards process understanding concerning the mixing behaviour of Lake Constance see "*Climate sensibility of a large lake - a scenario study using a 3D hydrodynamic model and a statistical weather generator*" by Maria Magdalena Eder in Session "*Lakes and inland seas*" (HS10.2/OS2.3).