Robustness for Dynamic Models for Extreme Values

P. Ruckdeschel[1*], B. Spangl[2], S. Desmettre[3], A. Mändle[1], and K. Rohmeyer[1,4]

[1] *Institute for Mathematics, Oldenburg University, Oldenburg, Germany; peter.ruckdeschel@uni-oldenburg.de, andreas.maendle@uni-oldenburg.de, kornelius.rohmeyer@uni-oldenburg.de*
[2] *Institute of Applied Statistics and Computing, BOKU, Vienna, Austria; bernhard.spangl@boku.ac.at*
[3] *Department of Mathematics, Kaiserslautern University, Kaiserslautern, Germany; desmettre@mathematik.uni-kl.de*
[4] *Institute for Statistics, Bremen University, Bremen, Germany*
[*] *Presenting author*

Keywords. *GLM; Dynamic model; Extremes; Hydrology; Goodness of fit.*

River discharge data exhibit interesting dynamic patterns as to the occurrence of extreme events. For i.i.d. data the respective limit theorems of extreme value statistics give rise to and convincingly suggest parsimoniously parametrized models, i.e., the Generalized Pareto (GPD) and the Generalized Extreme Value distributions.

Passing over to dynamic situations, respective distributional limit theorems do exist as well, but parsimonious parametric models are less evident, in particular when a good fit of the empirical interarrival times is also of interest.

We discuss four different approaches to tackle this issue, i.e., dynamics introduced by (a) a state-space model for location and scale, (b) a shot-noise-type process with GPD marginals, (c) a copula-based autoregressive model with GPD marginals, and (d) a generalized linear model with GPD marginals (and previous extremal events as regressors) including a corresponding regression for the shape of the GPD as well.

In each of these models we discuss respective robustness issues and robust procedures, and some techniques to decide among the different approaches based on corresponding goodness of fit tests.