

[Home](#)

[Online Library HESS](#)

- Recent Final Revised Papers
- [Volumes and Issues](#)
- Special Issues
- Full Text Search
- Title and Author Search

[Online Library HESSD](#)

[Alerts & RSS Feeds](#)

[General Information](#)

[Submission](#)

[Review](#)

[Production](#)

[Subscription](#)

[Comment on a Paper](#)

Journal Metrics

 IF 2.462

 5-year IF 2.670

 SNIP 0.856

 SJR 0.099

[Definitions](#)

ARCHIVED IN



PORTICO

[Volumes and Issues](#) [Contents of Issue 12](#) [Spec](#)

Hydrol. Earth Syst. Sci., 14, 2429-2442, 2010
www.hydrol-earth-syst-sci.net/14/2429/2010/
doi: 10.5194/hess-14-2429-2010

© Author(s) 2010. This work is distributed
under the Creative Commons Attribution 3.0 License.

A stochastic design rainfall generator based on copulas and mass curves

S. Vandenberghe¹, N. E. C. Verhoest¹, E. Buyse¹, and B. De Baet

¹Laboratory of Hydrology and Water Management, Ghent University, Coupure links 653, 9000 Ghent, Belgium

²Department of Applied Mathematics, Biometrics and Process Control, Ghent University, Coupure links 653, 9000 Ghent, Belgium

Abstract. The use of design storms can be very useful in many hydrological and hydraulic practices. In this study, the concept of a copula-based secondary return period in combination with the concept of mass curves is used to generate point-scale design storms. The analysis is based on storms selected from the 105 year rainfall time series with a 10 min resolution, measured at Uccle, Belgium. In first instance, bivariate and secondary return periods are explained, together with a focus on which couple of storm variables is of highest interest for the analysis: discussion of how the results might be affected by the goodness-of-fit of the copula. Subsequently, the fitted copula is used to sample storm predefined secondary return period for which characteristic variables as storm duration and total storm depth can be derived. In order to construct design storms with a realistic storm structure, mass curves of 1st, 2nd, 3rd and 4th quartile storms are developed. An analysis is made that the assumption of independence between the secondary return period and the internal storm structure could be made. Based on these curves, a technique is developed to randomly generate an intrastorm structure. The coupling of both techniques eventually results in a methodology for stochastic design storm generation. Finally, its practical usefulness for design studies is illustrated based on the generation of a set of statistically identical design storm and rainfall-runoff models.

[Final Revised Paper](#) (PDF, 1905 KB) [Discussion Paper](#) (HESSD)

Citation: Vandenberghe, S., Verhoest, N. E. C., Buyse, E., and De Baet, B.: A stochastic design rainfall generator based on copulas and mass curves, Hydrol. Earth Syst. Sci., 14, 2429-2442, doi:10.5194/hess-14-2429-2010. [Bibtex](#) [EndNote](#) [Reference Manager](#) [XML](#)