STOCHASTIC GENERATING OF AREAL PRECIPITATION EXTREMES BASED ON DOWNSCALING FROM ATMOSPHERIC CIRCULATION PATTERNS

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A new model for generating daily precipitation time series has been developed and applied to the Neckar catchment with the area of cca 14000 km^2 (Germany). Precipitation is modelled as process conditioned to atmospheric circulation pattern (CP). The CPs are defined by fuzzy rules and are optimized in order to explain the variability of rainfall. The CPs were classified taking daily pressure fields over Europe and daily precipitation totals from 9 Germany-wide distributed stations into account. The CPs were defined with emphasis of explaining extreme precipitation events. The problem of intermittence of rainfall occurence is solved by introducing power transformation between highly skewed distribution of rainfall amounts and normally distributed random function. The parameters of this function depend on the CP and the day of the year. The seasonal cycle of precipitation is described by using Fourier series. The precipitation is modelled as a multivariate process taking spatial correlation function into account. The presented model allows the simulation of precipitation for a set of points simultaneously which enables the calculation of areal precipitation. Statistical tests comparing the observed and generated extreme events show that the model reproduces these events very well. It can be therefore used for generating long-term precipitation series with high spatial resolution.

No.	Instruction
1.	EGS 2000
2.	Second Submission
3.	Stochastic generating of areal precipitation extremes based on downscaling from atmospheric circulation patterns
4.	BÁRDOSSY, A.; STEHLÍK, J.; CASPARY, H.J.
5.	HS02-01 Predicting and estimating of extremes of precipitation
6.	A. Montanari, A. Bárdossy
7.	-
8.	NONE
9.	Oral
10.	Word (added)
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