ETH zürich

ETH Library

A stochastic rainfall generator for Brest area

Other Conference Item

Author(s):
Boutigny, M.; Ailliot, P.; Saussol, B.; Sinquin, A.

Publication date:
2019

Permanent link:
https://doi.org/10.3929/ethz-b-000347527

Rights / license:
In Copyright - Non-Commercial Use Permitted

This page was generated automatically upon download from the ETH Zurich Research Collection.
For more information, please consult the Terms of use.

A stochastic rainfall generator for Brest area

M. Boutigny*[1,2], P. Ailliot[2], B. Saussol[2], A. Sinquin[1]

1 Eau du Ponant, Brest, France
2 Université de Brest, France

*Corresponding author: marie.boutigny@eauduponant.fr

Abstract

In urban areas, where an important part of the sewage system is combined, waste water dumping can occur during rainy weather. Water collection and storage systems are generally designed using hydrological models which describe the functioning of the sewage systems. Weather conditions such as evapotranspiration and most of all precipitation are very important forcing factors for such models. A usual approach to take into account the variability of weather conditions consists in forcing the hydrological model with up to 5 years of meteorological data, considered as "representative" and observed in a site close to the system location. This permits to estimate the statistical distribution of water dumping with reasonable computational cost.
In order to assess the sensitivity of the method to the choice of the "representative" meteorological conditions, we propose to develop a stochastic weather generator. A stochastic weather generator (Wilks et al., 1999, Ailliot et al., 2015) is a way to simulate a high number (e.g. several centuries) of realistic spatio-temporal meteorological series. These artificial weather conditions can then be used as input to the hydrological model. This will allow us to estimate its sensitivity to different things, such as the length of the input time series or rainfall spatialization, and finally determine the forcing weather conditions to be used in studies aiming at designing sewage systems.
Among the challenges in developing such a weather generator we can cite

1. the observations: different sources of data (e.g. rain gauges and radar) are available, providing different information and having their strengths and weaknesses,
2. the resolution: a high temporal resolution required by the hydrological model (e.g. 3 minutes), and a high spatial resolution (with a dense rain gauge network and 1km2 radar data) is also necessary to reproduce convective rain events,
3. the need to reproduce complex statistics that can impact waste water dumping such as the duration of wet/dry periods, rain cells movements with variable speed and direction or the relation between several meteorological factors (rainfall, wind, evapotranspiration),
4. the non-Gaussian nature of precipitation data,
5. dealing with big spatiotemporal datasets (e.g.: radar data).

We will discuss these different aspects and illustrate them using the particular case of the city of Brest (west part of France).

References

Ailliot P., Allard D., Monbet V., Naveau P. (2015). Stochastic weather generators: an overview of weather type models. Journal de la Société Française de Statistique, 156(1), pp 101-113

Wilks, D. and Wilby, R. (1999). The weather generation game: a review of stochastic weather models. Progress in Physical Geography, 23(3):329–357.