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Temporal and spatial characteristics of rainfall events: a Slovenian case study

Domen Dolšak, Nejc Bezak, and Mojca Šraj
University of Ljubljana, Faculty of Civil and Geodetic Engineering, Ljubljana, Slovenia

Temporal rainfall distribution within individual rainfall events can have significant impact on the runoff characteristics such as the time to peak discharge and peak discharge values. Therefore, the information about temporal rainfall distribution within rainfall event is crucial for planning of hydraulic structures, flood protection, reliable hydrological modelling, etc. The main aim of this study was to investigate temporal and spatial characteristics of rainfall events in Slovenia, Europe.

Data from 30 rainfall stations in Slovenia were used in order to analyze properties of rainfall events in Slovenia. Rainfall data with 5-minute time step was used and the sample data lengths varied from 10 to 66 years with a mean sample data length of 35 years. Huff curves and binary shape code (BSC) method, which was proposed by Terranova and Iaquinta (2011), were used to analyze temporal and spatial characteristics of rainfall events in Slovenia. All calculations were performed using the free software program R (https://www.r-project.org).

The results of the study show that rainfall characteristics in eastern (BSC 1111) and western (BSC 0000) part of Slovenia are not the same. This means that in the western part of Slovenia on average the majority of rainfall occurs in the second part of the rainfall event and in the eastern part of Slovenia on average most of the rainfall occurs in the first part of the rainfall event. Thus, on average higher peak discharge values can be expected in rivers located in the western part of Slovenia due to the higher antecedent conditions. Furthermore, the estimated BSC types did not depend on the rainfall station elevation.

Moreover, the calculated BSC types were dependent on the duration of the rainfall event. The BSC 1111 type (most of rainfall occurs in the first part of the rainfall event) was the most frequent for the shorter duration rainfall events (less than 12 hours) and the BSC 0000 type (most of rainfall occurs in the second part of the rainfall event) was a characteristic of rainfall events with the longer duration (more than 24 hours).

Reference:
Terranova, O., G., Iaquinta, P. 2011. Temporal properties of rainfall events in Calabria (southern Italy). Natural Hazards and Eart System Sciences 11: 751–757.