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Construction of Intensity-Duration-Frequency (IDF) curves for precipitation with limited Annual Maxima data in Rwanda

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Detailed probabilistic information on the intensity of precipitation in Central Africa is highly needed in order to cope with the risk analysis of natural hazards. In the mountainous areas of Rwanda land slides frequently occur and might cause a heavy toll in human lives. The establishment of Intensity-Duration-Frequency (IDF) curves for precipitation is a frequently used tool in water researches projects and management, sewer design in urban areas and geomorphologic research and is as such an adequate help in disaster reduction programs. The establishment of Intensity-Duration-Frequency curves for precipitation in Central Africa remains a difficult task as adequate long-term data sets for short aggregation times are usually not available. The IDF-curves for precipitation provide an empirical expression linking the intensity, the duration or, better said the aggregation time, and the frequency or, the probability, of rainfall.
In 1962 a number of classical recording raingauges were installed at several stations in Rwanda. According to the climatological procedures in use at that time in Rwanda monthly and annual precipitation depths for fixed-time durations of 15, 30, 45, 60 and 120 minutes were determined from the rainfall charts. The data set is completed by the monthly and annual daily precipitation extremes from the non-recording raingauge at the stations.
The authors use the data set to establish the IDF-curves for precipitation at 3 precipitation stations in Rwanda located in zones with a different rainfall regime and having each of them more than 20 years of operation. The limited data set prescribes the use of the Annual Maximum (AM) probability technique. Furthermore, the fixed-time intervals of 15 minutes clock-time data require the use of Hershfield factors. These factors will be assessed for the different aggregation times according to the van Montfort technique.