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Spatial structure of monthly rainfall measurements average over 25 years and trends of the hourly variability of a current rainy day in Rwanda.

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Climate plays a vital role in a wide range of socio-economic activities of most nations particularly of developing countries. Climate (rainfall) plays a central role in agriculture which is the main stay of the Rwandan economy and community livelihood and activities. The majority of the Rwandan population (81,1% in 2010) relies on rain fed agriculture for their livelihoods, and the impacts of variability in climate patterns are already being felt. Climate-related events like heavy rainfall or too little rainfall are becoming more frequent and are impacting on human wellbeing.The torrential rainfall that occurs every year in Rwanda could disturb the circulation for many days, damages houses, infrastructures and causes heavy economic losses and deaths.

Four rainfall seasons have been identified, corresponding to the four thermal Earth ones in the south hemisphere: the normal season (summer), the rainy season (autumn), the dry season (winter) and the normo-rainy season (spring). Globally, the spatial rainfall decreasing from West to East, especially in October (spring) and February (summer) suggests an «Atlantic monsoon influence» while the homogeneous spatial rainfall distribution suggests an «Inter-tropical front» mechanism. What is the hourly variability in this mountainous area? Is there any correlation with the identified zones of the monthly average series (from 1965 to 1990 established by the Rwandan meteorological services)? Where could we have hazards with several consecutive rainy days (using forecasted datas from the Norwegian Meteorological Institute)?

Spatio-temporal analysis allows for identifying and explaining large-scale anomalies which are useful for understanding hydrological characteristics and subsequently predicting these hydrological events. The objective of our current research (Rainfall variability) is to proceed to an evaluation of the potential rainfall risk by applying advanced geospatial modelling tools in Rwanda: geostatistical predictions and simulations, machine learning algorithm (different types of neural networks) and GIS. Hybrid models – mixing geostatistics and machine learning, will be applied to study spatial non-stationarity of rainfall fields. The research will include rainfalls variability mapping and probabilistic analyses of extreme events.

Key words: rainfall variability, Rwanda, extreme event, model, mapping, geostatistics.