Pluviometric characterization of the Coca river basin by using a stochastic rainfall model

Dunia González-Zeas (1), Adriadna Chávez-Jiménez (2,4), Xavier Coello-Rubio (1), Ángel Correa (3), and Ángela Martínez-Codina (4)

(1) Association CFE–PYPSA–CVA–ICA, Quito, Ecuador, (2) Department of Civil Engineering, University of Piura, Peru, (3) Coca Codo Sinclair Hydroelectric EP, Quito, Ecuador, (4) Department of Hydraulic and Energy Engineering, Technical University of Madrid, Spain

An adequate design of the hydraulic infrastructures, as well as, the prediction and simulation of a river basin require historical records with a greater temporal and spatial resolution. However, the lack of an extensive network of precipitation data, the short time scale data and the incomplete information provided by the available rainfall stations limit the analysis and design of complex hydraulic engineering systems. As a consequence, it is necessary to develop new quantitative tools in order to face this obstacle imposed by ungauged or poorly gauged basins. In this context, the use of a spatial-temporal rainfall model allows to simulate the historical behavior of the precipitation and at the same time, to obtain long-term synthetic series that preserve the extremal behavior. This paper provides a characterization of the precipitation in the Coca river basin located in Ecuador by using RainSim V3, a robust and well tested stochastic rainfall model based on a spatial-temporal Neyman-Scott rectangular pulses process. A preliminary consistency analysis of the historical rainfall data available has been done in order to identify climatic regions with similar precipitation behavior patterns. Mean and maximum yearly and monthly fields of precipitation of high resolution spaced grids have been obtained through the use of interpolation techniques. According to the climatological similarity, long time series of daily temporal resolution of precipitation have been generated in order to evaluate the model skill in capturing the structure of daily observed precipitation. The results show a good performance of the model in reproducing very well the gross statistics, including the extreme values of rainfall at daily scale. The spatial pattern represented by the observed and simulated precipitation fields highlights the existence of two important regions characterized by different pluviometric comportment, with lower precipitation in the upper part of the basin and higher precipitation in the lower part of the basin.