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Climate change impact on variability of rainfall intensity in upper Blue Nile Basin

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Extreme rainfall events are major problems in Ethiopia with the resulting floods that usually could cause significant damage to agriculture, ecology, infrastructure, disruption to human activities, loss of property, loss of lives and disease outbreak. The aim of this study was to explore the likely changes of precipitation extreme changes due to future climate change. The study specifically focuses to understand the future climate change impact on variability of rainfall intensity-duration-frequency (IDF) in Upper Blue Nile basin. Precipitations data from two Global Climate Models (GCMs) have been used in the study are Hadley Climate Model Version 3 and Canadian Global Climate Model version 3 (CGCM3). Rainfall frequency analysis was carried out to estimate quantile with different return periods. Probability Weighted Method (PWM) selected estimation of parameter distribution and L-Moment Ratio Diagrams (LMRDs) used to find the best parent distribution for each station. Therefore, parent distributions for twelve stations from frequency analysis are Generalized Logistic (GLOG), Generalized Extreme Value (GEV), and Gamma & Pearson III (P3) parent distribution. After analyzing estimated quantile simple disaggregation model was applied in order to find sub daily rainfall data. Finally the disaggregated rainfall is fitted to find IDF curve and the result shows in most parts of the basin rainfall intensity expected to increase in the future. IDF parameter A, B, and C are estimated for each scenario period and return period with both HadCM3 and CGCM3 projections. For the IDF parameters sensitivity analysis was carried out by increasing 10% from estimated result and parameter C is highly sensitive than A, and B. It is also expected to have a change on extreme precipitation by 1 to 26% increase with HadCM3 projection and by 11 to 61% increase with CGCM3 projection for most parts of the study area. But at station Debre Birhan (2020s) and Debre Markos (2080s) with HadCM3 result and at Hayk (2020s) with CGCM3 result and Gondar (both GCMs) shows decreasing extreme precipitation. As a result of the two GCM outputs, the study indicates there will be likely increase of precipitation extremes over the Upper Blue Nile basin due to the changing climate. This study should be interpreted with caution as the GCM model outputs in this part of the world have huge uncertainty.

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