



The increased frequency of flash floods in Ethiopia: climate change or human impact?

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In the last decade the frequency of flash floods has markedly increased all over Ethiopia. They have caused a number of fatalities and a large amount of property damage. The occurrence of such flash floods is recorded mainly in semi-arid areas with the monsoon-like rain distribution typical of Ethiopia and an annual rainfall around 500-700 mm. In order to investigate the effect of climate change, the rainfall intensity in 24 hours data from 19 meteo station evenly distributed across Ethiopia have been considered. The data cover different time intervals with the longer series spanning the last 60 years. Taking the value of 100 mm/24hr as a reference threshold to trigger a flash flood, based on the data of the devastating flood of the Dechatu River that severely affected the town of Dire Dawa in 2006, the data analysis has shown that for half of the rain gauges a rainfall intensity of 100 mm in 25 hours occurs with a frequency of less than 20 years and two thirds of the meteo stations record a rainfall intensity of 80 mm in 24 hours with a frequency of less than 10 years. These results indicate that the whole country is potentially prone to flash floods hazard. The shortest return intervals (less than 10 years) were found in semiarid areas and at rain gauges located near the main rifting escarpments, i.e. where commonly the headwater of the most of the river catchment is located. The highest rainfall intensities may occur in every month, though they are more common in July and August and, subordinately in March April. By contrast no relation was found between maximum rainfall intensity and annual precipitation or elevation. The data analysis indicates also that there is no clear trend in peak rainfall intensity throughout the six decades investigated. Therefore, the increased frequency of flash floods in a few areas of Ethiopia cannot be accounted for by any significant change in rainfall intensity. In order to investigate man induced effect, two study areas were considered. They are the Dechatu R. in Dire Dawa and a few rivers in the Kobo-Alamata basin. The rivers of both these areas are ephemeral and have water flowing only in response to very intense downpours. These two case studies show that man impact can be even more important than climate factors. In the Dechatu river a marked change in land use and vegetation, consisting mainly of forest clearing and a substantial increase in household settling, occurred in the last decades, whereas in the Kobo-Alamata basin the recent construction of under fitted bridges are investigated as the main causes that led these ephemeral rivers to accentuate their main distinctive natural characteristics that are flash floods and a very large sediment transport, with this latter factor exacerbating their devastating effects.