

## Predicting and analyzing flash floods of ungauged small-scale drainage basins in the eastern desert of Egypt

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**Abstract:** Although the coastal area spreading between Safaga and El Quseir span of the hyper-arid regions, it is frequently influenced by severe flash floods. Deficiency of rain-gauges is a great challenge faced by scientists in this arid and hyper-arid regions for predicting and analyzing torrential runoff accompanied by severe floods. The present work rises to this challenge depending on extrapolation of the Rainfall over the Red Sea Mountain (RRSM) using inverse distance weighted method (IDW) and analysis of the historical flood events for the period 1925-1997. Runoff prediction has been done using rational methods i.e. peak discharge  $Q_{peak}$  and time of concentration  $T_c$  depending on some hydro-morphometric parameters of the catchment area (e.g. area, length, gradient, soil characteristics, and average rainfall intensity). This study inferred that probability of annual occurrence P is high (92.3 %) where the RRSM as much as 10 mm and it is very low (2.9 %) where the RRSM is about 75 mm. However, the return period T analysis revealed that events of low rainfall are likely to occur every 1.3 years. Inversely, events of high rainfall are likely to occur every 34 years. Analysis of the METEOSAT infrared images covering northern Red Sea and Eastern Mediterranean during the last four flood events (1991, 1994, 1996, and 1997) explicated that southern-eastern Egypt and the Red Sea Coast were vulnerable to thunderstorms especially during October and November, resulting in heavy torrential rain and followed by severe flash floods. It has been inferred that large areas of Safaga and El Quseir cities are the most vulnerable to severe floods.

**Keywords:** Egypt, Eastern Desert, Flash flood, Safaga, El Quseir, Red Sea