Geophysical Research Abstracts
Vol. 16, EGU2014-12058-1, 2014
EGU General Assembly 2014

Flash floods in the Sahara: A case study for the 28th January 2013 flood in Qena-Egypt

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Understanding the torrential rainfall and its consequent surface runoff in the Sahara is a crucial issue for better flood protection and water management plans. This is often hampered by lack of the appropriate in situ measurements. Even now the satellite derived rainfall suffers from great uncertainty. Thus, we adjusted the data obtained from real-time satellite rainfall coverage (HYDIS) using the in situ observed rainfall (Robs). Hydro-morphological parameters were then integrated with the empirical curve number (CN) approach to estimate the surface runoff in Qena, Egypt during the 28th January 2013 flash flood event. We deduced that the study area received a total precipitation ($\sum$Rcum) of $\sim$35.6$\times$106 [mm] and a total rain volume ($\sum$Rvol) of $\sim$88.9$\times$109 [m3] mainly from wadi Qena (89.8%). The majority of the rainfalls fell at light intensity (<2.5 [mm hr-1]). The estimated total surface runoff ($\sum$Qsur) was 26.5$\times$106 mm and the total runoff volume ($\sum$Qvol) was 66.2$\times$106 [m3]. The total surface transmission losses ($\sum$Tlos) were calculated as 9.1$\times$106 [mm], which represents about 25.6% of the total precipitation ($\sum$Rcum) and creates substantial opportunities for alluvial aquifer recharge. The total surface runoff ($\sum$Qsur) and flood magnitude were generally low, therefore, flood influences were restricted to the destruction of some roads in Qena but no fatalities were involved, nevertheless. Most of the running water was contained by the El Sail Canal and poured into the Nile River. It is expected that the applied method in this study will be helpful for our understanding and quantification of flood hydrology and contribute to better risk management plan in the arid and hyper-arid regions.