

Investigating the Morphometry and Hydrology of Drainage Networks using Remote Sensing and GIS: A Case Study in Wadi Umm Gheig, Eastern Desert of Egypt

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The drainage networks in the Eastern Desert of Egypt are of complex patterns due to the variability of underlying rock units, structural trends related to the opening of the Red Sea and uplift of the mountains, and the hydrological processes. The relief of basement rocks is highly variable and ranges from flat areas in the deeply eroded granitic plutons to steep ridges in the hills and mountains. The faults are very common and the subtle changes in throws have produced conspicuous scarps. Accordingly, the gradient and profiles of the Wadi floors do not differ from one catchment to another, but also within same drainage basin. Therefore, the morphometrical analyses of Wadi Umm Gheig, Eastern Desert, have been investigated in order to assess the control on the occasional flash floods and fragile groundwater resources. The drainage networks have been derived from the Digital Elevation Models (DEM) and topographic maps were compared with their counterparts on the Landsat satellite images. The morphometrical parameters of the drainage networks of different sources are more or less similar. But specific Wadi channels (i.e. alluvium) are occupied by opposite flow directions of the drainage networks, thus the watershed divides are disclosed across these dry channels corridors. The changes of flow directions for these paleo channels can be attributed to the neotectonic activities along the structural lines. Consequently, the regional groundwater flow directions have been locally affected by the induced changes in surface flow direction. A flash flood hydrograph was estimated given the 'GIS-spatially distributed time-area zones' for the catchment, a designed storm of uniform rainfall distribution and intensity, and an estimated average runoff coefficient and transmission loss. The resulting hydrological analyses indicate the need for mitigation measures to be considered in the development areas within the catchment. Furthermore, the occasional runoff harvesting could be allocated in certain areas that are characterized by alluvium conditions capable to develop groundwater aquifer.