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# The River Nile Rifting in Egypt: A new tectonic model

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The (Cenozoic) River Nile is one of the major fluvial systems in the world. Since decades (the early 20th Century), the Egyptian Nile has been one of the well-known and studied parts of the River. It has attracted the attention of several interdisciplinary studies. Some workers have interpreted it as an erosional feature, while others believed in its rifting nature. To this day, the origin, structural setting and geodynamics of the Egyptian part of the Nile are not well understood. Moreover, most of the previous studies have not considered possible controls on the tectonic evolution of the Nile by inherited basement fabrics or Mesozoic rift basins and structures. The present study suggests a new rift model of the Nile river in Egypt, in which we have integrated surface and subsurface data along its course between latitudes 25˚ to 29˚ N and longitudes 29˚ to 33˚ E. We present the results of detailed fieldwork, analysis of multispectral satellite images and ultra-high resolution digital elevation models (down to 1-meter resolution) as well as interpretation of high quality gravity and magnetic models and 3D seismic data.
In our model, we propose the existence of three main late Paleogene-early Neogene rift segments (southern, middle and northern blocks) of WNW to NNW-NW orientation, which are distributed on the eastern and western shoulders of the River Nile. These rift blocks are separated and terminated by E-W to ENE accommodation or transfer zones. The accommodation zones include the southern Qena ENE dome and shear faults; the central ENE to E-W Wadi El Assiuty basin and its bounding right lateral strike-slip faults, and the northern Beni Suef-Faiyum belt. The rift basins and transfer zones are in part underlain and controlled by structures and basins that formed asynchronously during Mesozoic rifting phases and were rejuvenated differentially in the Cenozoic.
Our study focuses mainly on the late Paleogene-early Neogene rifting phase. We believe that this phase was initiated in the Nile domain contemporarily with the Oligocene Red Sea-Gulf of Suez rifting. This phase of extension is documented in the middle part of the Nile, by Oligocene fluvial early rift sediments and red beds, the development of an extensive network of fractures, normal fault-related folding and volcanism. We have mapped and studied several basaltic occurrences in the entire area on both sides of the Nile rift system. Some of them represent the core of NW elongated anticlines that are made up of relatively steeply dipping pre-rift Eocene rocks, and occasionally cored by Cretaceous sediments. By contrast, the surroundings of these anticlines are flat-lying beds with very mild deformation, as an indication that localised and severe uplifting was caused by the volcanism that erupted coevally with the onset of rifting. NW striking dikes and extensional faults delineate the basalts and their hosting domes. We conclude that the Nile river evolved on a Paleogene rift aborted at an early stage.