

The Mesozoic Rift Systems of North Africa and Arabia: Overview and Exploration Future

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ABSTRACT

Pangaea and its component Gondwana have been undergoing break-up since the Permian. In Arabia and North Africa this was tied most closely to the opening of Neotethys and the Indian Ocean. On several occasions these evolving rift systems attempted to link together through the interior of the supercontinent and similarly to the slightly younger South Atlantic. This resulted in the formation of the Anza-South Sudan-Central African, Ogaden-Yemen-North Sudan, and Niger-South Sirt intra-continental rifts that all ultimately failed. In North Africa rifting initiated in the Permian and by the Triassic Neotethys reached from Tunisia to the Levant. As an oceanic basin continued evolving to the north, continental rifting shifted in-board to the eastern Sirt-Western Desert east-west rifts during the latest Jurassic. This period saw the deposition of a broad belt of fluvial/near shore continental source rocks. In Arabia, several rifts developed during the Late Jurassic as the easternmost manifestation of the Central African rift system. Most of these failed rift basins, which can be correlated from Yemen to Somaliland, developed effective marine source rocks. A more significant extensional event began in the earliest Cretaceous and was followed by a plate-scale rotation of extension direction by the Aptian. The Aptian-Albian was also a major period of subsidence in the Anza-South Sudan rifts and resulted in lacustrine environments and the main source rocks of these regions. Rifting in the Late Cretaceous occurred in several phases, interrupted by plate-scale inversion during the Santonian. In Arabia, the Euphrates Graben in Syria developed during the latest Senonian. Interconnectivity and simultaneous tectonic activity in the many rifts of Africa and Arabia was greatest during the Cenomanian-Turonian and again in the Campanian-Maastrichtian. This resulted in marine incursions that deposited the tremendous source rocks of the Sirt and also in the Euphrates rift. Future exploration potential is largely the result of this extremely complex rifting history that has made deeper and older stratigraphic intervals difficult to resolve seismically and to reach with the drill bit. The rich variety of source rocks similarly adds to this potential and likewise the complexity of the problem.