

## Review on Tectonics of Barmer rift Basin, Rajasthan, India

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The Barmer basin is < 50 km wide, ~ 200 km elongated trending NNW extending up to Sanchor towards S. It is a part of NW segment of Indian plate in Rajasthan state, India. The Fatehgarh fault limits the northernmost part of the basin. The Barmer basin consists of Jurassic to Eocene shallow marine- and fluvial sediments. The basin separates from the pericratonic Jaisalmer basin by a NE trending structural high: the Devikot-Fatehgarh/Barmer-Devikot-Nachana ridge. While the eastern segment of the basin is fault bound with thicker sedimentary cover, the western part comprises of basement uplifts with thinner sediment layer. The Barmer rift extends southward towards Sanchor and into the Cambay rift system. The Malani basement rhyolites are exposed in and around Barmer on the western rift shoulder. Bouguer anomaly gravity lows occur distinctly along the Cambay basin, which extends into the Barmer rift basin associated with high amplitude gravity highs (0 to 50 mGal) along the rift shoulders on either side. The gravity low at Jaisalmer basin (~ -20 to -50 mGal) is separated by a low-intensity gravity high (-5 to -15mGal), trending NE, from the Barmer basin (~ -15 to -35 mGal). The residual magnetic anomaly maps also depict similar geometry. Additionally, there are gravity- and magnetic trends along NE-SW connoting flexed basement. The high magnetic anomalies, associated with rift shoulders, resemble those produced by mafic intrusions in the basement. Moreover a ~ 100 km deep linear NNW trending low velocity zone exists below the Barmer basin. All these indicate that the Mesozoic rift basin reactivated ~ end Cretaceous due to Reunion pluming resulting in Deccan volcanism thereby extending the second rifting phase into the Cambay basin. A modelled NE-SW profile from Bouguer anomaly map across Barmer basin identifies a mafic basement with large-scale intrusion along with Moho upwelling up to 27-28 km beneath the basin like a typical rift basin. The dominant fault system in Sarnoo hill area at the eastern rift shoulder strikes NE and accommodates more deformation than its NW cross trend. Images from Google Earth Pro also shows three sets of lineaments in the Sarnoo hill area. The NE trend is the most distinct one and is followed by ENE and a less prominent ~ ESE trend. The Barmer hill section in the western rift shoulder is of Malani igneous suite. The Google Earth Pro images of this area depicts clear NW trending lineaments and an indistinct N-S one. The evolution of younger lineament fractures like Rajkot-Lathi and Jaisalmer-Barwani lineaments might indicate shallow crustal flexure. The Rajkot-Lathi lineament runs N-S along the NW limit of the Barmer basin. The NW-SE trending Jaisalmer-Barwani lineament runs longitudinally along the W margin of the Barmer basin. Few key unanswered issues for the Barmer rift system are (i) scale of deformation; (ii) strain rates and mode of deformation- was it a continuous rifting or was it pulsating; (iii) was initial rifting magmatic or amagmatic; and (iv) genesis of neotectonic lineaments. This review speculates (i) the Barmer petroleum basin is a failed continental rift; (ii) Deccan volcanism affected only the eastern rift shoulder of the Barmer basin; (iii) the rift faults are at high-angle on the two rift shoulder margins; and (iv) the rift faults are oriented in different (near perpendicular) directions on the two rift shoulders.