Evidence of the Mid-Clysmic Event in the Red Sea, Saudi Arabia

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Abstract

The Mid-Clysmic unconformity is an intra-Burqan (Intra-Rudeis equivalent) event that marked the rift climax and major subsidence during the evolution of the Gulf of Suez. This event is well recognized in the Gulf of Suez and its age is well constrained (16.5-17Ma). Despite being well documented, its origin remains a contentious question. The Mid-Clysmic event is proposed to have originated due to a far-field effect of the imminent collision between Eurasia and Arabia along the Zagros-Bitlis suture (Bosworth et al., 2005). Many authors (e.g. Wescott et al., 1996) have, however, attributed the Mid-Clysmic event to rift shoulder uplift which is proposed to be associated with magmatic under-plating according to Garfunkel (1988). Gupta et al., 1998 suggested that rift-climax can be attributed to fault interaction and linkage rather than a change in extension rate induced by a major change in tectonic regime. This study utilized various subsurface datasets to examine the occurrence of the Mid-Clysmic unconformity in the Red Sea and critique existing hypothesis addressing its origin. Seismic data from the Saudi Arabian margin of the Red Sea, dip-meter measurements and biostratigraphic studies indicate that the Mid-Clysmic unconformity is longitudinally widespread and is recognized in the Red Sea Basin. The unconformity is inferred from the clear change in dip of seismic reflectors between lower Burqan and middle Burqan indicating a change in tectonic regime and rate of subsidence. Similar interpretation can be drawn from dip-meter measurements obtained from image logs. Furthermore, major reworking of Cretaceous fauna has been documented at the boundary between lower Burqan and middle Burqan, confirming a stage of un-roofing (i.e. rift shoulder uplift). This study suggests that the mid-clysmic unconformity was initiated by a regional tectonic event affecting both the Gulf of Suez and the Red Sea Basin. Therefore, far-field effect may better explain its origin, since both magma under-plating and fault linkage may only have a sub-regional impact on the tectonic regime.