Analysis of tectonic phases and structural styles during evolution of Andaman Basin using restoration technique

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Abstract:
The Andaman basin evolved through polyphasic tectonic phases, viz passive margin phase during Mesozoic to soft and hard collision / convergence of Indian plate below Asian plate since Early Cenozoic to Recent. Structural restoration along selected profiles, passing through three major tectonic zones, viz. fore arc , volcanic arc and back-arc have been carried out. Study has revealed Early Cretaceous extension followed by soft collision / convergence phase during Eocene between Indian and Asian plates which resulted in maximum structural shortening. Collision / convergence caused accretion of earliest trench sediments by reverse faulting and folding, resulting in gradual fore arc uplift and formation of earliest fore arc sag. Oligocene compression caused subordinate structural shortening and emergence of Andaman Island chain and development of present inner fore arc low in eastern part.

The major structural styles identified in the basin are: compressional structures in outer fore arc, extensional features in inner fore arc and arching due to plutonic/volcanic activities in eastern part. Major compression resulted in uplift and negative accommodation along Andaman Island chain, whereas extension resulted in subsidence and positive accommodation in inner fore arc facilitating deposition of marine flysch fan. More than 7 km of sedimentary load caused basement subsidence of about 1547m in the inner fore arc low. Major faults are detaching towards east at depths ~8 to10 km near basement level in the inner fore arc. In the volcanic arc, emplacements of plutons have been visualized in upper crust during different times since Early Miocene onwards. Plutonic complexes caused arching up of basement and subsidence due to associated extension. This caused deposition of carbonate on the shoals and fans in the adjoining lows. North south trending volcanic arc were further subjected to NW-SE extension during late Miocene which led to development of intra volcanic lows, filled with volcanoclast, deep water fans and pelagic sediments.

The structural modelling has helped in evaluating prospectivity and related risks of few identified prospects in the basin.

Note: Authors are employed in ONGC and solely responsible for opinions presented in the paper