Jagmohan Singh and K.K. Nayak, ONGC, Western Onshore Basin, Vadodara

Cretaceous Sequences and their Chronostratigraphic Correlation in Western Part of Jaisalmer Basin

jagmohansinghongc@gmail.com

Detailed biostratigraphic studies have been carried out in the western part of Jaisalmer Basin. Chronostratigraphic and paleoecological modeling has been attempted. Hiatuses and there spans have been determined within framework of sequence stratigraphy in Jaisalmer Basin. The Pariwar Formation represents a regressive phase wherein subtidal to innershelf conditions prevailed in this basin. The Pariwar Formation has been dated as Neocomian to Aptian on the basis of foraminiferal studies. It is inferred that 30-50m or little deeper bathymetries within Inner shelf environment could be inferred for deposition of Pariwar sediments. The Goru Formation mark the second transgressive cycle of Mesozoic sedimentation and it is inferred that deposition took place under inner shelf regime. The Lower Goru Member is dominantly shale having very thin wackestone interlayers and calcareous siltstone beds having glauconite. The Upper Goru Member is characterized by siltstone and shale facies. The Lower Goru Member has been assigned Albian age. Around 40 to 100m paleobathymetries within the Inner to Middle shelf environments have been inferred for this Member. The Upper Goru Member has been assigned Cenomanian age. It can be inferred that the Upper Goru Member sediments were laid down in deeper part of Middle shelf environment with bathymetries ranging between 70-100m and occasionally up to 120m bathymetry in the outer shelf regime.

The Parh Formation has been dated as Turonian to Santonian. The Parh Formation is constituted mainly of argillaceous limestone and highly calcareous clays might have been laid down in open marine condition below wave base. The Parh Formation in the drilled wells comprises of thick alternations of fine grained wackestone and marl facies. Bathymetries of the order of around 200m of Outer Bathyal environments have been inferred for the deposition of sediments represented by this formation. Anoxic conditions have been inferred on the basis of very high planktic/benthic ratio. The top of the Parh Formation is marked by a regionally correlatable unconformity *(K/T* boundary).

Six hiatuses have been recognized in this work on the basis of foraminiferal studies. These are: Early/Middle Aptian hiatus 121-116.48 Ma (span 4.52Ma), Middle/Late Aptian hiatus 118.37-112.2 Ma (span 6.17Ma), Early Cenomanian hiatus 98.9-96 Ma (span 2.6Ma), Middle Cenomanian hiatus 97-95.81 Ma (span 1.19Ma), Early Turonian hiatus 93.9-93.29 Ma (0.61Ma) and *KIT* boundary regional hiatus. The magnitude of hiatus across KTB spans a duration of around 23.5 Ma *i.e.* from 83.5 Ma to 60 Ma.

The western Rajasthan shelf located to the west of Aravali ranges represents three important basins viz. Jaisalmer, Bikaner-Nagaur and Barmer (FIG. 1). It stretches over 1,20,000 sq. km. area. Each basin has different geological and sedimentation history, although at some point of time, there were some common elements. Bikaner-Nagaur and Barmer basins are essentially, Paleozoic and Cenozoic basins, respectively. The Jaisalmer Basin is the distal part of intracratonic sag, with Precambrian intracratonic rift setting related to Rodenia fragmentation during Late Proterozoic, as it is about 1500 kms away

from plate margin towards north and 400 km towards west. Of the three sedimentary basins, within the west Rajasthan shelf, the Jaisalmer basin is the biggest. The basin is located on the north-western slope of the Indian platform forming the central part of Rajasthan shelf: latitude 26 40' - 28 00' N; longitude 69 40' -71 00'E.

The Jaisalmer Basin, however, has a well documented Mesozoic and Cenozoic history. On account of its hydrocarbon prospectivty, the Jaisalmer basin has gained importance for hydrocarbon exploration. Jaisalmer basin is still to be placed on oil map of India, as yet, only some show on presence of liquid hydrocarbons in CT-A and GT-B has been reported. The liquid hydrocarbon show in these wells is from Early-Late Cretaceous TST.

The main objective of this work is to establish biostratigraphy and interpret paleoenvironments of Mesozoic successions in wells Sadewala-A, Achalwala Tibba-A, Chinnewala Tibba-A, Chinnewala Tibba-B, Langhewala Tibba-A, Kharatar-G, Shahgarh-Band Lang-B drilled in the western part of Jaisalmer basin of Rajasthan. Prepration of paleoecological model for Mesozoic sediments and decipher span of hiatuses within framework of sequence stratigraphy in Jaisalmer Basin has also been dealt in detail. The main aim of biostratigraphic studies has been to determine the planktic foraminiferal zonation and dating of Mesozoic sections in the studied wells and to infer hiatuses, anoxic events and paleoenvironments leading to reconstruction of paleobiogeography. These data will be helpful in sequence, event stratigraphy and eventually in hydrocarbon exploration.

**MESOZOIC BIOZONATION**

A rich assemblage of Cretaceous planktic along with varying population of benthic foraminifers has been recorded in the deeper sections of the wells Lang#B (2000-3400M), SG#B (2100-3200M), LT#A (l050-2700M), RBT#A (900-2695M), CT#A (1000-2000M), CHT#B (1000-2300M), AT#A (900-2500M), KT#G (lOOO-2105M)and SD#A (900-2500M) as shown in FIG.2. The Mesozoic sectons studied in this work have been dated as Callovian-Oxfordian and Kimmeridgian-Tithonian for Jurassic sections. These richly fossiliferous Cretaceous sections have been dated as Hauterivian at the base and Santonian towards the top and markedly separated from Cenozoic by a pronounced hiatus *i.e.* K/T Boundary. To subdivide the time interval from 132ma to 84ma *i.e.* a total of 48ma from the Hauterivian to the Santonian, **14** planktic biozones are recognized in this work. Paleoenviornments have been inferred and paleobathymetric curves have been reconstructed. The biozones recognized in this study are correlatable with the European standard stages and with some standard planktic foraminifer zones in the North Africa, Central Europe, Western Gulf Coastal Planes, Western Mediterranean area, Northern California and other areas in India.

Fourteen biozones for the Cretaceous sections have been identified to finely date the subsurface Mesozoic sections in wells AT#A (900-2500M), CT#A (l000-2000M), CT#B (l000-2300M), KT#7 (l 000-2105M), LANG#2 (2000-3400M), LT# 1 (1050-2700M), MT#17 (300-1100M), RBT#A (900-2695M), SD#A (900-2500M) and SG#B (2100-3200M). The planktic biozones recognized are: *Globuligerina hoterivica - H. sigali Zone* (Hauterivian -Barremian), *Globigerinelloides blowi Zone* (Early Aptian), G. *ferreolensis*

*Zone* (Middle Aptian), *Hedbergella gorbachikae* and *Hedbergella troicoidea-Hedbergella maslakovae Zone* (Late Aptian), *Ticinella roberti- T. raynaudi- T. primula Zone* (Early Albian), *Favusella washitensis - Ticinella bejauensis - Rotalipora ticinensis Zone* (Late Albian), *Rotalipora gandolfi/R. brotzeni Zone* (Early Cenomanian), *Rotalipora reicheli Range Zone* (Middle Cenomanian), *Rotalipora cushmani Partial Range Zone* (Late Cenomanian), *W. archaeocretacea Zone (Early Turonian), Helvetoglobotruncana helvetica Range Zone* (Middle Turonian), *M Sigali/D. hagni/Marginotruncana marianosi-Falsotruncana maslakovae* Zones (Late Turonian), *Dicarinella primitiva-Dicarinella concavata Zone* (Coniacian), *Dicarinella asymetrica Zone* (Santonian).

Six Hiatuses could be marked on the basis of planktic biozonation. The lowermost hiatus, the Early/Middle Aptian hiatus is marked at 1850m in well RBT#A, where the zones *G. blowi* and *G. ferreolensis* are missing spanning 121-116.48 Ma. The Middle/Late Aptian hiatus is identified at 2030m in well LT#A where the zones *G. ferreolensis* and *H.* gorbachikae are missing spanning 118.37-112.2 Ma. The Early Cenomanian hiatus is picked up at 1555m in well KT#G where the Zone *R. gandolfi/R.brotzeni* is missing spanning 98.9-96 Ma. The Middle Cenomanian hiatus is indicated at 1480m in well LT#A where the Zone *R. reicheli* is not recorded spanning 97-95.81 Ma. The Early Turonian hiatus is identified at 1550m in well AT#A as *W. archaeocretacea* zone is not present spanning 93.9-93.29 Ma. The top of Cretaceous in wells Lang#B (2030-2070M), SG#B (2119-2170M), LT#A (l070-1120M), RBT#A (1000-11OOM), CT#A (1060-1080M),
CT#B (1060-1090M), AT#A (1220-13IOM), KT#G (1050-1070M), and SD#A (960-1020M) have yielded *Dicarinella asymetrica, D. primitiva, D. concavata, D. canaliculata, M sinuosa, M coronata, M sigali, M renzi, M sheegansi, M pseudolinneian* and *M. marginata* are supportive of paleobathymetries of the order of around 200m of bathyal environment. This is followed on the top by a sudden drop in bathymetries and total elimination of Cretaceous fauna. In the south western wells at Lang#2 and SG#2 the Cretaceous/Tertiary boundary (KTB) is encountered at 2030m and 2119m respectively. In north western wells KTB is encountered at LT#A (l070m), RBT#A(1000m), CT#A(1060m), CHT#B (1060m), AT#A(1220m), KT#G (1050m), and in the extreme NW in SD#A at 960m. The K/T boundary can be easily picked up between the *Dicarinella asymetrica* zone of Santonian age and *Morozovella velascoensis* zone or *Assilina dandotica* zone of Paleocene (Thenetian) age. In some wells poorly fossiliferous sediments overlie the K/T boundary. This contact is unconformable as Campanian, Maastrichtian and Danian are represented by a hiatus. The magnitude of hiatus across KTB spans duration of around 23.5 Ma *i.e.* from 83.5 Ma to 60 Ma.

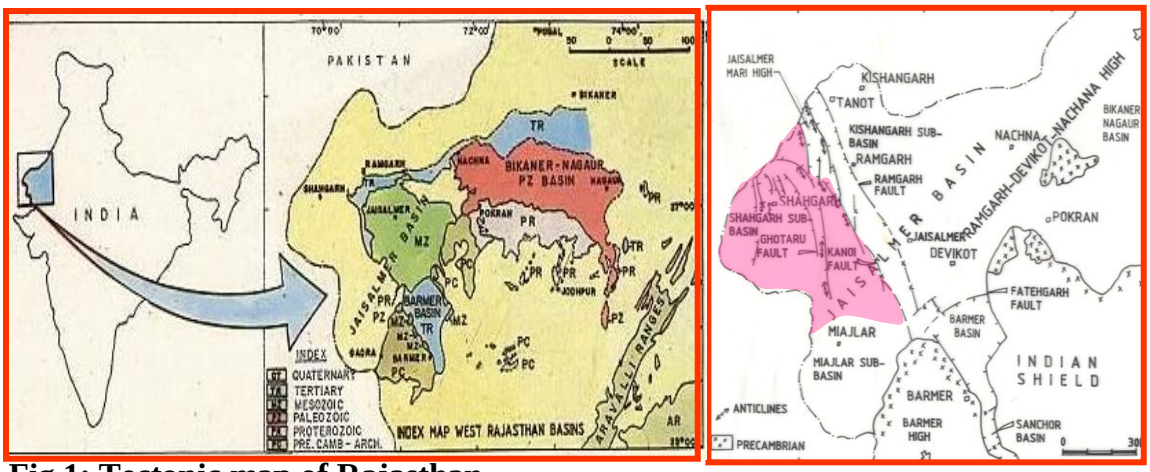


**Fig.1: Tectonic map of Rajasthan**

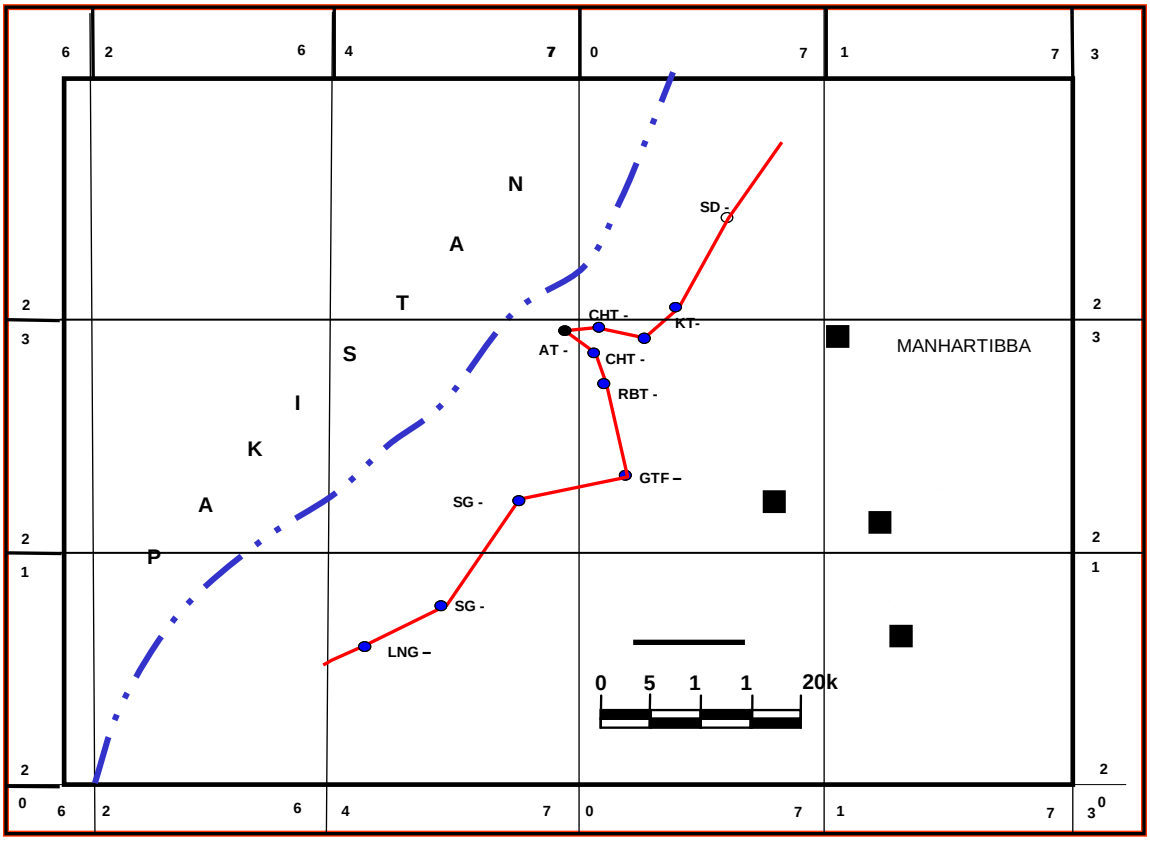


**Fig. 2 Location Map of Studied wells, Jaisalmer Basin**