**Paper ID: 1992753**

# Facies and paleogeography of the Eocene limestone, Jaisalmer basin Rajasthan, western India

A. Patra and B.P.Singh

Centre of Advanced Study in Geology, Banaras Hindu University, Varanasi-221005

***Presenting author, Email:*** *amitava.geol@gmail.com*

## Abstract

In this paper, attempts have been made to facies analysis and reconstruct paleogeography of the Eocene limestone of Jaisalmer basin. Three limestone facies are identified those are chalky limestone, fossiliferous limestone and nodular limestone and these facies reveals an overall shoaling sequence developed in platformal setting. The studied limestone containing algae and larger foraminifera suggesting that the biotic component played a major role during carbonate precipitation.

## Introduction

The Jaisalmer Basin is the eastern extension of the shelf part of the Indus basin and represents a more or less central part of the "West Rajasthan Shelf" tectonic province that is located to the west of the Aravalli ranges (Singh, 2007). Paleocene-Eocene succession of the Jaisalmer area is exposed in a crescent shape in the north of the Jaisalmer city between Habur and Bandah villages. The Eocene limestones are exposed in Khuiala and Bandah village along with the alteration of shales.

## Methodology

Individual facies were demarcated in the field on the basis of colour, sedimentary structures, grain size, composition and fossil content. Thickness of the individual facies was measured with the help of measuring tape and litholog was prepared from base to top. Fresh samples of Eocene carbonate were collected in and around Khuiala village. Thin sections were prepared from representative limestone samples.

## Discussion

The chalky limestone is evenly bedded, likely deposited in the onshore region of a shelf. The presence of ooids in the chalky limestone indicates that the deposition took place in shallow water close to platform margin. This limestone also contains peloids which may be of faecal origin and can be referred to as pellets also indicate shallow depth and protected part of the platform. The common presence of *Orbitolites*, Nummulites indicates that the lithofacies was deposited along the platform margins in depth ranging from intertidal to around 50 m. The presence of fenestral fabric and secondary porosity suggests that they have developed due to subaerial exposures in the peritidal environment.

The fossiliferous limestone covers larger areas of the platform from water depths of around 9 m to just expose at low tide and currents and wave action are generally sufficient to prevent deposition of lime mud during their deposition (Tucker and Wright 1990). Thus, it is envisaged that the fossiliferous limestone deposited under the influence of currents and waves on the platform. The presence of broken skeletal components and planner beddings reflect high intensity tidal currents and wave activities play major role in the deposition of this limestone facies. The platform margin zone characterized by the subtidal bathymetry is affected by waves and tides, and reflects high energy conditions. So the fossiliferous limestone deposited in the platform margin influenced by waves and tides.

The nodular limestone with development of weak bedding features and without any fossil content indicates deposition in a low energy shallow marine environment. Nodular limestone deposits on platforms in intertidal to supratidal zone where evaporative conditions exist (Boggs 2009). Thus, the nodular limestone was deposited on a platform under the influence of evaporitic conditions in intertidal to supratidal and nodular nature of the limestone may refer and support an occasional period of storm activity (Bàdenas and Aurell 2001). Thus, it can be interpreted that the nodular limestone was deposited above the storm wave base under the influence of storm on the platform. However, the occurrence of pisolites suggests that it has mainly developed during early diagenesis and surface weathering (e. g. Tandon and Narayan 1981). Further, the abundance of nodules and fractures suggests longer period of exposure during the formation of nodular limestone (e. g. Grosjean et al. 2012).

Widespread shallow-water carbonate precipitates within the vast epeiric seas in tropical and subtropical climatic zones (Edinger et al. 2002). The tropical carbonates, typically, contain ooids and peloids and host diverse genera of larger foraminifera that are generally absent in the temperate carbonates (Ahr 1998; Hottinger 1998; Yordanova and Hohenegger 2007). The Eocene carbonate of the Jaisalmer basin composed of ooids, peloids and larger foraminifera suggest the tropical climatic condition. The occurrence of substantial proportion of the larger foraminifera in the Eocene carbonates suggests that they multiplied from early Eocene to middle Eocene as a result of warm temperatures in shallow seas owing to the Eocene warming (Hottinger 1998). The fossiliferous limestone facies in the Jaisalmer basin containing large amount of foraminifera, thus, suggests their formation during the Eocene global warming. The characteristic accumulation of the tropical factory is the flat-topped, often reef-rimmed platform (Schlager 2003).

## Conclusion

Facies analysis of the Eocene limestone of the Jaisalmer basin of Rajasthan is significant for the reconstruction of paleogeography. The limestones were deposited in tidal flat environment of a platform. Carbonate facies mainly composed of ooids, peloids, larger foraminifera and algae deposited in the photic zone and tropical climatic condition. The paleogeographic reconstruction of the Jaisalmer basin suggests that it was between the equator and the 20° N latitudes during early Paleogene.

## References


1. Ahr WM (1998) Carbonate ramps, 1973–1996: a historical review. In: Wright VP, Burchette TP (eds.) Carbonate Ramps, London Geol Soc Spec Publ 149: 7–14

2. Alonso-Zarza AM, Wright VP (2010) Palustrine carbonates. In: Alonso-Zarza AM, Tanner LH (ed) Carbonates in continental settings: facies, environment and Processes. Dev in Sedimentology 61: 103–131

3. Badenas B, Aurell M (2010) Facies models of a shallow-water carbonate ramp based on distribution of non-skeletal grains (Kimmeridgian, Spain). Facies 56: 89–110

4. Boggs S JR (2009) Petrology of sedimentary rocks. 2nd Edition, Cambridge University Press, p 607

5. Edinger EN, Copper P, Risk MJ, Atmojo W (2002) Oceanography and reefs of Recent and Paleozoic tropical epeiric seas. Facies 47: 127–149

6. Grosjean AS, Pittet B, Ferry S, Mahe´o G, Gardien V(2012) Reconstruction of Tertiary palaeovalleys in the South Alpine Foreland Basin of France (Eocene–Oligocene of the Castellane arc). Sediment Geol 275–276: 1–21

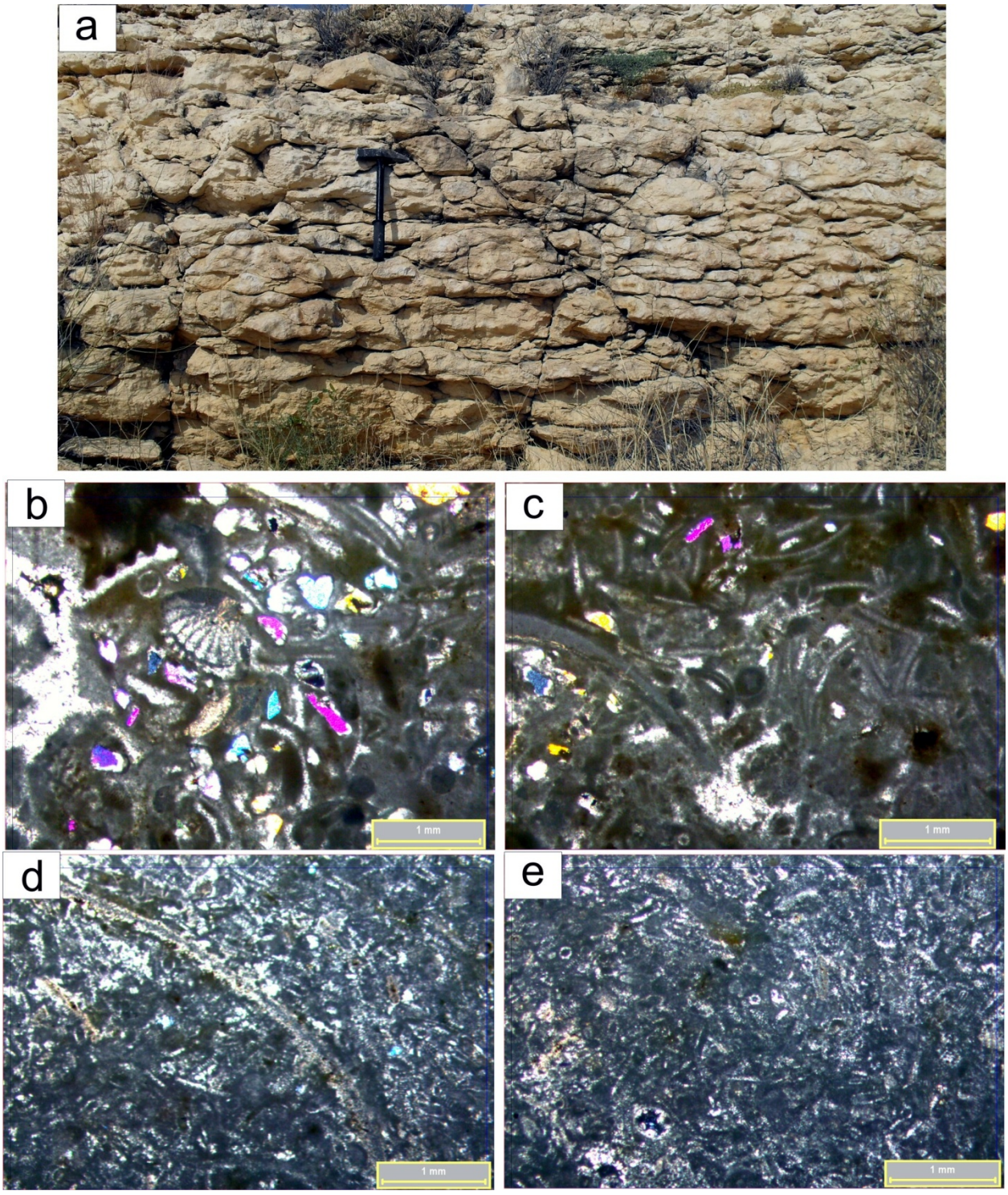
7. Hottinger L (1998) Shallow benthic foraminifera at the Paleocene–Eocene boundary Strata 1: 61–64

8. Schlager W (2003) Benthic carbonate factories of the Phanerozoic. Int. J. Earth Sci 92(4): 445–464

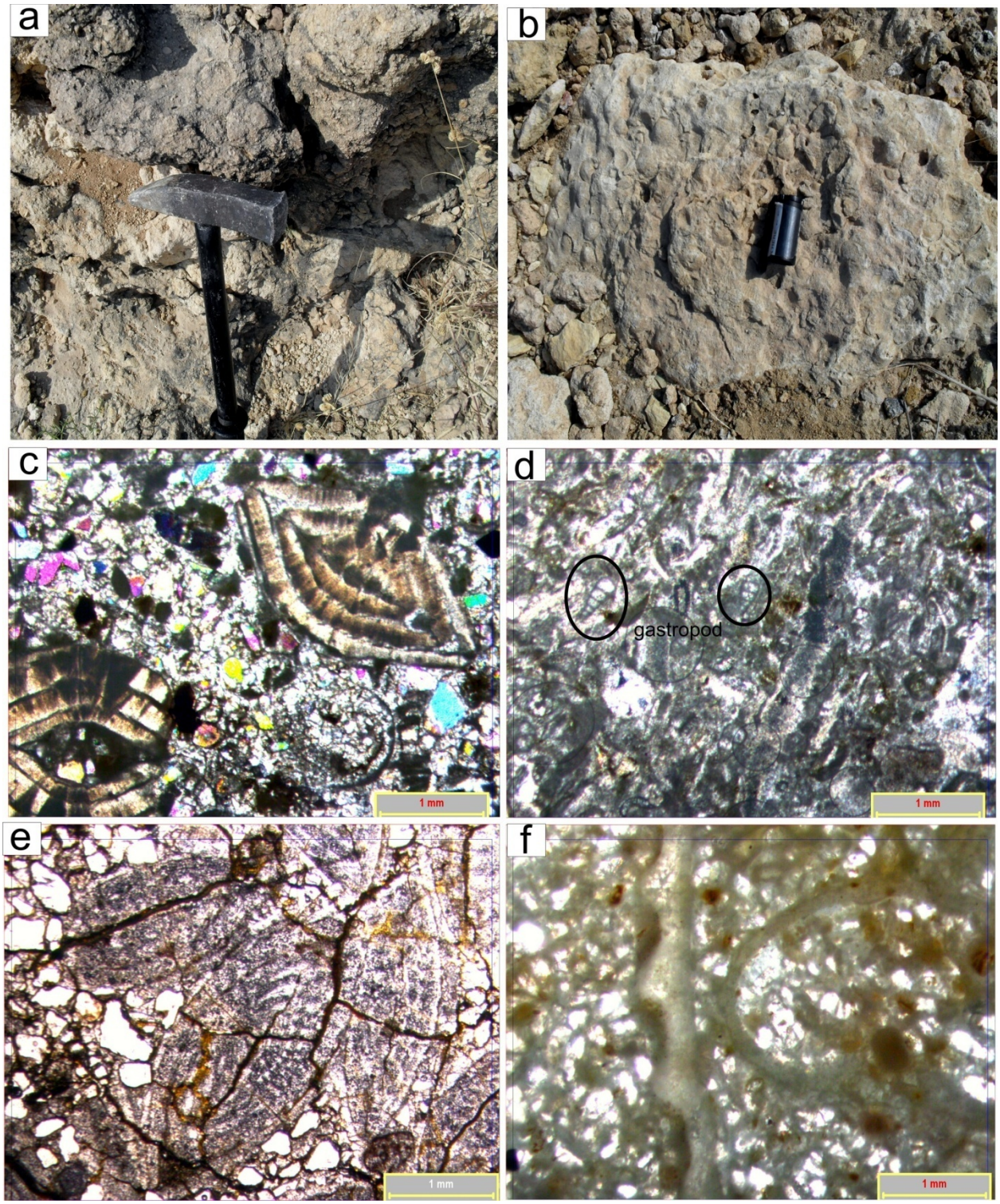
9. Singh NP (2007) Cenozoic Lithostratigraphy of the Jaisalmer Basin, Rajasthan, J Paleont Soc India 52(2), 129-154

10. Tandon SK, Narayan D (1981) Calcrete conglomerate, case-hardened conglomerate and cornstone: Comparative account of pedogenic and nonpedogenic carbonates from continental siwalik group, Punjab, India. Sedimentology 28:353-367

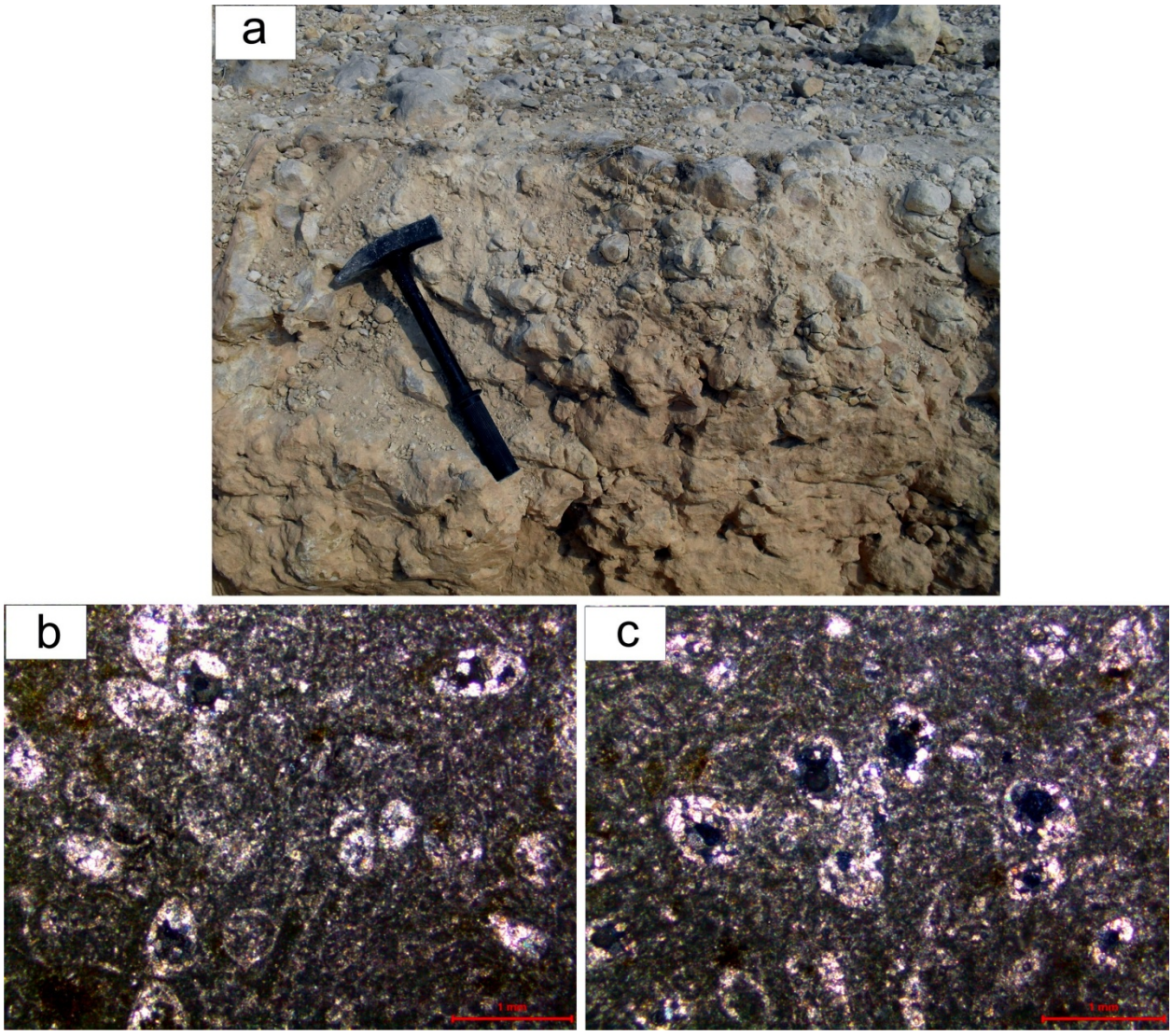
11. Yordanova EK, Hohenegger J (2007) Studies on settling, traction and entrainment of larger benthic foraminiferal tests: implications for accumulation in shallow marine sediments. Sedimentology 54: 1273–1306




Chalky limestone




Fossiliferous limestone




Nodular limestone