

Depositional framework and sequence stratigraphic aspects of the Coniacian–Santonian mixed siliciclastic/carbonate Matulla sediments in Nezzazat and Ekma blocks, Gulf of Suez, Egypt

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Received 30 November 2005; received in revised form 29 January 2007; accepted 2 February 2007

Available online 14 February 2007

Abstract

Superb outcrops of mixed siliciclastic/carbonate rocks mark the Coniacian–Santonian Matulla Formation exposed in Nezzazat and Ekma blocks, west central Sinai. They are built up of various lithofacies that reflect minor fluctuations in relative sea-level from lower intertidal to slightly deep subtidal settings. Relying on the facies characteristics and stratal geometries, the siliciclastic rocks are divided into seven depositional facies, including beach foreshore laminated sands, upper shoreface cross-bedded sandstone, lower shoreface massive bioturbated and wave-rippled sandstones, shallow subtidal siltstone and deep subtidal shale/claystone. The carbonate rocks comprise lower intertidal lime-mudstone, floatstone and dolostone, shallow subtidal skeletal shoal of oyster rudstone/bioclastic grainstone, and shoal margin packstone. Oolitic grain-ironstone and ferrifacies are partially intervened the facies types. Deposition has taken place under varied conditions of restricted, partly open marine circulation, low to high wave energy and normal to raised salinity during alternating periods of abundant and ceased clastic supply. The facies types are arranged into asymmetric upward-shallowing cycles that record multiple small-scale transgressive–regressive events. Lime-mudstone and sandstone normally terminate the regressive events. Four sequence boundaries marking regional relative sea-level falls divide the Matulla Formation into three stratigraphic units. These boundaries are Turonian/Coniacian, intra-Coniacian, Coniacian/Santonian and Santonian/Campanian. They do not fit with those sequence boundaries proposed in Haq et al.'s global eustatic curves (1988) except for the sea-level fall associated with the intra-Coniacian boundary. Other sequence boundaries have resulted from regional tectonic impact of the Syrian Arc Fold System that has been initiated in north Egypt during the Latest Turonian–Coniacian. These boundaries enclose three well-defined 3rd order depositional sequences; their enclosing shallowing-upward cycles (i.e. parasequences) record the 4th order relative sea-level fluctuations. 34 and 20 parasequence sets, in the order of a few meters to tens of meters thick, mark the Matulla sequences in Nezzazat and Ekma blocks respectively. Each sequence shows an initial phase of rapid sea-level rise with retrogradational sets, followed by lowering sea-level and progradation/aggradation of the parasequence sets. The transgressive deposits display predominance of deep subtidal lagoonal facies, while highstand deposits show an increase in siliciclastic and carbonate facies with the progressive decrease of lagoonal facies. The sedimentary patterns and environments suggest that the regional, partly eustatic sea-level (i.e. intra-Coniacian) changes controlled the overall architecture of the sequence distribution, whereas changes in the clastic input controlled the variations in facies associations within each depositional sequence.

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Keywords: Depositional facies; Matulla formation; Coniacian–Santonian; Sea-level change; Sequence stratigraphy; Gulf of Suez

1. Introduction

Gabal Nezzazat and G. Ekma are obvious tilted blocks lying in west central Sinai along the eastern coast of the Gulf of Suez (Fig. 1). They are located about 150 km and 165 km southeast of Suez respectively and represent

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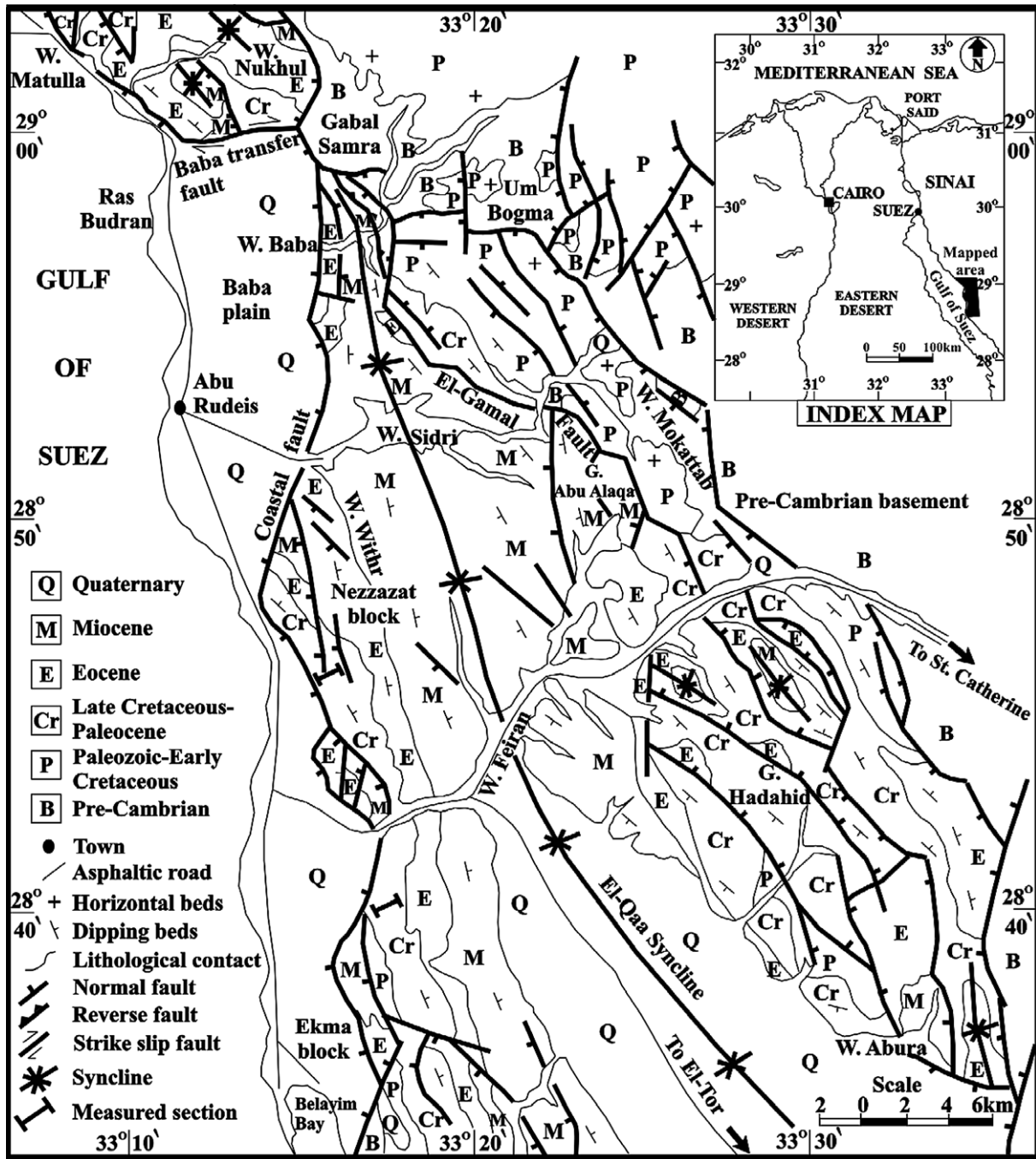


Fig. 1. Simplified geologic map of the Nukhul-Feiran area showing the location of the Nezzazat and Ekma blocks, eastern coast of the Gulf of Suez, Egypt (modified after McClay et al., 1998).

NW-oriented fault blocks with a general trend parallel to the Gulf of Suez. The blocks extend for a distance of about 15 km with an average width of 4 km in G. Nezzazat and for about 10 km with an average width of 7 km in G. Ekma. They are bounded to the north by Baba plain and to the south by G. Abu Durba. The Gulf of Suez coastal plain delineates both tilted blocks from the west and the northern extension of El-Qaa plain limits them from the east. The sedimentary record of these fault blocks ranges in age from Early Cretaceous to Middle

Eocene (Fig. 1). The Lower Cretaceous Malha Formation, the oldest exposed rocks, is followed upwards by a thick succession of the Cenomanian Raha Formation, Cenomanian–Turonian Abu Qada Formation, Turonian Wata Formation, Coniacian–Santonian Matulla Formation and Campanian–Maastrichtian Sudr Chalk respectively. These formations are capped by the Paleocene Esna Shale and the Eocene limestone respectively. The sediments dip toward the northeast with moderate angles never exceeding 35°.

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