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New insight into the sedimentology and stratigraphy of the Dur At Talah tidal-fluvial transition sequence (Eocene–Oligocene, Sirt Basin, Libya)

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ABSTRACT

The Dur At Talah escarpment is exposed in the Abu Tumayam Trough at the southern part of the Sirt Basin, central Libya. The cliff (~145 m high and ~150 km long) is oriented along an E–W axis and faces southward. Only a few field studies have been previously carried out in this area, and these were mainly focused on the succession's famous vertebrate fossil-content. The reconstruction of the depositional environments, which is the purpose of this paper, remained poorly documented. In this study, the uppermost Eocene rock succession composing the Dur At Talah escarpment is divided into two stratigraphic units: the New Idam Unit at the base composed of highly bioturbated fine sand/claystone alternations, and the Sarir Unit at the top dominated by medium to very coarse grading sometimes to microconglomeratic sandstones. This complete succession is built up of shallow marine (New Idam Unit) to fluvial (upper part of Sarir Unit) deposits passing through a "marine/fluvial" transition zone (lower Sarir Unit). The stratigraphic succession suggests a global regressive trend. The marine part of the New Idam Unit is dominated by deposits attributed to tidal depositional environments including tidal flat, tidal channel and tidal bars as well as biostroms of oyster shells at the base of the unit. The lower part of the Sarir Unit appears to be deposited in a fluvial influenced, tide-dominated environment. The upper part of the Sarir Unit, made of coarse-grained to microconglomeratic sandstones interbedded with paleosoil horizons, is interpreted as being fluvial.

1. Introduction

The study area is located at the southern fringe of the Sirt Basin (Fig. 1). It corresponds to the southern, exposed part of the Abu Tumayam Trough. The outcrop can be described as a well pronounced E–W stretching escarpment about 150 km long by 100–150 m high. The age of the deposits forming this escarpment corresponds roughly to the Upper Eocene-Lower Oligocene transition. The deposits of the Dur At Talah cliff have received the attention of geologists because of their remarkable vertebrate content; especially mammals (rodents, primates, proboscidians), reptiles, sharks and fish (Arambourg and Magnier, 1961; Wight, 1980; Rasmussen et al., 2008; Jaeger et al., 2010a,b). The importance of the Dur At Talah area is increased due to the continuous exploration activities devoted to the discovery of more hydrocarbon occurrences in the Sirt Basin. Late Cretaceous and Early Cenozoic rocks of the Sirt Basin contain large accumulations of hydrocarbon which have been the target for the numerous exploration wells drilled in the region since oil discovery in 1957. Therefore, understanding this outcrop would certainly lead to a better understanding of its counterparts in the subsurface towards the basin centre.

First reports and descriptions about the geology of this area are attributed to Desio (1935), Bellair et al. (1954) and Arambourg and

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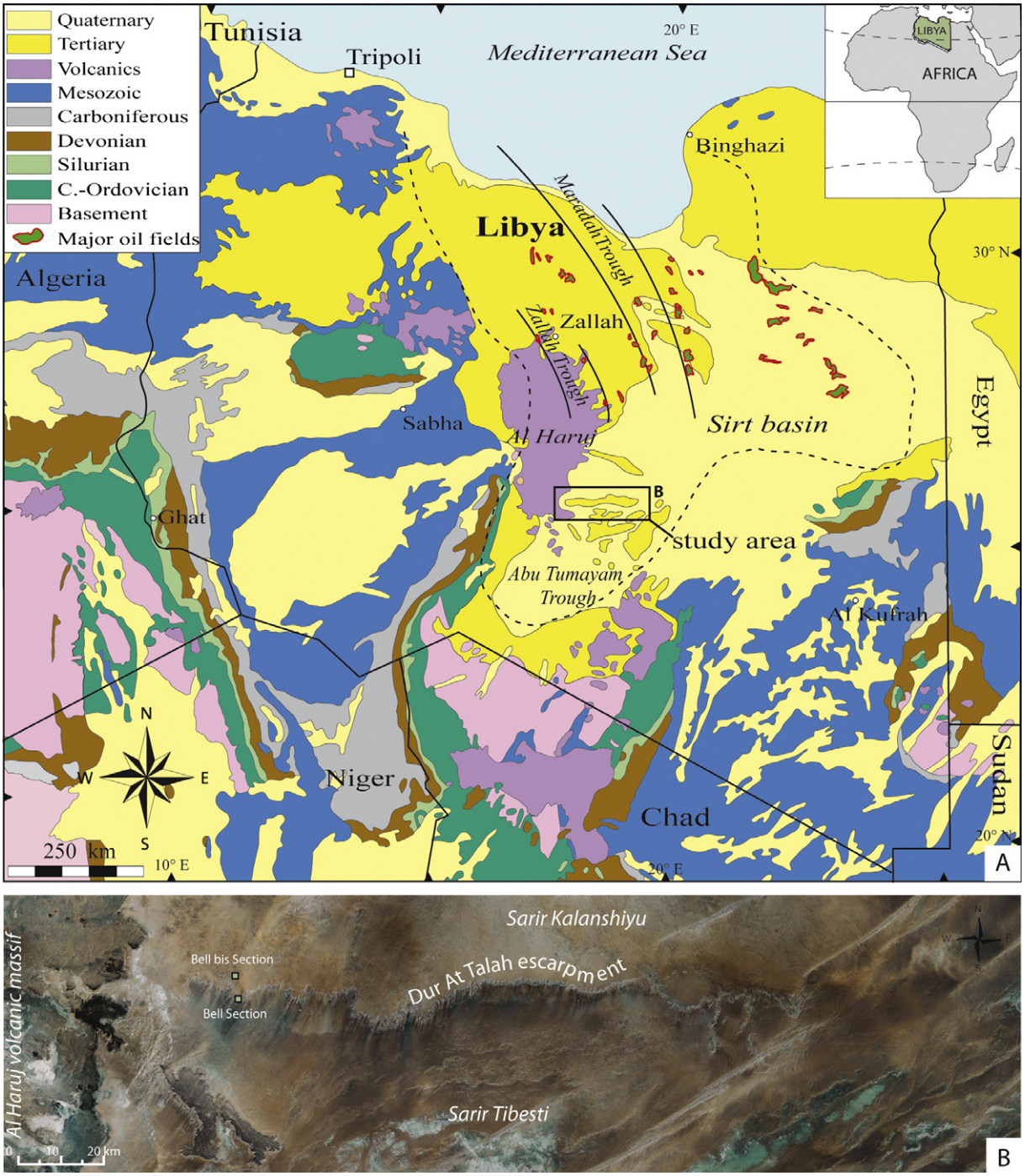

Fig. 1. Location maps of the study area. (A) General geologic map of Libya (modified after Rubino and Blanpied, 2000) showing the outline of the Sirt Basin (dotted line) and the location of the Dur At Talah escarpment (rectangle). (B) Satellite view (CNES/Spot Image, Google Earth capture) of the study area shows the East–West oriented escarpment, with the location of studied sections.

Magnier (1961). Recent geologic contributions at the Dur At Talah escarpment are attributed principally to Wight (1980), Vasic and Sherif (2007) and Jaeger et al. (2010a,b). The work of Wight (1980) is mainly focused on stratigraphy, paleontology and to a lesser extent on sedimentological aspects. The study by Vasic and Sherif (2007) provides the first geological map of the region including a new stratigraphic division; where the Dur At Talah sequence is assigned as a "Formation". The papers by Jaeger et al. (2010a,b) propose a reevaluation of the age of the deposits (Late Bartonian, between 39 and 38 Myrs) and reveal new paleontological assemblages (primates and rodents). Concerning the fossil content, close resemblance of the Dur At Talah sequence with Jebel Qatrani and Qser As Sagha formations of Fayum is reported (Savage, 1971; Wight 1980; Rasmussen et al., 2008; Jaeger et al., 2010a,b). The principal aim of this paper is to identify and describe the main facies assemblages including an attempt to interpret the depositional environments and their successions, which have until now received only scant attention. Micropaleontological investigations as well as organic matter analyses have been performed in order to support environmental interpretations. For the first time in