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Late Cretaceous transgression on a Cimmerian high (Neka Valley, Eastern Alborz, Iran): A geodynamic event recorded by glauconitic sands

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Abstract

In the Neka Valley (Eastern Alborz, Iran), glaucony-bearing marine sediments of early-middle Santonian age directly overlie Palaeozoic to Triassic units deformed during the Eo-cimmerian orogenic event (Late Triassic). The Upper Cretaceous open marine sediments were deposited on a flat surface lacking any evidence of pedogenesis. The geochemical and morphological features of glaucony grains, which characterize the base (1 to 1.5 m) of the Upper Cretaceous succession, indicate an autochthonous origin of the highly-evolved glaucony, denoting a long-lasting period of low sedimentation rate. The development of glaucony in the observed stratigraphic position is indicative of a rapid drowning of the former Cimmerian relief that cannot be explained by a eustatic rise alone: the palaeo-depth needed for the development of glaucony and for the presence of the observed bathyal foraminifera assemblages is greater than the maximum eustatic excursion documented in the Cretaceous. The occurrence of glaucony in this stratigraphic position reflects thus an important episode of increased subsidence rates, related to a geodynamic event framed in a time-interval of major plate reorganization in the complex puzzle of the Iranian plates: the subsidence event that caused the development of the glauconitic horizon in the Neka Valley could likely represent the effect of a Santonian stage of the complex and long-lasting story of the opening of the Caspian Sea.

Keywords: Glaucony; Late Cretaceous; Cimmerian orogeny; Alborz; Unconformity

1. Introduction

The Palaeozoic–Mesozoic succession of the Alborz belt records the stratigraphic and tectonic effects of the Cimmerian orogenic events (from Late Triassic, Eo-cimmerian event, to the Middle Jurassic, Neo-cimmerian event). In the Neka Valley (Eastern Alborz, Northern Iran, Fig. 1) the Palaeozoic to Triassic succession, deformed and metamorphosed during the Eo-cimmerian event, has been deeply eroded before the Late Cretaceous marine transgression, giving origin to an impressive angular unconformity.

In general, since the description of the historical Hutton's unconformity at Siccar Point (Scotland), unconformities marking the return to deposition after an orogenic event have been recognized as evidence of a long-term erosion. The sedimentological analysis of the

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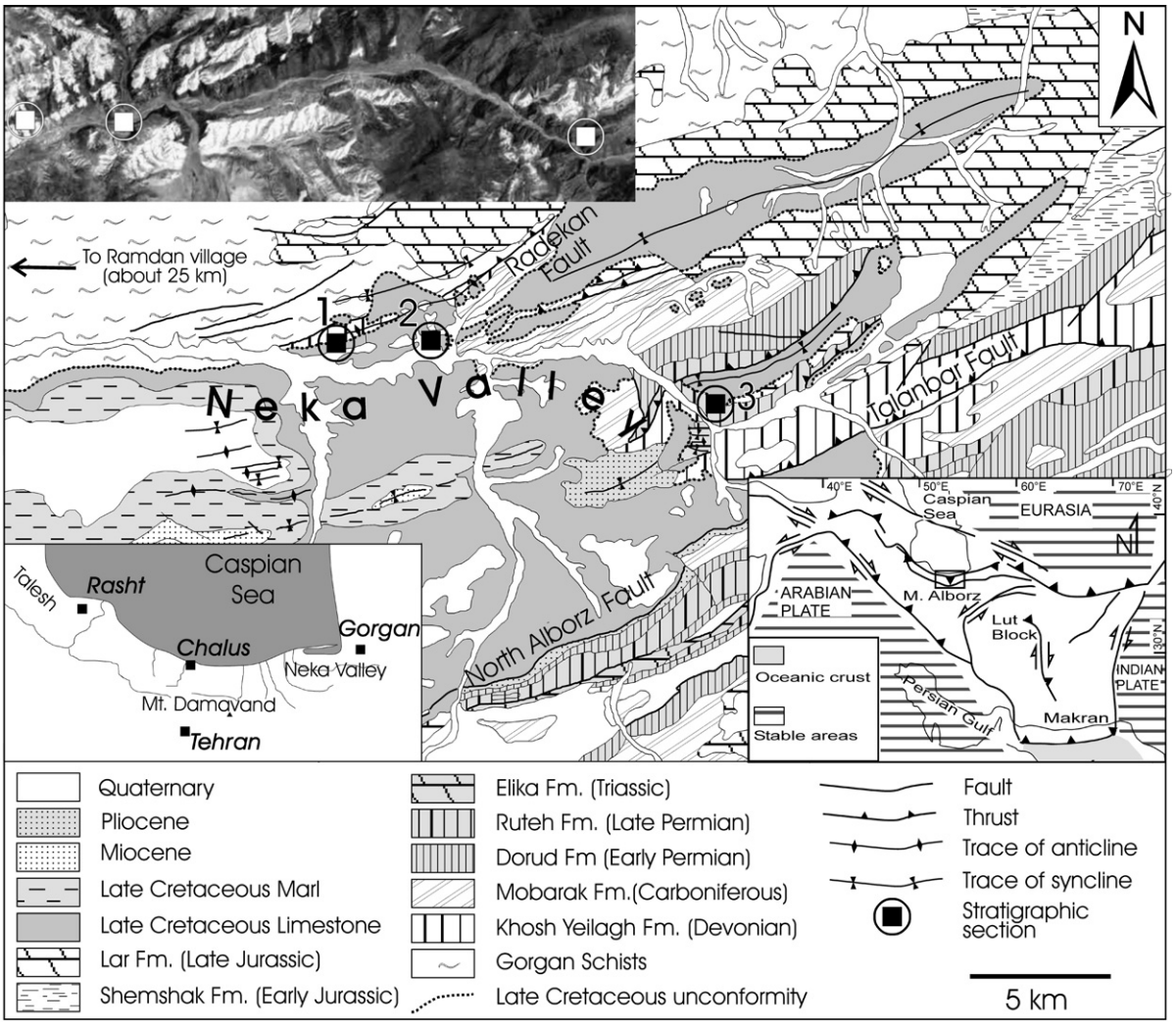

Fig. 1. Geological map of the Neka Valley (Geological Survey of Iran, 2000). In the insets: upper left: a satellite image (Aster) showing the sharp contact between the Cretaceous sediments and the deformed Palaeozoic units; lower right: simplified geodynamic setting of Iran; lower left: geographic location.

basal transgressive deposits above an unconformity is therefore important for environmental reconstructions and for the definition of the timing and type of processes that controlled the return to sedimentation. The sediments above the unconformity may deposit in different environmental settings and with different sedimentary facies, but they are generally represented by clastic continental deposits, mainly eroded from the orogen itself, that are usually followed by marine units. Sedimentation usually occurs on an irregular surface, due to the pre-depositional erosion, favouring a time-transgressive deposition above the unconformity, with onlap geometries toward the topographic highs. An exception to the described scenario is recorded by the succession of the Neka Valley (Eastern Alborz, Iran), where the transgressive surface is represented by a regular and flat, originally horizontal, palaeotopography that is directly covered by marine sediments. Here, above the transgressive surface a classical continental "basal conglomerate" is missing and the base of the Upper Cretaceous sediments is characterized by bio-clastic glauconitic limestones that were deposited in an open marine setting. Sedimentological features across the unconformity and characteristics of the glaucony grains have been studied in order to reconstruct the environmental conditions that existed immediately before and after the observed transgression. The scope of this study is to characterize the drowning of the formerly emerged surface and to identify the cause of the rapid drowning, which led to the deposition of open