

# ABSTRACT VOLUME

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## CALCAREOUS NANNOFOSSIL EVENTS IN THE PABDEH FORMATION (LATE PALEOCENE - LATE OLIGOCENE) AT THE DEHLORAN SECTION, LORESTAN PROVINCE, IRAN

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The Pabdeh Formation is recognized both in outcrops and subsurface in the Zagros Basin (southeast Turkey, northeast Iraq, west and southeast Iran). It is a Paleogene marine deposit represented by purple shales, with inter-bedded green shales at the base, followed by gray shales, limestones, and marls. The 333 meters outcrop at the Dehloran section was sampled for calcareous nannofossil analysis. Our preliminary results on the biostratigraphy and paleoceanography of nannofossils recovered from the section are presented herein. The assemblages are, in general, quite affected by overgrowth but highly diverse and abundant. It was possible to recognize a series of nanno-events that lead to a biostratigraphic interpretation. At the base of the section, the last occurrences (LO) of *Discoaster araneus*, *Fasciculithus tympaniformis*, *Sphenolithus editus*, *S. anarrhopus* and *Toweius eminens* disclose the Paleocene/Eocene boundary. Above it, the early Eocene was interpreted based on the first occurrence (FO) of *Discoaster kuepperi*, *D. lodoensis* and *Girgisia gammation*, and the LO of *Chiasmolithus bidens* and *Tribrachiatus orthostylus*. The early Eocene/ middle Eocene boundary was interpreted by the LO of *Discoaster kuepperi* and *D. lodoensis*. Throughout the middle Eocene, the FO of *Reticulofenestra umbilica* and *R. reticulata*, and *R. bisecta* and *Helicosphaera bramlettei*, allow us to identify the late Lutetian and the Bartonian respectively. The late Eocene and early Oligocene were interpreted by the recognition of the subsequent nano-events: the LO of *Chiasmolithus grandis* and *Discoaster barbadiensis*, the LO of *Discoaster saipanensis*, the FO of *Coccolithus formosus* and the LO of *Reticulofenestra umbilica*. The latter allows the identification of the early Oligocene/middle Oligocene boundary, and above it, the middle Oligocene/late Oligocene was interpreted on the basis of the LO of *Helicosphaera compacta*. Paleoceanographic interpretations were attempted by the analysis of the nannofossil assemblages. At the lower part of the section, the association suggests oligotrophic and warm conditions that could be related to the Paleocene-Eocene Thermal Maximum event. Afterwards, a long cooling trend is interpreted by the abrupt diminution in the relative abundance of discoasters and sphenolithus. In the middle to late Eocene, warmer conditions were reestablished and are related to the Middle Eocene Climatic Optimum. In the latest Eocene and throughout the Oligocene, another cooling trend is interpreted mainly due to an increasing abundance of *Coccolithus pelagicus* and *Cyclicargolithus floridanus*, both species with affinity to temperate to cold surface waters. This section appears to be a promising site for Paleogene eastern-Tethys further studies.



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## INTRODUCTION

Preliminary results on the biostratigraphy and palaeoceanography based on the calcareous nannofossils recovered from the Pabdeh Formation, Lorestan Province, Irán, are presented (Fig. 1). The Pabdeh Formation is recognized both in outcrops and subsurface in the Zagros Basin (southeast Turkey, northeast Iraq, west and southeast Iran). It is a Paleogene marine deposit represented by purple shales, with inter-bedded green shales at the base, followed by gray shales, limestones, and marls (Figs. 2-3).

## MATERIALS AND METHODS

The 333 meters-long outcrop at the Dehloran section was sampled for calcareous nannofossil analysis. Samples were prepared according to the standard gravity settling technique. The assemblages are, in general, quite affected by overgrowth but highly biodiverse and abundant.

## STUDY AREA

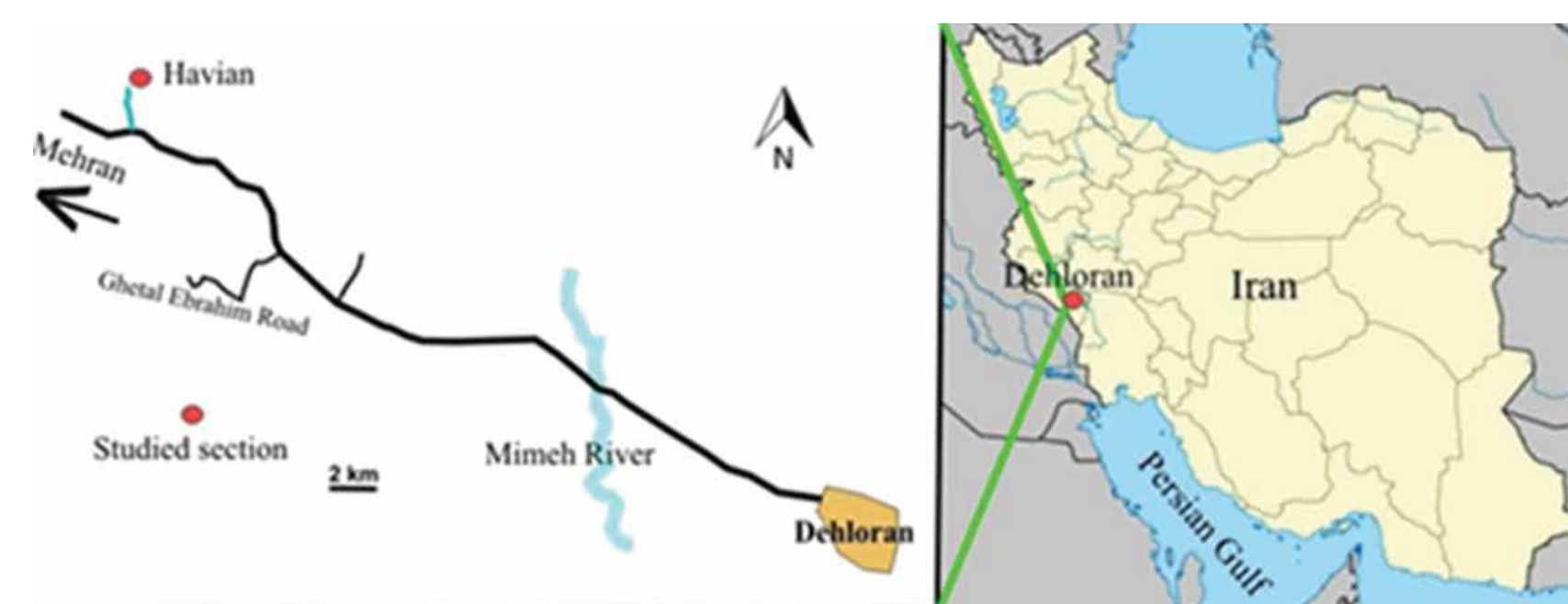


FIGURE 1. Location map of Dehloran section



FIGURE 2. Photograph of Pabdeh Formation at Dehloran section

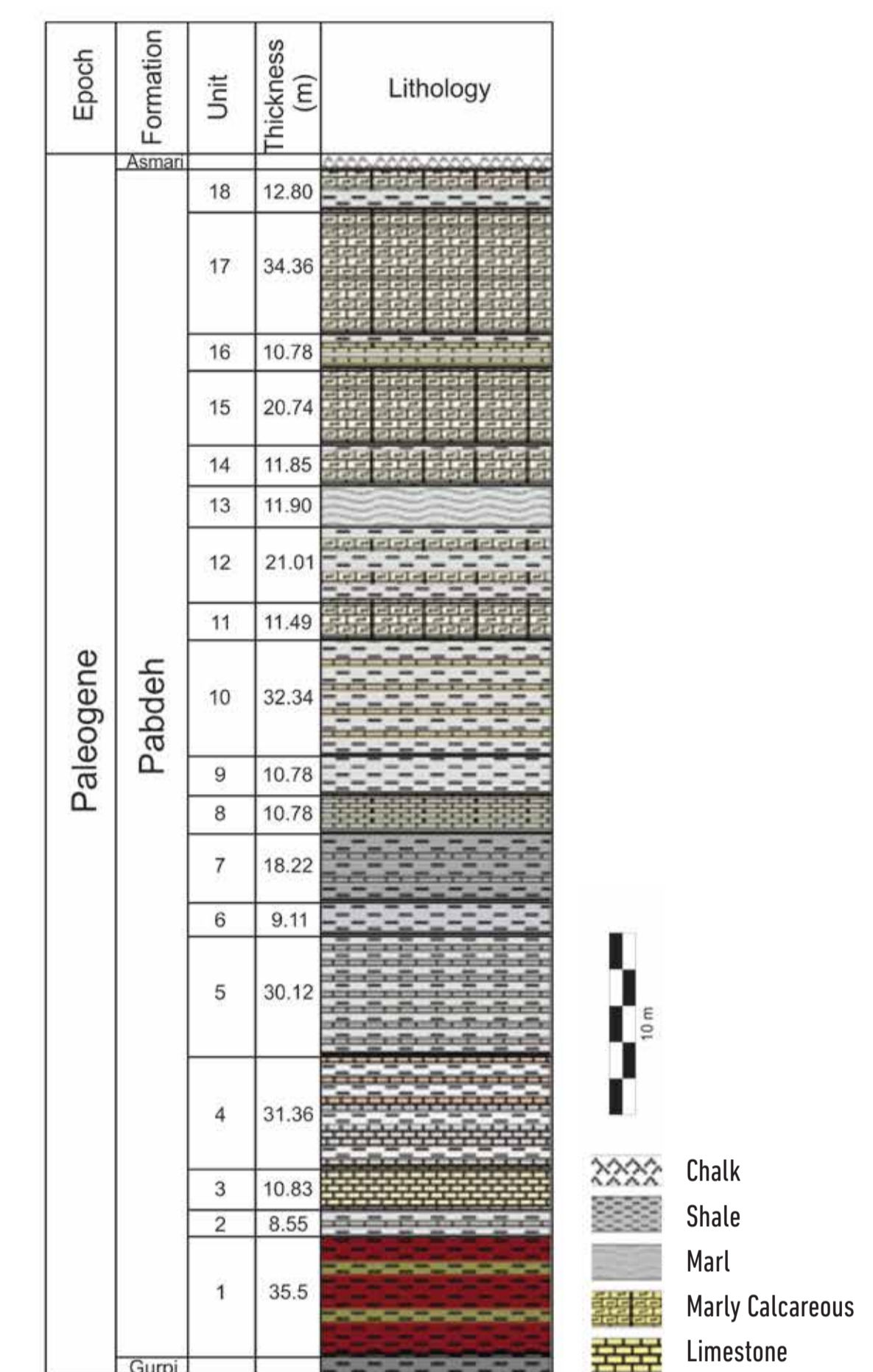


FIGURE 3. Stratigraphic Profile

## RESULTS AND DISCUSSION

The recovered calcareous nannofossil assemblages are, in general, quite affected by overgrowth but highly biodiverse and abundant. It was possible to recognize a series of nanno-events that lead to a biostratigraphic interpretation with the recognition of Late Paleocene, Eocene and Oligocene sections (Fig. 4). At the base of the section, the last occurrences (LO) of *Discoaster araneus*, *Fasciculithus tympaniformis*, *Sphenolithus editus*, *S. anarrhopus* and *Toweius eminens* disclose the Paleocene/ Eocene boundary. Above it, the Early Eocene was interpreted based on the first occurrence (FO) of *Discoaster kuepperi*, *D. lodoensis* and *Girgisia gammation*, and the LO of *Chiasmolithus bidens* and *Tribrachiatulus orthostylus*. The Early Eocene/ Middle Eocene boundary was interpreted by the LO of *Discoaster kuepperi* and *D. lodoensis*. Throughout the Middle Eocene, the FO of *Reticulofenestra umbilica* and *R. reticulata*, and *R. bisecta* and *Helicosphaera bramlettei*, allow us to identify the late Lutetian and the Bartonian respectively.

The Late Eocene and Early Oligocene were interpreted by the recognition of the subsequent nano-events: the LO of *Chiasmolithus grandis* and *Discoaster barbadiensis*, the LO of *Discoaster saipanensis*, the FO of *Coccolithus formosus* and the LO of *Reticulofenestra umbilica*. The latter allows the identification of the Early Oligocene/ Middle Oligocene boundary, and above it, the Middle Oligocene/ Late Oligocene was interpreted on the basis of the LO of *Helicosphaera compacta*.

Palaeoceanographic interpretations were attempted by the analysis of the nannofossil assemblages using statistical analysis (Fig. 5). At the lower part of the section, the association suggests oligotrophic and warm conditions that could be related to the Paleocene/ Eocene Thermal Maximum event (PETM). Afterwards, a long cooling trend is interpreted by the abrupt diminution in the relative abundance of discoasters and sphenolithus. In the Middle to Late Eocene, warmer conditions were reestablished and are related to the Middle Eocene Climatic Optimum (MECO). In the Latest Eocene and throughout the Oligocene, another cooling trend is interpreted mainly due to an increasing abundance of *Coccolithus pelagicus* and *Cyclicargolithus floridanus*, both species with affinity to temperate to cold surface waters.

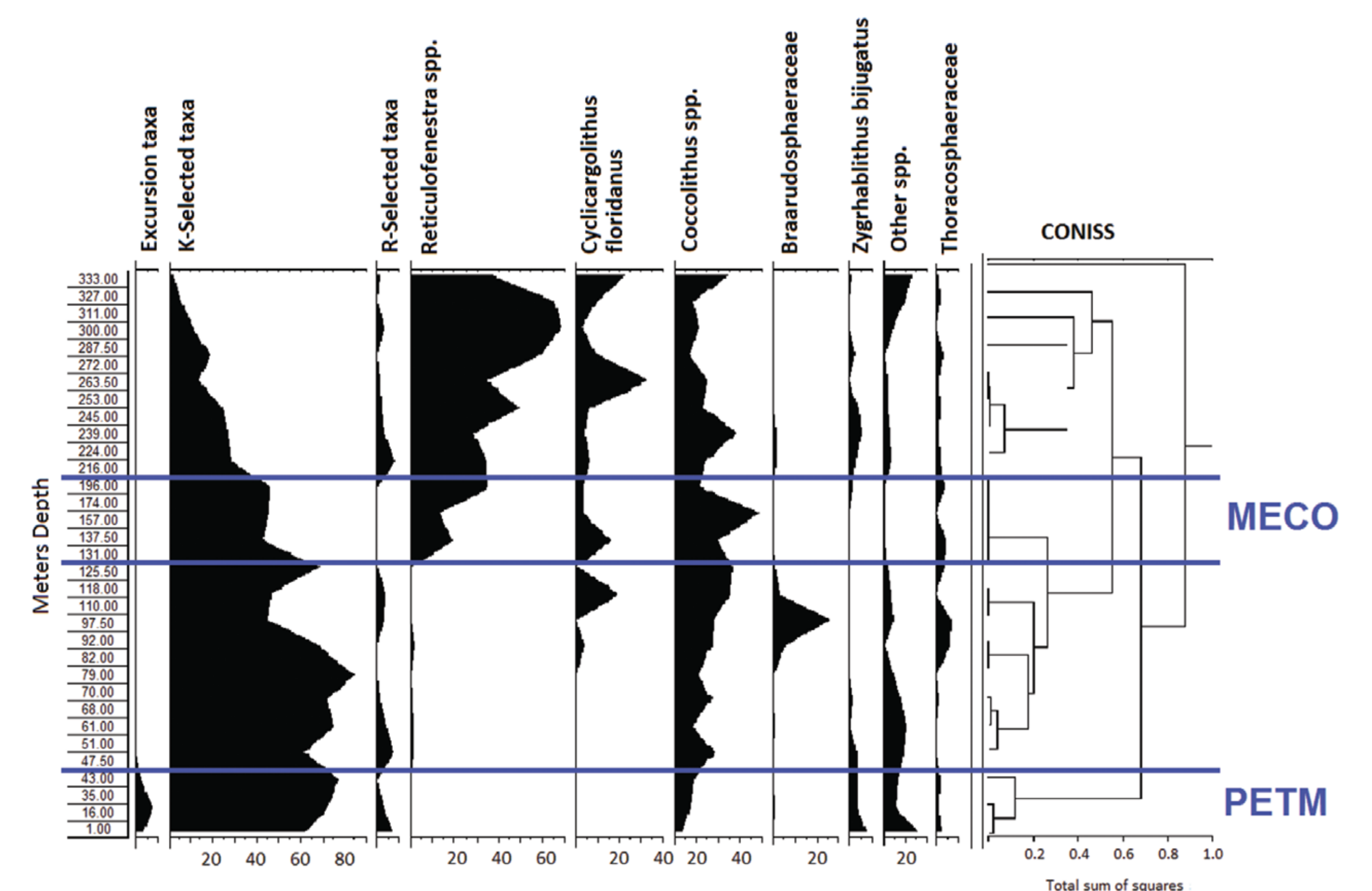


FIGURE 5. Relative abundance of selected calcareous nannofossil groups through the section. CONISS analysis based only in the first three groups. Excursion Taxa: *Discoaster araneus*; K-Selected taxa: *Discoaster*, *Sphenolithus* and *Fasciculithus*. R-Selected Taxa: *Chiasmolithus*.

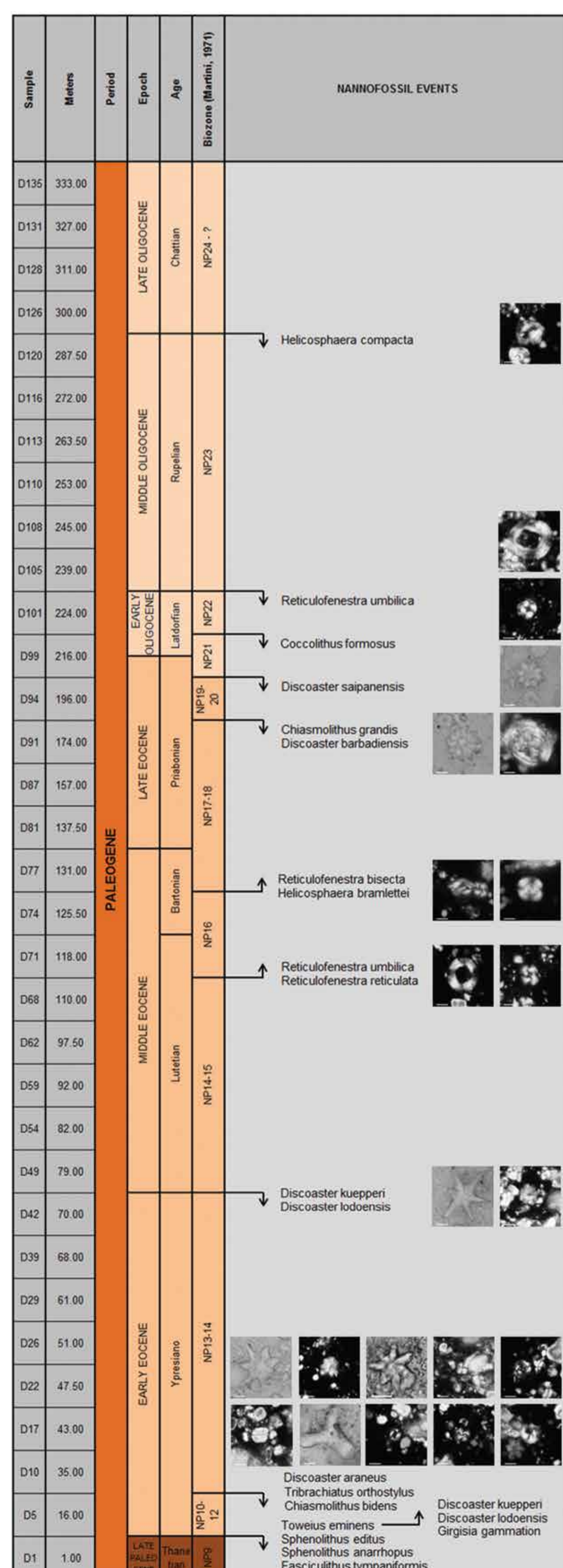


FIGURE 4. Nannoevents and Biostratigraphic interpretation of Pabdeh Formation

## CONCLUSIONS

The Pabdeh Formation at Dehloran section represents a continuous record of the Latest Paleocene through the Eocene and Oligocene as revealed by calcareous nannofossil analysis. Mayor paleogene global climatic events could be as well identified and evaluated.