Biostratigraphy and biocorrelation of the Late Cretaceous high productivity sequence of the Southern Tethys, Israel

Sarit Ashckenazi-Polivoda (1), Aaron Meilijson (2), Libby Ron-Yankovich (2), Peter Illner (3), Heiko Alsenz (4), Robert P Speijer (5), Ahuva Almogi-Labin (6), Shimon Feinstein (2), Zsolt Berner (3), Wilhelm Püttmann (4), and Sigal Abramovich (2)

(1) Dead Sea and Arava Science Center, Neve Zohar, Israel (sarit@adssc.org), (2) Department of Geological and Environmental Sciences, Ben Gurion University of the Negev, Beer Sheva, Israel, (3) Institute for Mineralogy and Geochemistry, Karlsruhe University, Germany, (4) Institute of Atmospheric and Environmental Sciences, Department of Environmental and Analytical Chemistry, Goethe-University, Frankfurt am Main, Germany, (5) Department of Earth and Environmental Sciences, KU Leuven, Leuven, Belgium, (6) Geological Survey of Israel, Jerusalem, Israel

Organic rich deposits are common throughout Israel and the Levant region, and are a product of intensive and prolonged upwelling system that prevailed during the Late Cretaceous. In the distal Shefela Basin (central Israel) uniform lithology of organic rich carbonates locally referred as oil shale occur, unlike the distinct Si-P-C enriched sequence of the more proximal Negev basins (southern Israel). The high water column productivity and frequent oxygen deficiency caused partial to total disappearance of some index taxa used traditionally in biostratigraphy. This challenges accurate dating and correlation of the studied sequences.

Here we present a new detailed chronostratigraphic framework for the high productivity sequence in Israel, based on the most updated Late Cretaceous planktic foraminiferal zonation, coupled with secondary biomarkers and regional acme events of benthic foraminifera. Lithostratigraphic boundaries and gamma ray log markers were integrated and used as tie points in our age model. The newly drilled Aderet borehole from the Shefela Basin is used as a 'type-section' for correlation with the sequences of southern Israel (M8, Saraf, Pama).

Ten age intervals were determined in the studied sections ranging from the Late Coniacian Dicarinella concavata Zone to the Late Maastrichtian Pseudoguembelina hariaensis Zone. Some of the zonal subdivision could not be defined and differentiated based on the common biomarkers, due to their rareness or delayed occurrence. In these cases, they were replaced by the following secondary datum: The lowest occurrence (LO) of Rugoglobigerina rugosa and the highest occurrences (HO) of D. concavata and Marginotrunana spp. were used as alternative biomarkers for the top of D. asymetrica Zone and the base of Globotruncanita elevata Zone. The LOs of Pseudoguembelina costulata and P. excolata were used for correlating the undifferentiated Radotruncana cal-carata/Globotruncanella havanensis Zones. The LO of Gublerina cuvillieri was found as a reliable biomarker for the base of the Racemiguembelina fructicosa Zone. The LOs of Abathomphalus intermedius and Pseudotextularia intermedia were found to co-occur with Abthomphalus mayaroensis.

The recently defined Contusatruncana plummerae Zone and Pseudoguembelina palpebra Zone were found more applicable and well established at the studied sequences due to the high abundance of the nominated species in our region. The P. palpebra Zone marked the onset of the deposition of the Oil Shale Mbr in the Negev with total organic carbon up to ∼18 wt.% and the TOC-rich zone at the Shefela Basin, Central Israel with up to 21 wt.% .

LOs of seven benthic species namely Anomalinoides praeacutus, Laevidentalina gracilis, Loxostomum decurrens, Angulogavelinella abudurbensis, Siphogenerinoides parva, Neoflabellina rugosa and Gaudryina rugosa and the acme event of Elhasaella alanwoodi were found useful as local stratigraphic indicators. LO of these species, define an interval that covers the top part of the undifferentiated R. calcarata/G. havanensis zones to the base of the P. palpebra Zone.

Based on our age model the full duration of the high productivity sequence in Israel is estimated to span approximately 18 Ma, from the upper Coniacian at ∼86 Ma, within the upper part of the D. concavata Zone to the late Maastrichtian A. mayaroensis Zone.