An unconventional application of calcareous nannofossils – reconstructing the timing and the course of an Eocene meteorite impact in central Jordan

Mohammad Alqudah
American University of Beirut, Department of Geology, Beirut, Lebanon; ma404@aub.edu.lb

Hani Khoury
University of Jordan, Department of Geology, 11942 Amman, Jordan: khouryhn@ju.edu.jo

Elias Salameh
University of Jordan, Department of Geology, 11942 Amman, Jordan; salameli@ju.edu.jo

Jörg Mutterlose
Ruhr-Universität Bochum, 44801 Bochum, Germany; joerg.mutterlose@rub.de

A meteorite impact structure has been recognized in the central part of eastern Jordan. Although geologists do have some evidence for this meteorite impact, the age of the Waqf as Suwwan impact is still poorly constrained. By examining calcareous nannofossils from sediments exposed in this structure, an age model for the timing of the event has been obtained. A total of 81 smear slides from two cores (BH-1 and BH-2), which penetrated the sediments of the central structure, were studied in order to obtain biostratigraphic ages for the post-impact sediments.

The calcareous nannofossils assigned the sediments of core BH-1 a late Campanian to early Eocene age and to core BH-2 a late Campanian to late Maastrichtian age. The upper part of the sedimentary sequence in the impact structure, which was removed from the adjacent area, consists of breccia components. The biostratigraphic study of the sedimentary breccias provides an important data set for interpreting the history and the course of the impact event. The calcareous nannofossils suggest that the components came from two different sources: Cretaceous and Paleocene-early Eocene. The deposition of the breccias resulted from a gravitational collapse of water-saturated sediments in two stages. The earlier of these was more intensive than the latter. The stratigraphic framework and the presence of reworked Cretaceous and Paleocene calcareous nannofossils within Paleogene nannofossil Zone NP13 suggest an early Eocene age for the impact. The upper part of the Cretaceous sediments was thermally altered by the impact, causing partial or complete dissolution of the calcareous nannofossils. This caused overgrowth for the more resistant species, while others were dissolved.