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Discussion

Comment on "Danian/Selandian unconformity in the central and southern Western Desert of Egypt" by S. Farouk and A. El-Sorogy [J. Afr. Earth Sci. 103 (2015) 42–53]

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ABSTRACT

In their recent paper, Farouk and El-Sorogy (2015) present a reconstruction of the Danian–Selandian relative sea-level changes for the Western Desert of Egypt and an interpretation of eustatic versus tectonic controls on the latter. However, the relative sea-level changes should be distinguished from the shoreline shifts (also for the purposes of inter-regional comparisons). From three alternative global curves, two confirm the authors' conclusions, although it is questionable whether these curves are suitable for the purposes of such an analysis. It cannot be excluded that the relative sea-level fall in the late Danian was caused by the same regional tectonic uplift that resulted in the hiatus at the Danian/Selandian boundary. More research (including quantitative palaeobathymetric modelling) is necessary to understand the relative importance of the eustatic and tectonic controls on the sea-level changes established in the Western Desert of Egypt.

Precise biostratigraphical examination of Paleocene sections in the Western Desert of Egypt (northeastern Africa) based on the study of benthic and planktic foraminifers and calcareous nannofossils has permitted Farouk and El-Sorogy (2015) to recognize a significant hiatus at the Danian/Selandian boundary, to reconstruct the relative sea-level changes, and to interpret the possible controls on these relative sea-level changes. These important results are very interesting with regard to the global events that took place in the Paleocene Epoch. Moreover, the noted article provides some methodologically-valuable information. The conclusions of Farouk and El-Sorogy (2015) are sensible and useful, and their interpretation needs wider analysis.

Farouk and El-Sorogy (2015) reconstructed the relative sea-level fall in the late Danian, the absence of marine sedimentation across the Danian/Selandian boundary, and the sea-level rise in the middle Selandian (Fig. 10, p. 51). They tend to conclude that the late Danian sea-level fall resulted from the eustatic fall, whereas the Danian/Selandian hiatus resulted from the regional uplift. How did they reach these conclusions?

There are two possible approaches to discriminating the eustatic versus tectonic controls on relative sea-level changes and shoreline shifts. The first approach is the inter-regional correlation (tracing) of the events. Farouk and El-Sorogy (2015) attempted this and compared the relative sea-level changes with the transgressions and regressions known from the other regions (Africa, America, Europe). Of course, this provides sensible results, although one should note that relative sea-level changes (rises and falls) should be distinguished from shoreline shifts (transgressions and regressions), which do not necessarily coincide (e.g., Ruban, 2007). For instance, Fig. 2 (p. 44) of Farouk and El-Sorogy (2015) implies that the above-mentioned sea-level pattern was superposed by short term transgressions and regressions that were relatively small-scale and coincided with the changes of the basin depth in a complex way. The data from the noted figure could be used for more detailed recognition of transgressive-regressive and shoaling-deepening cycles (see example in Zorina, 2014a).

The second approach is the comparison of the regional sea-level curve with the available eustatic curves that serve as standards. For instance, Zorina (2014b) applied it successfully to the Early Cretaceous epicontinental Eastern Russian Sea. Farouk and

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