Geophysical Research Abstracts
Vol. 12, EGU2010-6815, 2010
EGU General Assembly 2010

Paleoceanographic setting for thick Eocene limestone successions in and around Israel

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Eocene autochthonous pelagic limestones, or chalks, are found in all parts of Israel. They are composed of calcareous nannofossils, and foraminifera of which usually >95% are planktonic. Secondary components include diatoms, radiolarians and poriferan spicules, frequently remobilized into chert horizons. Chalks are often bioturbated with typical ichnofacies suites for the pelagic environment, or may be laminated. Total thickness for Early and Middle Eocene chalks rarely exceed 150-200 m in any one locality. The paleoceanographic interpretation of these chalks is a pelagic, oceanic environment both laterally too distal, and much too deep, for any conceivable shallow-water benthic input.

Interbedded with these chalks are a variety of limestones with shallow-water faunas and calcareous algae. The biofacies zones present correspond to a modified version of the Arni paleoecological model. Alveolinid foraminifera are rare. Nummulitic packstones partially cemented by corallinacean algal crusts represent the shallowest facies. Nummulitic wacke- or packstones dominated by discocyclinids and rotaliid debris accumulated more distally, with convoluted chalky packstone/wackestone in the south of Israel, and coprolitic wackestones with micritic cement more common in the northern Israel. Wherever these limestones occur, they are interlayered with pelagic mudstones with planktonic foraminifera, a facies that only when undisturbed forms the pelagic chalk lithofacies described above.

Aside from this facies disparity, one troubling feature of the sections with limestones is that they are commonly >350 m thick and may locally exceed 1 km. These unusual thicknesses are remarkable in the face of general tectonic quiescence of the Early and Middle Eocene on the north Arabian platform.

A sedimentary model is presented in which nearly all ‘shallow-water’ biofacies are transported downslope, forming slope-failure olistoliths for most of the algal limestones, and coalescing toe-of-slope splaying fans for the nummulitid – discocyclinid –
Pararotalia-bearing limestones. The autochthonous setting of their emplacement is represented by a variety of chalky lithofacies at bathyal depths. This model can explain the distribution and inordinate thickness of Eocene ‘shallow-water’ facies in Israel. The paleotopographic relief required for this model is not dissimilar to that of the present day Levant margin.