



Stratigraphy, climate and downhole logging data – an example from the ICDP Dead Sea deep drilling project

Lisa Coianiz (1), Zvi Ben-Avraham (1,2), and Michael Lazar (1)

(1) Department of Marine Geosciences, University of Haifa, Haifa, Israel, (2) Department of Earth Sciences, Tel Aviv University, Tel Aviv, Israel

During the late Quaternary a series of lakes occupied the Dead Sea tectonic basin. The sediments that accumulated within these lakes preserved the environmental history (tectonic and climatic) of the basin and its vicinity. Most of the information on these lakes was deduced from exposures along the marginal terraces of the modern Dead Sea, e.g. the exposures of the last glacial Lake Lisan and Holocene Dead Sea. The International Continental Drilling Program (ICDP) project conducted in the Dead Sea during 2010-2011 recovered several cores that were drilled in the deep depocenter of the lake (water depth of ~ 300 m) and at the margin (depth of ~ 3 m offshore Ein Gedi spa). New high resolution logging data combined with a detailed lithological description and published age models for the deep 5017-1-A borehole were used to establish a sequence stratigraphic framework for the Lakes Amora, Samra, Lisan and Zeelim strata. This study presents a stratigraphic timescale for reconstructing the last ca 225 ka. It provides a context within which the timing of key sequence surfaces identified in the distal part of the basin can be mapped on a regional and stratigraphic time frame. In addition, it permitted the examination of depositional system tracts and related driving mechanisms controlling their formation. The sequence stratigraphic model developed for the Northern Dead Sea Basin is based on the identification of sequence bounding surfaces including: sequence boundary (SB), transgressive surface (TS) and maximum flooding surface (MFS). They enabled the division of depositional sequences into a Lowstand systems tracts (LST), Transgressive systems tracts (TST) and Highstand systems tracts (HST), which can be interpreted in terms of relative lake level changes. The analysis presented here show that system tract stacking patterns defined for the distal 5017-1-A borehole can be correlated to the proximal part of the basin, and widely support the claim that changes in relative lake levels were synchronous across the northern Dead Sea, although differences do exist. These discrepancies can possibly be explained in part by the tectonic nature of the basin. Within the 5017-1-A section, the interpreted changes in depositional environments derived primarily from the gamma ray log patterns show a good correlation in time with sequence-chronostratigraphic framework, extracted lake level curves and paleohydrological records of other areas worldwide. Sequence stratigraphic analysis presented here allows for a detailed, high resolution examination of the sedimentary sequences in the Northern Dead Sea Basin together with an independent proxy that is an indirect indicator of changes in relative lake level.