The Scarred Slopes of the Dead Sea – Evidence for Intensive Subsea Landsliding

Lensky N. G. (1), Calvo R. (1), Sade A. R. (2), Gavrieli I. (1), Katz O. (1), Hall J. K. (1), Enzel Y. (3), Mushkin A. (1)

1. Geological Survey of Israel, 30 Malkhe Israel, Jerusalem, 95501
2. Department of Marine Geosciences, University of Haifa
3. Institute of Earth Sciences, The Hebrew University, Jerusalem 91904, Israel

With the fast declining Dead Sea level in recent years, its western coastline present a large sinuosity increase characterized with numerous narrowly curved bays and pointed and narrow small peninsulas. The high-resolution bathymetry of the Dead Sea (grid size = 5 m; Sade et al. 2014) indicates that these new and common features are the exhumation of the topmost parts of distinct underwater ridges that characterize the Dead Sea western slope. These topmost ridges and valleys have common upper altitude of ~-415 m and extend down slope, eastward and perpendicular to the shore, some of them extend all the way to the Dead Sea deep. This distinct morphology characterizes the western slopes of the Dead Sea, whereas in the eastern slopes of the lake these features are much less extensive. The western slope is covered by relatively thick late Pleistocene and Holocene sediments. Characterizing these features and identifying their origin are the goals of this study. The Western slope of the Dead Sea slope has the following features, from top to bottom: (a) an upper exposed coastal plain (altitude ~-400 m) with minor coastline sinuosity (~1.3), (b) steep slope, ~10 degrees, between altitudes of -410 m to -580 m with highest sinuosity (>2), and spacing between ridges is a few hundreds of meters, (c) the lower part of the slope from altitudes of -580 m to -710 m with slope angle ~3 degrees and spacing between ridges is ~1 km, and (d) the practically flat abyssal plains at ~-720 m. Hypotheses for the origin of this morphology include (a) incision by streams during past low sea levels, (b) deposition, (c) tectonic activity, and (d) submarine landslides. Incision by streams is ruled out as most of the underwater valleys have no stream mouth or drainage basin on land. This also rules out deposition. Underwater landslides can explain most of the observed bathymetric morphology: (a) the landslides develop at the steep parts of the slopes, below the coastal plains, (b) the slides generate turbidity currents that propagate downslope while developing wide valleys at the lower part of the slope, (c) the turbidity gravity current reach the bottom of the lake while spreading laterally, and turbidites at low angles while flattening the Dead Sea bottom. We propose that the high slope angles of the basin fill sediments, together with the seismically active environment, the high density of the Dead Sea brine, which reduces the effective weight of the sediments, all contribute to the landsliding. Rapid lake level drops in the past could have enhanced landslides by increasing the effective pore pressure as a result of over-consolidation. Turbidites are documented in the archive of the Lisan formation depocenter (Kagan et al., 2014, this meeting).