

Paleoclimatic studies with Dead Sea Sediments



The Levant is located between two major climate belts and its late Quaternary climate history reflect global shifts of the major ocean-atmospheric systems.

Monitoring these shifts is important for understanding the mechanism of past climatic changes and for inferring future climate patterns that are so critical in our evaluation of the global warming effects.

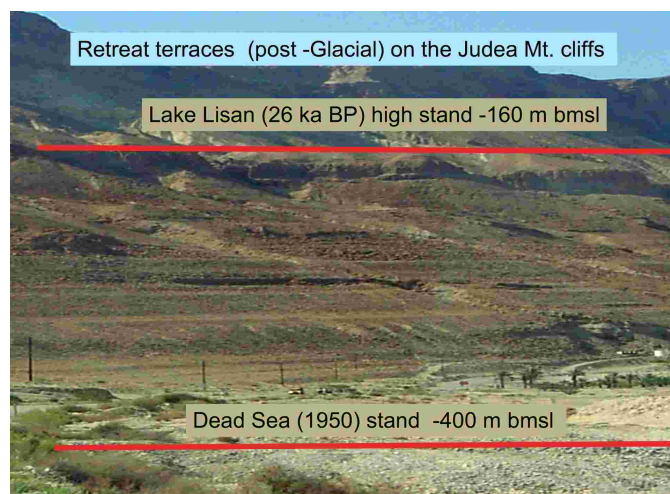
The Levant was the cradle of human prehistory and a major region of migration and settling of our ancient ancestors. Their cultural development was intimately associated with climate-environmental changes in the region.

The Dead Sea basin located along a major tectonic feature in the earth crust accommodated several water-bodies that deposited sequences of evaporitic and detrital sediments. These sediments contain information on the geochemical-hydrological-climatic history of the region throughout the past 3 Ma.



The lakes in the Dead Sea basin received their water from a very large drainage area and they loss water mainly by evaporation, thus, they behave like a big hydrological gauge of the entire drainage area and the east Mediterranean-Levant region.

The lakes changed frequently their levels reflecting rapid shifts from arid to wet climate. In the picture-extent (maximum stand) of lake Lisan the late Pleistocene (70-14 ka BP) precursor of the Dead Sea.



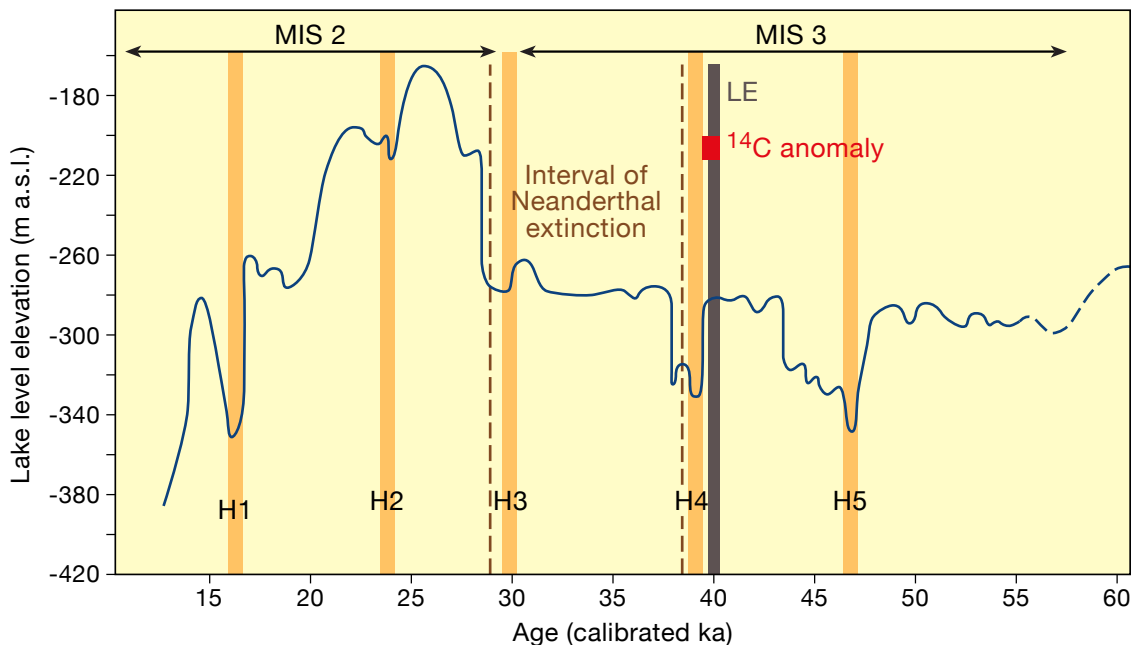
Large changes in lake levels between the high stand of Lake Lisan at ~25 ka BP to the that of the Dead Sea (e.g. at the 19th century). The picture shows the retreat terraces on the walls of the Judea Mt.



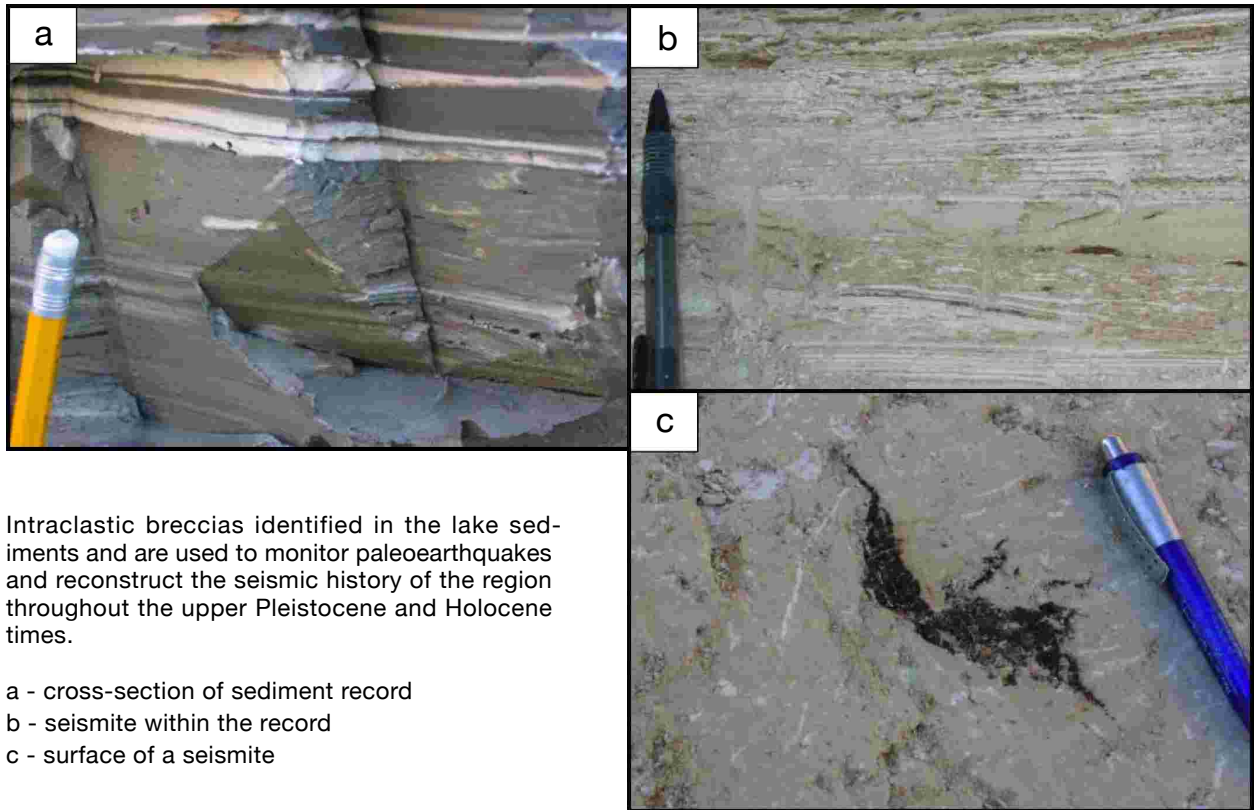
The exposures of the lake Lisan sediments beneath the archaeological of Masada. The section is dominated by whitish deposits of primary-evaporitic aragonite, which alternate with brown-dark detrital laminae to form pairs of annual deposits. These exposures contains high-resolution environmental history of the last glacial period at the region.

Magnified section of laminated aragonite (white) and detritus (brown) laminae of Lisan sediments. The aragonite was deposited from the lake water and requires supply of freshwater - thus, it is proxy for the behavior of the hydrological system. The aragonite is also an excellent material for radioactive dating and is used to establish the lake chronology.

The brown detritus is desert dust washed to the lake by the winter floods. It provides information on the dust sources and mode of transport to the region.

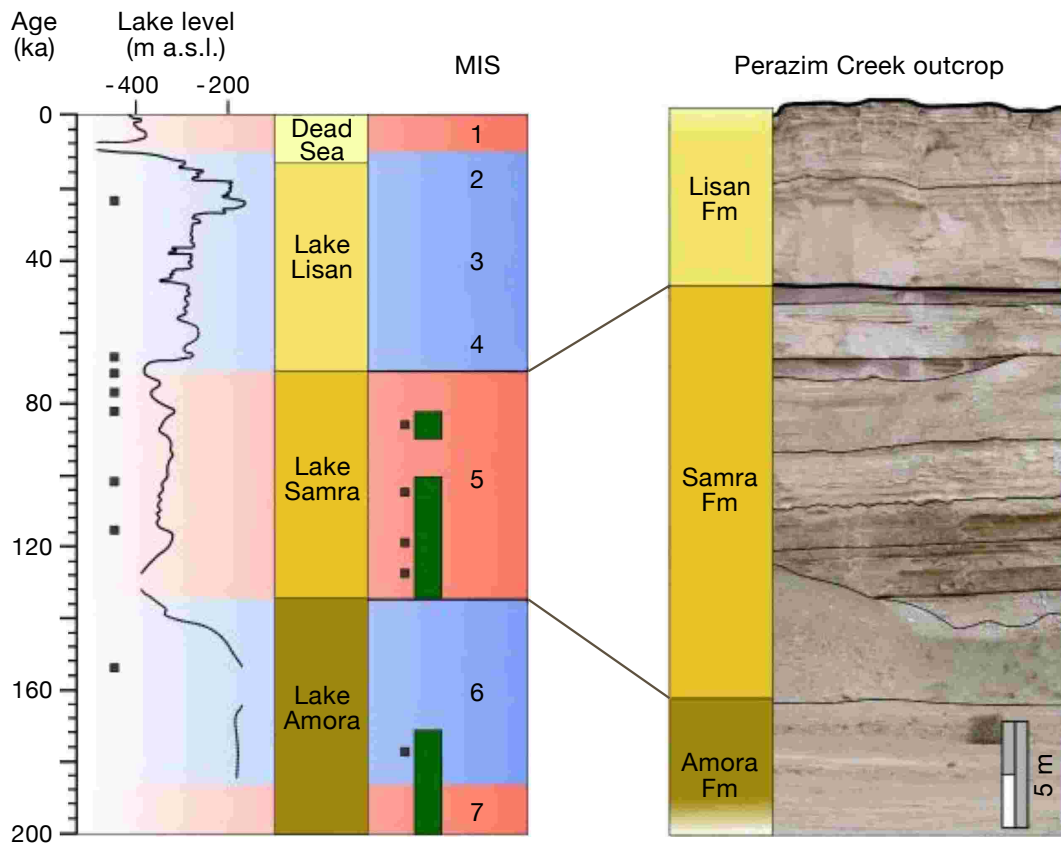


The reconstruction of a lake level curve is a prime target in the scientific investigation of the Dead Sea lakes since it serves as a regional-hydrological proxy telling about the climatic conditions in the Levant. Lake level curves were established for the late Pleistocene lake Lisan and the Holocene Dead Sea. The level curve can be compared with global climate archives such as the ice core records.

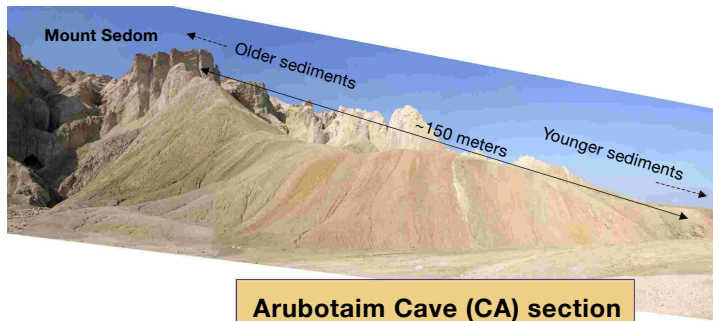


Intraclastic breccias identified in the lake sediments and are used to monitor paleoearthquakes and reconstruct the seismic history of the region throughout the upper Pleistocene and Holocene times.

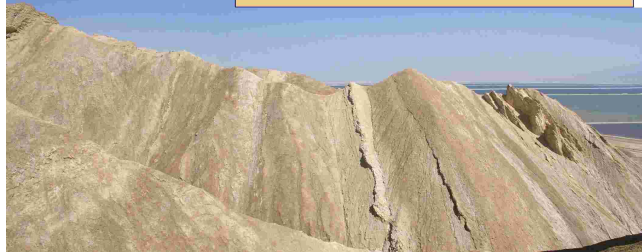
- a - cross-section of sediment record
- b - seismite within the record
- c - surface of a seismite



Stratigraphic column of the sedimentary deposits in the Late Quaternary Dead Sea basin, the older parts of the section as well as part of the Holocene section are buried in the subsurface (except for the exposure of the mid to late Pleistocene Amora Formation that was uplifted by Mt. Sedom salt diapir (next picture)). The ICDP drilling campaign intends to recover sedimentary cores that will recover in high-resolution details (e.g. annually deposited carbonates and detritus) the entire sedimentary history of the Dead Sea basin during the past 1Ma.



Arubotaim Cave (CA) section



The exposed section of the mid to late Pleistocene Amora Formation uplifted and tilted by the rising Sedom salt diapir. The formation consists of sequences of laminated primary evaporitic aragonite and detritus similar to those deposited in lake Lisan and thus can provide information on the environmental history during the time interval of ~700-140 ka BP.

Two drilling campaigns (carried by teams of GFZ-Potsdam, Tel Aviv University, The Hebrew University of Jerusalem and the Geological Survey of Israel (at 1993 and 1997) recovered sediment cores from the bottom and the recently exposed margins of the Dead Sea. The cores were used to construct the Holocene environmental (climatic and seismicity) history of the Dead Sea.

Proposed site of the ICDP drilling campaign in the northern deep basin of the Dead Sea at depth of 600 m below mean sea level and 200 m below the current water level. The drill aims to reach ~400 m.

