Geophysical Research Abstracts
Vol. 20, EGU2018-18899, 2018
EGU General Assembly 2018

Frequency of torrential rainstorms during a regional late Holocene drought inferred from a Dead Sea sediment record

Markus Schwab (1), Marieke Ahlborn (1), Moshe Armon (2), Yoav Ben Dor (2), Ina Neugebauer (3), Rik Tjallingii (1), Jawad Hasan Shoqeir (4), Efrat Morin (2), Yehouda Enzel (2), Achim Brauer (1), and Palex Scientific Team (5)

(1) GFZ German Research Centre for Geosciences, Sect. 5.2 Climate Dynamics and Landscape Evolution, Potsdam, Germany (mschwab@gfz-potsdam.de), (2) The Hebrew University of Jerusalem (HUJ), The Fredy and Nadine Herrmann Institute of Earth Sciences, Jersualem, Israel, (3) University of Geneva, Department of Earth Sciences, Geneva, Switzerland, (4) Al Quds University, Department of Earth and Environmental Sciences, Abu-Dies, Jersualem, Palestinian Authority, (5) For more information: https://www.gfz-potsdam.de/en/section/climate-dynamics-and-landscape-evolution/projects/palex-paleoclimate-research-in-the-middle-east/

Reconstructing the paleoclimate along the Dead Sea Transform and the hydrological evolution of the Dead Sea watershed is crucial to validate climate model simulations predicting enhanced aridity in the region due to global warming. Identifying climates favoring extreme weather phenomena is a primary aim of paleoclimate and paleohydrological research. Here, we present a well-dated, late Holocene Dead Sea sediment record of debris flows covering 3.3 to 1.9 cal ka BP.

Twenty-three graded layers deposited in shallow waters near the western Dead Sea shore were identified by microfacies analysis. These layers represent distal subaquatic deposits of debris flows triggered by torrential rainstorms over the adjacent western Dead Sea escarpment. Modern debris flows on this escarpment are induced by rare rainstorms with intensities exceeding >30 mm h-1 for at least one hour and originate primarily from the Active Red Sea Trough (ARST) synoptic pattern. The observed late Holocene clustering of such debris flows during a regional drought indicates an increased influence of ARST resulting from a shift in synoptic atmospheric circulation patterns. Regional droughts in the Levant are caused by reduced frequency of eastern Mediterranean (EM) cyclones. The shift into drier conditions is characterised by decreased passages of such winter cyclones, but favored localised rainstorms triggered by the ARSTs. This is in accord with present-day meteorological data showing an increased frequency of torrential rainstorms in regions of drier climate. Hence, this study provides a rare conclusive evidence for a shift in synoptic atmospheric circulation patterns during a late Holocene drought.

Within the framework of the DFG ICDP priority program SPP1006, the PALEX (Paleoclimate in the Eastern Mediterranean Region – Levante: Paleohydrology and Extreme Flood Events) research project joins sedimentologists, hydrologists, meteorologists and geochemists from Germany and Near East. This research joins experts to apply a multidisciplinary approach to link modern meteorological and hydrological observations of recent flash flood events using state-of-the-art technologies with flood reconstructions obtained from sediment records. These observations are combined with modern analogues to constrain the strength and frequency of flood time-series obtained from the thousands years long Dead Sea sediment records. The long sediment cores of the ICDP Dead Sea Deep Drilling Program (DSDDP) recovered an unique archive from the deep basin of the Dead Sea that allows the reconstruction of the natural hydroclimatic variability in this region over the past 220 kyrs.

This study is a contribution to the PALEX project "Paleohydrology and Extreme Floods from the Dead Sea ICDP core", funded by the DFG (grant no. BR2208/13-1/-2). Additional funding was provided by the Israel Science Foundation (ISF) grant 1436/14 to Y. Enzel. This is a contribution to the Helmholtz Association climate initiative REKLIM Topic 8.