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Abrupt changes in Levant precipitation during the last glacial from Dead Sea lake levels

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Terminal lakes within the Dead Sea basin have captured and amplified, in their water levels and sediment compositions, the climatic response of the East Mediterranean and Levant to Late Quaternary orbital- and millennial-scale climate changes. The changes in the levels of Lake Lisan, the last glacial Dead Sea, reflected the regional hydrological budget during the last ice age. A new lake level record shows that Lake Lisan displayed very high stands between 330 and 160 meters below mean sea level (m-bmsl), significantly higher than typical Dead Sea levels of 400 m-bmsl during the Holocene, documenting extremely humid conditions in the Levant during the last ice age. Superimposed over this orbital time-scale pattern are large abrupt millennial oscillations of up to $\sim$100 meters, which dominated Marine Isotope Stage (MIS) 3 and are directly tied to the timing of stadial-interstadial cycles recorded in Greenland ice cores, whereby interstadial warmings are linked to pronounced wet spells in Lake Lisan, and the most prominent millennial-scale lake level drops correlate with the timing of Heinrich (H) stadials. The conundrum of the Levant and the Northern Hemisphere climate connection, between orbital (cold glacial – wet Levant – high lake levels) and millennial (stadial cooling – dry Levant – lake drops) timescales reflects the fundamental differences in the impacts on winter storm tracks in the Levant during glacials and interglacials. During glacials the westerlies shift southward and bring higher levels of moisture to the region, leading to overall higher precipitation in the Dead Sea and high lake levels, but the lower sea surface temperatures during H-events result in a vapor uptake over the sea and a weakening in the transport of humidity leading to lower precipitation in the Dead Sea basin.