Earliest human impact on geological processes took place 11,500 years ago (Update)

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Credit: Tel Aviv University

A new Tel Aviv University study has uncovered the earliest known geological indications of manmade impact on geological processes, in particular erosion of the surface, from 11,500 years ago. Within a core sample retrieved from the Dead Sea, researchers discovered basin-wide erosion rates dramatically incompatible with known tectonic and climatic regimes of the period recorded.

"Human impact on the natural environment is now endangering the entire planet," said Prof. Shmuel Marco, Head of TAU's School of Geosciences, who led the research team. "It is therefore crucial to understand these fundamental processes. Our discovery provides a quantitative assessment for the commencement of significant human impact on the Earth's geology and ecosystems." The results of the study were published in *Global and Planetary Change*.

The research was conducted by TAU post-doctoral student Dr. Yin Lu and in collaboration with Prof. Dani Nadel and Prof. Nicolas Waldman, both of the University of Haifa. It took place as part of the Dead Sea Deep Drilling project, which harnessed a 1,500-foot-deep drill core to delve into the Dead Sea basin. The core sample provided the team with a sediment record of the last 220,000 years.

The newly-discovered erosion occurred during the Neolithic Revolution, the wide-scale transition of human cultures from hunting and gathering to agriculture and settlement. The shift resulted in an exponentially larger human population on the planet.

"Natural vegetation was replaced by crops, animals were domesticated, grazing reduced the natural plant cover, and deforestation provided more area for grazing," said Prof. Marco. "All these resulted in the intensified erosion of the surface and increased sedimentation, which we discovered in the Dead Sea core sample."

A natural laboratory in the Dead Sea

The Dead Sea drainage basin serves as a natural laboratory for understanding how sedimentation rates in a deep basin are related to climate change, tectonics, and man-made impacts on the landscape.

"We noted a sharp threefold increase in the fine sand that was carried into the Dead Sea by seasonal floods," said Prof. Marco. "This intensified erosion is incompatible with tectonic and climatic regimes during the Holocene, the geological epoch that began after the Pleistocene some 11,700 years ago."

The researchers are currently in the process of recovering the record of earthquakes from the same drill core. "We have identified disturbances in

the sediment layers that were triggered by the shaking of the lake bottom," Prof. Marco said. "It will provide us with a 220,000-year record—the most extensive earthquake record in the world."

More information: Yin Lu et al. Increased sedimentation following the Neolithic Revolution in the Southern Levant, *Global and Planetary Change* (2017). DOI: 10.1016/j.gloplacha.2017.04.003 , www.sciencedirect.com/science/ … ii/S0921818116305227

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