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# Ancient water harvesting systems in East Crete as identified by geophysics and laser scanning

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The mountains of Crete have been used extensively for settlement activities since the early Bronze Age. Most of all, the numerous enclosed karst depressions were chosen as favorable locations for land use and agriculture due to their function as sediment traps and their water storage capability. A complex of several dolines near Kritsa-Latô was investigated to improve the understanding of the landscape evolution and the associated man-environment interactions in the Dikti mountain range (East Crete). The study aims at presenting a new approach for combining digital datasets, archaeological remains and geomorphological information in order to unravel a paleaoenvironmental scenario. On-site investigations were carried out using a 'time-of-flight' terrestrial laser scanner (TLS, Riegl VZ-400) with online full waveform processing technology to yield topographic information. All outcomes were implemented into a GIS and used for creation of DEMs as well as morphometric and hydrologic analyses. Subsurface data were obtained by electrical resistivity tomography (ERT, Geotom 100 electrode system) in 2D- and 3D-arrays, while postprocessing was conducted with RES2DINV and RES3DINV software packages. Several geophysical anomalies suggest the existence of an ancient water harvesting system that dates back to Dorian times quite likely. This finding is supported by stone settings that are accessible in the embankments of two water-filled ponds, which were recently dug out by local farmers. They correlate to high-resistivity clusters and form a part of a walled cistern, which might represent an off-site reservoir formerly associated with the city-state of Latô during the classical period. Evidentially, the availability of water was essential for subsistence in the karstified and thus arid mountains of Crete as early as the Bronze Age. When combined with laser scanning data, the ERT-findings can be put into a spatial context that provides insights into the whole extent of the ancient water supply system. The 3D tomography highlights a former drainage channel that is exactly in line with both the wall remains in the ponds and a captured spring at the southern margin of the doline. In contrast, the modern drainage pattern, which was derived from the high-precision DEM by GIS-based analyses, does not correspond with the subsurface findings. While TLS-data allows the uncovering of microscale features, which are generally invisible to the unaided eye, the actual presence and position of buried remains can only be identified through geophysical mapping. By integrating both the surface and the subsurface data sets, the differences between the ancient drainage system and the recent surface runoff can be assessed and visualised for the first time. In addition to other prospecting techniques applied in geoarchaeological studies, laser scanning may contribute essentially to a comprehensive reconstruction of former landscape processes at the human-environmental interface.