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Reconstructing the Holocene paleoenvironment of the semi-arid Shiraki Plain of eastern Georgia – a center of settlement activity during the Late Bronze and Early Iron age

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Studying of the interactions between past environmental changes and former human societies delivers key information to understand the future evolution of landscapes under changing environmental conditions and increasing human stress. The combination of these two factors is especially critical for fragile landscapes such as drylands, where even small-scale climatic or anthropogenic factors can have relatively large effects on the landscape dynamics.

Holocene paleoenvironmental changes on the Shiraki Plain, located in Eastern Georgia (South Caucasus), were studied. The selected site is characterized by semiarid climate conditions (annual precipitation <500 mm per year) and an open dry steppic landscape today. Currently the area is devoid of settlements, due to absence of water resources. However, recent archaeological data collected using remote sensing and ground-proven by ongoing archaeological excavations, delivered evidences of an active former human inhabitation of this area mostly during the Late Bronze - Early Iron Ages. Several large, city-type settlements of the given period that were identified on the Shiraki Plain suggest the existence of early state formation under favorable environmental conditions.

During the conducted study we have combined stratigraphical-sedimentological investigations of sediments using drilling cores, trenches and laboratory analyses with high-resolution D-GPS measurements in the RTK mode, remote sensing using drone photogrammetric surveys, paleoecological investigations, and hydrological modeling. Our initial results clearly support the hypothesis of a large shallow lake in the center of the Shiraki Plain that was surrounded by the Late Bronze and Early Iron Age settlements. Therefore, the regional water balance of that period was obviously more positive than today. Furthermore, our investigations indicate that this period of high settlement intensity was characterized by intensive soil erosion processes that washed

away the dominant Chernozem soils.

Altogether, our investigations suggest a tipping point of the landscape evolution dynamics that must have been crossed during the Late Bronze and Early Iron period, leading to the current dry steppic landscape. This also provides key information to reconstruct the archaeological past of the region, and to address the main question of rapid depopulation and further abandonment of this area.

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