Fluvial landforms along the Khabur River in northeast Syria and their palaeoenvironmental implications

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Tell Seker al-Aheimar in northeast Syria is an archaeological site along the Khabur River, a major tributary of the Euphrates. Fluvial landforms around the tell are classified based on geomorphological and sedimentological surveys. Ten topographic cross sections were constructed using a hand level and a measuring tape. The results and additional field observations revealed that the terraces can be divided into three levels: High (ca. 15 m above the present river bed), Middle (9 m) and Low (4-5 m). The Low terraces commonly occur along the Khabur with a width of up to a few hundred meters. The Middle terraces occupy a much larger area. The High terraces have a limited distribution. Floodplains also occur at relative heights of ca. 2-3 m.

The deposits of the Low and Middle terraces consist of upper weakly-bedded fine material (flood loam) and lower more bedded deposits with gravel with diameters of ca. 5-20 cm. Although the observed deposits look similar to typical fluvial deposits by a meandering river, the observed gravel size is too large for low-gradient rivers. The interiors of the gravel show that most of the gravel consist of several concentric layers which developed around a core such as a piece of flint. The layers mainly consist of calcite. Therefore, the gravel particles are oncoids, a type of tufa formed in a shallow-water environment. The occurrence of some gypsum in the outer coating indicates that the oncoids formed in the past. The core materials of the oncoids are small, meaning that the original deposits of the Middle and Low terraces are regarded as typical deposits of a meandering river. The deposits of the High terraces significantly differ from those of the lower surfaces. They consist of well-bedded thick sandy sediment, without typical reddish flood loam and oncoids. The facies of the deposits are analogous to those of sandy braided rivers.

Sediment samples were collected from fluvial deposits in order to estimate their ages using OSL. A sample from the floodplain yielded an age of 200 +- 100 years ago. This age points to the optical resetting of quartz grains, meaning that OSL technique can be applied. The other sample yielded an age of 27,600 +- 4,000 years ago. This age is considered to be minimum, because some of the aliquots showed dose values fairly larger than the average. As the sample was taken from the uppermost part of the deposits, the accumulation of sand to form the High terraces can be correlated with MIS 3. Topographic and sedimentological relations of the Low terrace with the tell indicate that the Low-terraces formed in the Holocene. The inferred ages of the Low and High terraces suggest that the Middle terraces were formed in MIS 2.

The following palaeoenvironmental reconstruction is offered. During MIS 3, the Khabur in and around the study area was braided with abundant sandy sediment, leading to thick fluvial deposition. This reflects large sediment supply from the upstream area, as well as abundant water supply which allowed sediment transport. During MIS 2, the river condition changed from braided to meandering, and fluvial erosion took place to form the Middle terraces. Lateral erosion by the meandering river was pronounced, reflecting the high availability of water, but the lack of thick sedimentation and the change from braided to meandering conditions indicate significant decrease in sediment supply from the upstream area. Stagnant water seems to have been present on the wide floodplain, resulting in the formation of oncoides. In MIS 1, further erosion resulted in the Low terraces and the floodplain, but the scale of erosion was much smaller than that in MIS 2, because the erosive power of the Khabur decreased significantly. The above reconstruction is in line with a number of previous palaeoenvironmnetal studies in adjacent areas.