FLOOD CAUSED SEDIMENTATION ON THE FORESHORE OF THE RIVER TISZA

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Introduction

On the lower reaches of the Tisza two huge floods ran along since the autumn of 1998: one at late fall of 1998 (from November till mid-December) and another at the spring of 1999 (from end of February till the end of May). During both floods very high water level was measured (*Fig. 1*) and both had covered the whole foreshore totally. After the floods passed we have observed sediments of different thickness all over the foreshore. We have measured the thickness of the sediment deposited during the last two floods, and we have tried to estimate the average rate of sedimentation.

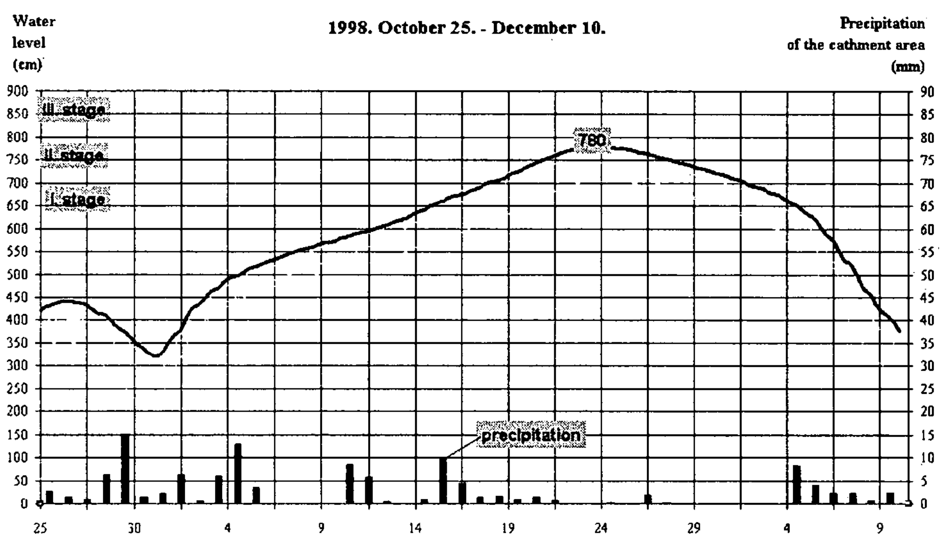

Figure 1A Water levels of two floods in 1998 at Mindszent

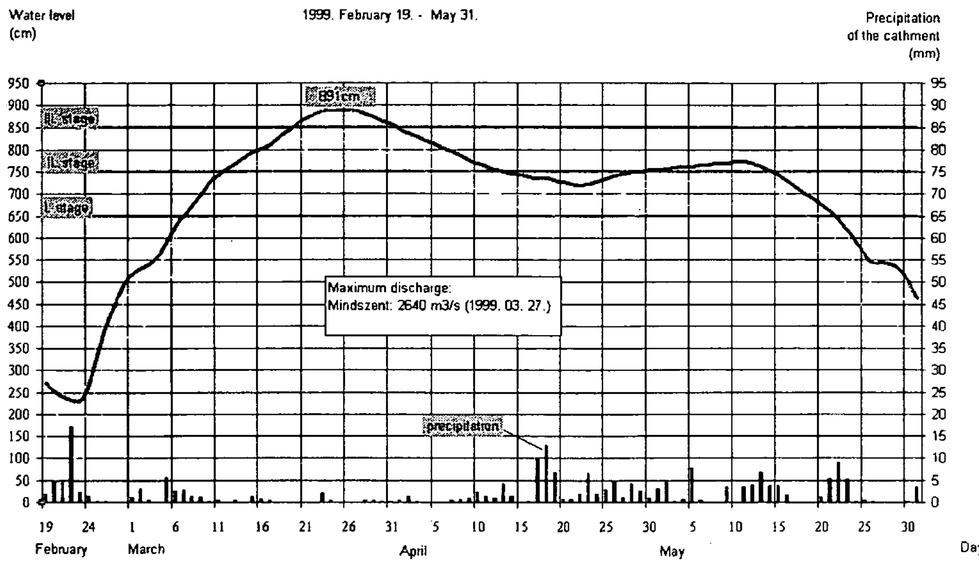

Figure 1B Water levels of two floods in 1999 at Mindszent

Research area

The measurements were carried out on the foreshore of the Tisza, near the town of Mindszent (*Fig. 2*), mostly on the left side of the floodplain, at the inner bend of the river, between two inflexion points. Along the sampling sites the cross-sections show that the floodplain is convex: from the levee towards the river the surface rises, at some places the difference in height can be even 3,0 m.

Along the banks of the Tisza narrow gallery-forest can be found. On those parts of the research area that are close to the town, gardens, vineyards, summer resorts are located. Between the cultivated areas and the levee mostly planted poplar forests, and on the swampy areas willow trees can be found. After the floods passed, considerable amount of sediment was observed on the foreshore. In the newly built channel bars enormous amount of sand was deposited, its thickness reached several meters at some parts. Most of this material slid back to the riverbed during low water.

Methods

The measurements were made along five transects, all together at 106 points. The floods came after the falling of leaves, therefore, the fluvial deposits accumulated on this strata, thus it was easy to measure the thickness of the sediments above the leaf-litter. The only exceptions were those places where the Tisza removed the last leaves, but the good preservation of the yesteryear leaf-litter precluded the possibility of confusing them with those of the former years.

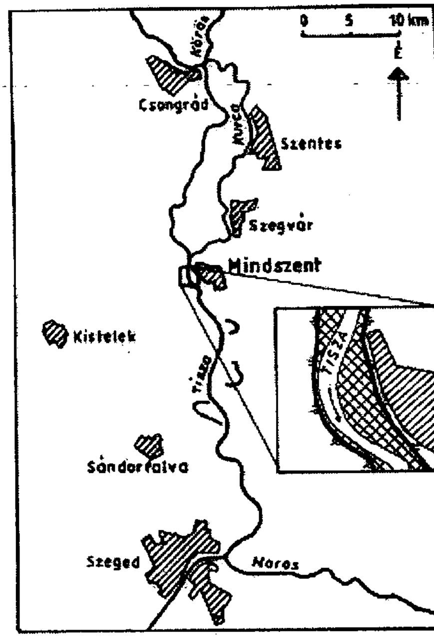

Figure 2 Location of the study area

Therefore, during the investigation we tried to find places where the yesteryear leaf-litter was preserved, where we could handle it as the marker of the bottom of the newly deposited sediment. On those places, where the leaf-litter was missing (i.e. treeless areas) the measurements could be carried out by studying the soil-structure, while in the area of summer resorts the pavements and other solid surfaces marked the bottom of the sediments.

Results

The thickness of the newly deposited sediment varies in a wide range, therefore, for easier evaluation we have used their logarithm, then we have made a map showing the sediment thickness with contour lines (*Fig. 3*). Analysing the figure we can state, that the sedimentation was the greatest on the lower part of the concave bank of the Tisza. In this narrow (10-75 m) riverside area the thickness of the deposits were always over 50 cm. These deposits consist of mostly sand. At some places a rhythm in the fresh sediment – due to two subsequent floods – can be seen: the autumn flood deposited sand, then it was covered by a thick silty-clayey layer; the next sandy layer marks the spring flood, which covered by clay and silt again. This strip is the area of point bar formation.

On most of the area of the bend the new sediment is about 5-10 mm thick, in correspondence with the topography. The best example for the influence of topography on the sedimentation can be studied in the middle part of the bend, where the thickness of the sediment (2-5 mm) is below the average.

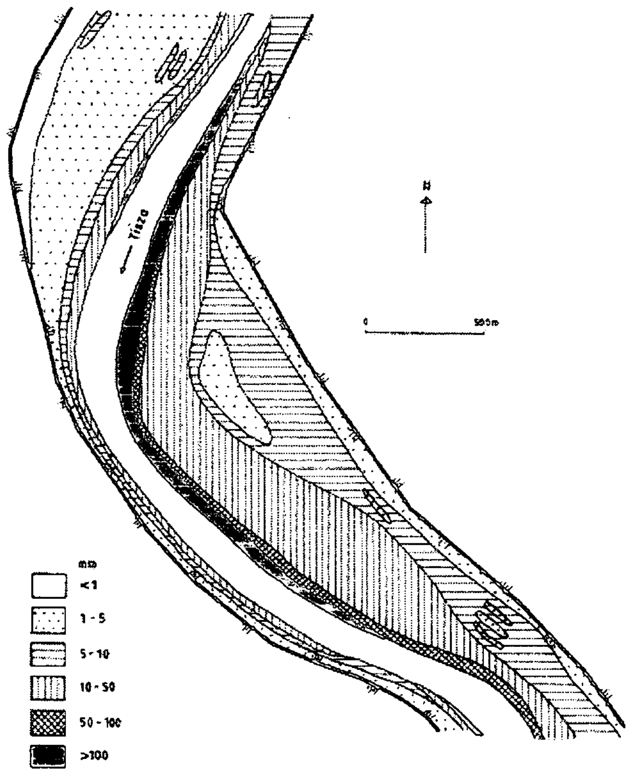

Figure 3 Thickness of sediment deposited by two floods

This can be explained by the fact that this part is higher than its surroundings by 2.0 meters, therefore, the flood covered it for shorter period than the rest of the foreshore.

In front of the levee the thickness of the deposit is greater. We believe it can be explained partly by the natural convexity of the floodplain and partly by anthropogenic activity: the material of the levee was derived from here, therefore it became even deeper than it was, so now it is better sediment trap than the other parts. Because of the fore-mentioned topographical effect, the water stayed here longer, therefore, more clay and silt could deposit here.

On the external bend of the river the amount of sediment is very small, probably because all the measurements are along the inflexional lane of the river.

As a summary we can conclude that the last two floods filled up the foreshore by 10 mm in average. On the riversides, on the bars much more material was deposited, but most of it has got back to the riverbed by mass movements and erosional processes after the flood has passed.

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