

### **Applying geophysical methods for mapping the internal structure of paleomeanders and evaluating the safety of earth embankment along the lowland section of Mures River**

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For its range of applicability, geophysical measurements are widely used in engineering, exploration of mineral deposits and environmental studies. Electrical resistivity tomography (ERT) and frequency domain of electromagnetism (EM) are primary methods for geological structures modeling, ground water mapping and also for detection of subsurface cavities. Geophysical methods were applied both for earth embankment and paleomeanders in order to test the safety of the anthropic levees and to map the internal structure of old river bends.

The human impact on river channel of Mures increased on the 19th century during the canalization period. We can recognize two main building periods, the downstream of Arad embankment sector in the second part of 18th century and in the beginning of 19th century, and the upstream of Arad sector after the great floods of '70s. Theoretically there should be a difference of composition between these structures. The paleomeanders resulted especially from the anthropic cut offs in different periods of time (many of them in the 19th century).

The investigated sites are located both in areas with major changes (Sâmbăteni and Munar) and in cvasi stable area (Arad). The results show a good correlation between the applied methods, mainly on Sâmbăteni's paleomeander, where the areas with high resistivity on ERT tomogram have low conductivity on electromagnetic data. For each side of the bend there is a small channel that is very possible to communicate with groundwater table. In the middle part of the paleochannel there is a relic of a mid-channel made up of gravel.

The geophysical models were validated with 4 drillings and the results are fitting very well. Using the Munar's paleochannel ERT tomogram is very easy to delineate the cross section profile and the shape of old channel bed, which open the possibilities to reconstruct the discharged for different periods and alluvial plain evolution. Comparing the embankment from Sâmbăteni and the embankment from Arad there is an evident difference, firstly based on different high and secondly on composition. The clay or sandy clay layers are more evident on the embankment from Sâmbăteni whilst the values for the embankment in Arad area are a little bit higher.

The conductivity and the magnetic susceptibility emphasize some anomalies in few spots of the levees that can be verified only based on drillings. In conclusion, both geophysical methods are a good and a faster alternative for classical ones, but the models can be validated only using punctually drillings.

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