

# Geodetic basis of river regulation maps

Folyószabályozási térképek geodéziai alapja

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River regulation maps are important parts of the Hungarian cartographic heritage. Despite that fact, detailed descriptions do not exist about them or their geodetic basis. My research was to present the used projection system and the maps which were surveyed on this basis, define this coordinate system for GIS applications and finally to visualize the georeferenced maps.

The first part of the essay describes the projection system established and used by civilian engineers during geodetic surveys of rivers in 19<sup>th</sup>-20<sup>th</sup> centuries and comparisons to other existing coordinate systems. It presents the main parameters of the system: ellipsoidal coordinates of the central point, which was originally located in the observatory atop of Gellért Hill; used ellipsoid and the geodetic datum parameters, calculated using the equations of Molodensky-Badekas method and the type of used projection. The given description is the first precise definition in the related literature.

In the next part essay gives the detailed description of maps examined during my research from the point-of-view of their history. I clarified some missing or misunderstood parts of existing articles regarding the used projection system during surveys of various river regulation maps (listed below) and the number of map sheets of Danube Mappation (1819-1845). I also present entirely new and complete descriptions about several map system: Tisza map of Sámuel Lányi (1834-1845), Plan of Danube (1911), Plan of Tisza (1902, second edition in 1935), Tisza and Danube maps of Béla Vályi (1896 and 1900) and finally maps of VITUKI (Water Management Research Institute) from the second half of 20<sup>th</sup> century.

In the next chapter I present the parameterized definitions (.PRJ, proj4 formats) of the discussed projection system. Using these definitions, the digitized map sheets can be imported into GIS software to examine their content. I also give a short description about the georeferencing methods of the discussed maps because they required different methods based on their nomenclature. I developed several software to make this process easier or automatic (both software and source code are open-source).

Final part of essay contains a description about the development of an interactive website which based on OpenLayers function library visualizes the georeferenced map sheets. User can compare their historical content to satellite images presenting current state of the rivers and their riverside.