



Cartometric research of the Müller's maps of Bohemia and Moravia

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Müller's maps of Bohemia (1720) and Moravia (1716) are among the most important historical maps showing the area of the Czech Republic. There was published many information about both maps. Historical research usually focuses on the mapping process and the map creation. Content of both maps is described thoroughly. Our contribution is focused on the cartometric research of the maps. In previous research sources the positional accuracy of the map is analyzed. Sometimes the scale of the map is determined. Rarely, cartographic projection with appropriate parameters is discussed.

Our work is based on the digitizing of both maps in 2007 and 2008. Original prints of the maps from the Central Archives of Surveying and Cadastre in Prague were used. These maps were scanned in 400 dpi resolution and 24-bit colors. For the map of Bohemia there is another important source of data. In 2010 original copperplate engravings were measured in National Technical Museum in Prague. We defined original dimensions of the map and therefore we can completely eliminate the shrinkage of the paper for this map.

It was necessary to create full vector data models of both maps to make high-quality cartometric research. Creating such models was very time consuming. In 2009, or 2010 respectively, we finished these models as ArcGIS geodatabases. Both models were verified, either in topological way or in attribute way. Confirmed models contain over 15000 point symbols for the map of Bohemia and over 4000 point symbols for the map of Moravia.

For the cartographic projection determination we used map frames. All 4 edges of both frames very measured very carefully. It was proved, that one minute latitude or longitude intervals have the same length for the whole one edge of the frame. What more, two opposite edges contain the same intervals. From these observations we assumed that both maps are created in the simple cylindrical projection equidistant in meridians. From the ratio of the length of one minute interval in meridian and in parallel we computed other parameters - undistorted parallels (Map of the Bohemia $49^{\circ}56'$, Map of the Moravia $51^{\circ}38'$).

The scale of both maps was computed from the graphic scale bars depicted on the maps. The scale bars contained historical length units, so these had to be converted. Final scale of the map of Bohemia is 1 : 132 367. For the map of Moravia, it is 1 : 182 221. Based on these numbers we computed possible diameter of sphere used. For both maps the diameters are similar (6 276 785 meters, 6 233 816 meters). Very interesting part of the research was the determination of prime meridians. Both maps, though created by the same author, have different prime meridians. Geographical coordinates of ground control points were compared with current coordinates measured from Greenwich. The map of Bohemia has the meridian $20^{\circ}34'$ west of Greenwich; the map of Moravia has the meridian $20^{\circ}04'$ west of Greenwich.

At the end the map frames were analyzed. Using ground control points coordinates (from the vector data models) we assumed that the map frame on the map of Bohemia is almost 3 minutes shifted in south direction. The map frame on the map of Moravia is shifted over 5 minutes in south direction. We found small rotation of both frames too.

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