A FEW CONSIDERATIONS REGARDING THE ROMANIAN CARTOGRAPHIC DEVELOPMENT AT THE BEGINNING OF THE 20TH (TWENTIETH) CENTURY

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ABSTRACT

Before the World War I the territory of Romania was represented on more type of topographic maps. In 1916 the projection was unified: it was used the Lambert–Cholesky Conformal Conic Grid on the datum Clarke 1880. The scale of the base-maps were 1: 20 000. The maps were used until the publication of the Gauss–Krüger maps in 1959. The maps are digitized and georeferred by the authors – so these maps can be used as a basic material for historical and geographical researches.

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1. INTRODUCTION

Before the 1918 Union, the Romanian territories were subject of several dominations, for which reason the cartographic data base for each Romanian province was different from an area to another. Starting from the second half of the 19th century, Valachia, Moldavia and Dobrogea (Dacia Pontica or Scitia Minor) field mapping was made, implicitly cartographic representations, different as structure. The projection systems used, the chosen geoid, the nomenclature and the distribution of the map pages were not uniform. For an example, the Bessel ellipsoid and the Cassini cross cylindrical projection were used especially to the eastern side of the Zimnicea central meridian (23^0 East from Paris), while to its western side the Bonne conic equivalent projection was used, as defined on the Clarke ellipsoid (Năstase, 1975, pages 86-87). In the other Romanian provinces, such as Transylvania, Romanian Banat, Bessarabia (Moldavia Republic) and Southern Bucovina, the major part of the cartographic products (surface contour maps) were made as polyhedral projections.

During the World War I, when artillery was a redoubtable weapon a necessary idea was born to articulate an unitary cartographic projection concerning the entire Romanian territory, which should respond to the principle of conformity. Between 1916-1917, pursuant to the above argumented measure, a new datum/location surface, a new projection system and a new nomenclature were introduced. The Lambert projection system was used as modified by the French land surveyor, the mathematician and officer Andre Louis Cholesky. He was born in 1875 in Mont Guyon and passed away on the battle field in

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Northern France in the month of August 1918. During September 1916 up to February 1918, following the Franco-Romanian military convention, he was a Commander of the Geographic Department of the Romanian Army (Brezinsky-Gross-Cholesky, 1996). The calculations for passing from the various projections (as previously mentioned), into the Lambert-Cholesky projection, were made by the Romanian officers (Osaci-Costache, 2000 page 138).

2. MAPS PROJECTION

The datum/location surface used by the Lambert-Cholesky projection was defined on the Clarke ellipsoid 1880. We have no data concerning the used datum. Employing Mugnier's (Mugnier 2001) data, we may state that the geometric elements of the ellipse used were: major semi-axis (a): 6378249,2 m; minor semi-axis (b): 6356515,0 m. These values differ only by 10 cm compared to the Clarke ellipsoid 1880, a difference which we may consider as a round-off error. We have no data on the actual position of the co-ordinates system centre. From the location surface it was arrived at the plane surface by using the conic conform projection of Lambert. The projection central meridian was located at 2 centesimal degrees western side of the meridian of the Military Astronomic Observatory in Bucharest ($24^0$18`44,99`` eastern longitude, respectively $45^0$02`29,216`` northern latitude). The size of the longitudinal deformation was reduced on the central parallel (l = 0,99844674), in this manner arriving in the situation where the longitudinal reducing on the central parallel and the longitudinal increasing on the parallel placed on the eastern border of the territory intended to be reciprocal one to each other (Cliford and Mungier, 2001 pg. 547). In this manner we are able to determine the projection central point in Valea Oltului in the closed vicinity of Stolniceni locality in Vâlcea county. The co-ordinates system was placed so that the crossing point of the 45^0 and the central meridian should observe the relation x = y = 500km. The Cartesian coordinate of the projection central point is x = 500000m, respectively y = 504599, 11m (Cliford and Mungier, 2001).

3. SCALE AND NOMENCLATURE SYSTEM

The basic map, called „Plan Director de Tragere" was drafted under 1:20000 scale in 2118 drawings, covering the Romanian territory. Under graphical aspect, such drawings had a 75 cm length (the equivalent of 15 km of land), respectively 50 cm (the equivalent of 12 km of land). Usually, at the upper part of the map, frequently to the left side, less frequently to the right side, the drawings nomenclature appeared, made following the principle: the first two letter meant the columns number and the last two characters represented the lines number. So, the drawing whose south-west corner had the Cartesian co-ordinate of 10 km, 20 km would have received the codification 1020.

Another series of maps of the same family was made under the 1:100000 scale, representing 102 drawings, covering the entire national territory. The drawings under the 1:100000 scale had the same size as the basis map, therefore they were covering a surface 25 times larger. The drawing nomenclature corresponded to the drawing under the 1:20000 scale in the south-west corner. The drawings under the 1:200000 scale were executed equally, with the same graphic dimension.

4. BASIC MATERIAL AND CONTENT OF THE MAP

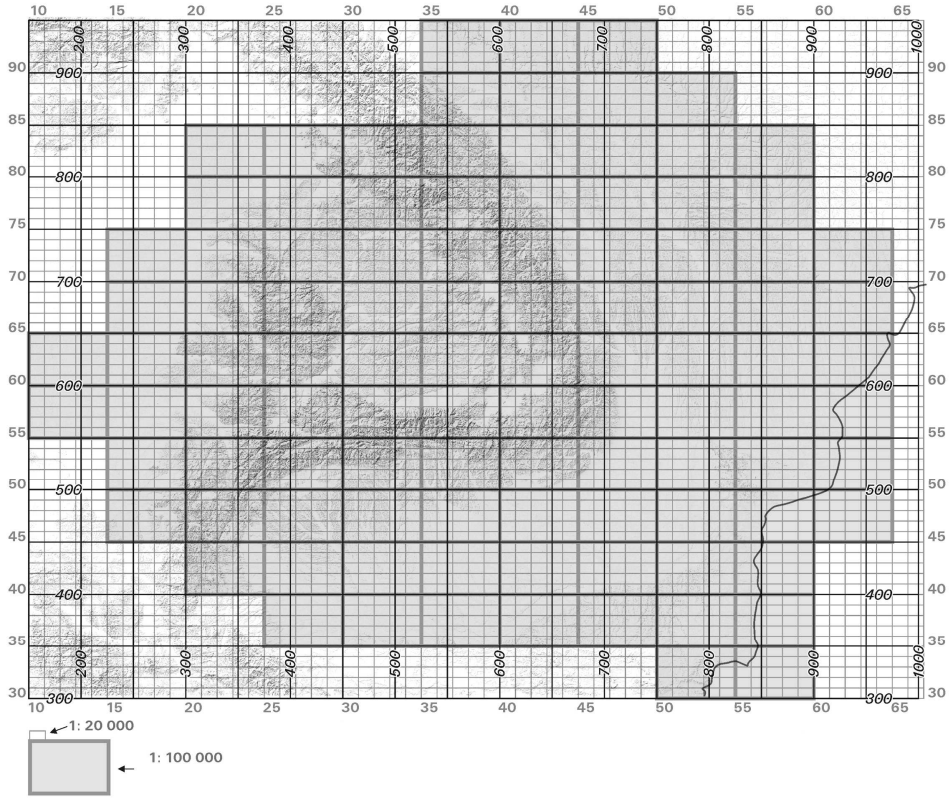

Fig. 1 ***Drawings rectangular system under the 1:20000 scale and the surface covered by the drawings under the 1:100000 scale of the Lambert-Cholesky projection.***

The maps under Lambert-Cholesky projection, especially those ones made in the first period, were not the result of some new measurements, but they proceeded from previous sources (Romanian, Austrian, Russian), graphically transposed. Since 1924, a major part of the data in these maps was updated on the grounds of the aerial photograms. Subsequent to the Agricultural Reform in 1921, the maps toponimy was modified, numerous Romanian denominations being added (Năstase, 1875 page 87).

On the maps under the 1:20000 scale, the relief was represented as elevation curves with an equidistance of 20 m, and on the maps under the 1:100000 scale, the equidistance was of 100 m. In order to represent the relief, the 1:200000 Variant employed the hachure method. The toponyms are usually written in Romanian language, while in Transylvania and especially in the transfrontalier areas, mixed toponyms are noticed. Colours used in the basic map printing were brown for the relief and black for the remaining representations. On the maps under the 1:100000 scale, a third colour appears (green for vegetation), and for the maps under the 1:200000 scale, only two colours are employed: green for vegetation and black for the rest of the represented elements.

Fig.2 ***Fragment of the Oradea drawing (1926) under the 1:100000 scale***

5. NEW EDITIONS OF THE MAPS. IMPORTANCE AND METHODOLOGY OF STUDYING THEM.

Editing, printing and spreading of the same covered many years, up to 1959.

Even at the beginning of the fourth decade, the projection changing have been decided (Hayford ellipsoid and the secant stereographic projection), a minor part of 5% of such maps were transposed in the new system (Năstase 1975, page 87). During the `50, the maps contents and accuracy gradually begin not to correspond anymore to the military topographic exigencies.

By this reason, and due to the fact that the maps under Lambert-Cholesky projection were not accordable to the Gauss-Kruger maps, as used by the soviet space, a decision to implement a new projection system for the Romanian space has been taken. This system is founded on large measurements campaigns, starting in 1951 and their results have been materialised into the new Gauss-Kruger projection maps. In parallel, between 1954 up to 1959, the most recent drawings under Lambert-Cholesky projection was edited and printed, bearing numerous toponymy corrections (Osaci-Costache, 2000).

The significance of the Lambert-Cholesky projection maps consists in the fact that they represent the first cartographic product referring to the entire Romania, under an unique projection system, and having an unitary legend.

Furthermore, these ones are the maps achieved at the highest scale up to that moment. In the mean time, they represent a public and not classified cartographic product, as well.

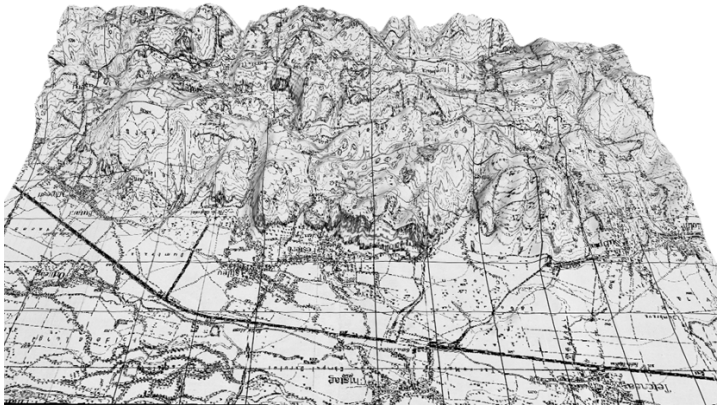

Fig. 3 ***Valea Crişului Repede (Lambert-Cholesky drawing under the 1:20000 scale) overlapping the altitudinal numerical template of the land (SRTM)***

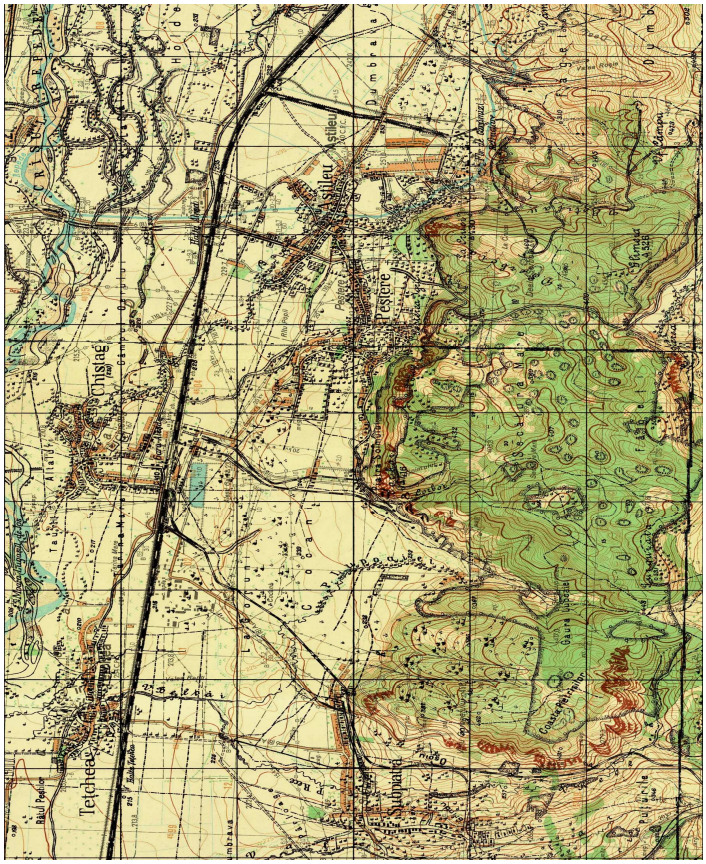

Fig. 4 ***Valea Crişului Repede (Lambert-Cholesky drawing under the 1:20000 scale, with Gauss-Kruger background under the 1:25000 scale).***

Part of the Lambert-Cholesky maps (1:200000, 1:100000, 1:200000) are kept at the Bucharest University, another part at the Babeş-Bolyai University. Their scanning was made at the Cluj University, using a reel scanner, A0 paper size, thus obtaining *.tif formats having a 300 dpi resolution. Employing the above mentioned parameters, these formats have been geo-referenced. Related to the errors occurring, we mention that the difference compared to the reality is comprised between 50 – 100 m. Such errors are caused, to a large extent, by the manner of graphic transposition by means of which the maps were drafted and to a smaller extent they are due to the parameterization.

6. CONCLUSIONS

Before the World War I, Romania had not an unitary cartographic system. Starting from 1916, it was attempted to standardize the previous projection systems and the nomenclature systems, aiming to guarantee the accordability premise.

With this purpose, the Lambert - variant Cholesky maps, under conic conform projection, have been made. Short time after that, the drawings under 1:20000 scale were edited under this projection. Such drawings were permanently updated, up to the year 1959, when the Gauss-Kruger projection imposed itself. Its authors transposed these materials on digital support, by scanning operations, actually the action of their geo-referring being in progress.

We therefore consider that such materials do constitute a proper foundation for the carto-topographic research, also enabling in the evolutional sense the development of the natural and the built environment. It is of a certain interest that this cartographical products, since they are geo-referenced, shout arrive to the interested persons in the geographical domain shaped as a multimedia product similar to the Austrian military measurements, as recently promoted by the ARCANUM Editing House.

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