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On the *Generalkarte* coverage of the northern part of Greece and its interactions with the relevant subsequent Greek map series

Keywords: Generalkarte; Mapping the Balkans; Greek cartographic heritage; Map analysis.

Summary: The map sheets of the *Generalkarte*, result of the *Third Austro-Hungarian Mapping* (late 19th century), are of particular importance to the modern Greek cartographic heritage, because they constituted the initial cartographic tools in the northern part of Greece, after its liberation and incorporation in the Greek state (early 20th century). The *Generalkarte* sheets were reproduced until the mid-20th century in various Greek map editions.

The paper is concerned with investigating the similarities between the original *Generalkarte* sheets and their respective subsequent Greek editions. Comparisons are carried out for sheets covering areas in both sides of the old borders of the Greek state (early 20th century) and interesting differences are spotted, attributed to Greek cartographic campaigns of the time, closely related to certain historical events.

Introduction

The first scientific mapping of the northern part of the actual Greek territory is an outcome of a broader cartographic campaign, namely the *Third Austro-Hungarian Mapping*. The relevant survey took place in the second half of the 19th century and resulted in the military map series of the so-called *Generalkarte*, in scale 1:200 000 (Livieratos, 2003).

The map sheets of the *Generalkarte* are of particular importance to the Modern Greek cartographic heritage, since they constituted the initial cartographic tools in the newly liberated northern parts of the Greek state (1912-1913) and were reproduced until the mid-20th century in various Greek map editions. Additional reproductions of the *Generalkarte* were made by other Balkan countries (e.g. Bulgaria) until the same period (op. cit.)

An attempt to compare a number of original sheets of the *Generalkarte* with their subsequent Greek and Bulgarian reproductions is made in this paper. The comparison was carried out with the help of suitable digital cartographic tools; the result of this digital comparison process confirms the historical evidence of copying the Austrian map sheets in later cartographic products of Balkan countries. In the Greek map sheets of the early 20th century, however, an interesting differentiation appears, especially in the newly liberated territories. More specifically, two editions (i.e. 1901 and 1910) of the *Generalkarte* are compared for two map sheets: one covering a part of Greece outside the borders of the Greek state of that time -and another one within the territories of the state. Remarkable differences are spotted between the *Generalkarte* and the respective Greek sheet for the latter case, especially in the form of the terrain, but also in additional map features. The two sheets of the former case (i.e. those outside the Greek state at that time) have, however, a striking similarity, in almost all their elements. This is also the case with the same map sheet of a later (1941), Bulgarian edition of the *Generalkarte* that was also used in the comparison process.

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It seems that the similarities and differences -traced briefly so far and explained in more detail in the following- are related to another mapping project of the time, namely the official Greek map series in scale 1:300 000 (produced in the early 1880s and also influenced by Austrian mapping tradition) as well as to some local surveys. Features of the Greek map series were incorporated in the respective *Generalkarte* sheets, resulting in an interesting blend.

The historical background

A strong cartographic relation is evident between Austria and modern Greece. Apart from earlier links in the late 18th century (see e.g. Livieratos, 2010), the origins of the first scientific mapping of the northern part of the Greek territory (mid- and late 19th century) date back to Austrian cartographic activities, namely the well-known “Landesaufnahmen” (mappings) of the Austro-Hungarian Empire.

The *first* of these, known as *Josephinische Landesaufnahme* started in 1764, when Empress Maria-Theresa ordered a systematic mapping of the Austro-Hungarian territory and was completed in 1787, during the time of her successor, Emperor Joseph II (Livieratos, 2003). It was followed by the *second* mapping (1806-1869), known as *Franzisceische Landesaufnahme*, which was soon substituted by the *third* one (1869-1887) known as *Franz-Josephinische Landesaufnahme*. The result of this mapping was the so-called *Spezialkarte*, in scale 1:75 000. In 1889 this map started to be generalized and the process resulted in the production of the so-called *Uebersichtskarte* (1:750 000) covering Central Europe, as well as of the so-called *Generalkarte* in scale 1:200 000 (covering Central and South-East Europe) (op.cit.). The geographic coverage of the *Generalkarte* sheets included thus and the actual northern territories of Greece, most of which were not part of the Greek state at that time. In approximately a decade from its start (i.e. around the turn of the century) the *Generalkarte* was complete (Fig. 1). The sheets concerning Greece were produced in the first years of the 20th century. Since then, these original *Generalkarte* sheets have undergone various subsequent editions (see e.g. Ploutoglou, 2003). The sheets covering the actual territory of Greece, in particular, were re-edited, from 1909 till 1927 by the greek State Cartographic Service of the time, as well as by private publishing houses in Athens (op. cit.).

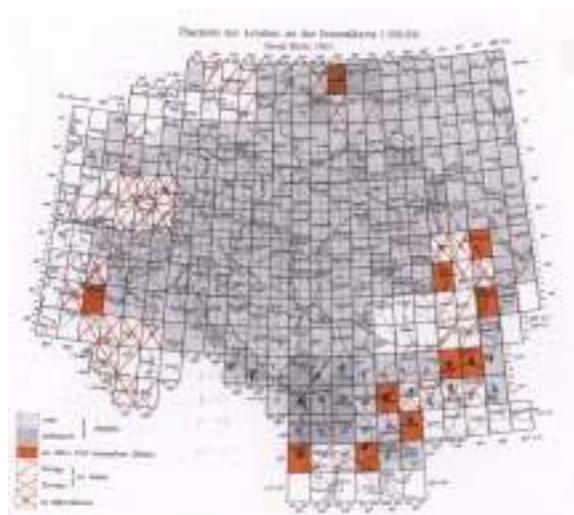


Figure 1. The tiling of the map sheets of the *Generalkarte*. The colors indicate progress of work at 1901 (source: Livieratos, 2003).

During the same period (i.e. the last decades of the 19th century) a strong interest in maps is evident in Greece, particularly focusing on mapping the lands across the country’s northern border of

Thessaly¹ (Livieratos, 2009). Amongst the maps that are issued within the Greek state, a prominent example is that of the map series of the so-called *Map of the Kingdom of Greece*, in scale 1:300 000. This map is engraved and printed in Vienna, in 1884, at the famous *Kaiserlich und Koeniglich Militaerischen Geografischen Institut* (op. cit.). Of particular interest is the fact that the tiling of this map is based on that of the so-called *Handkarte*: an Austrian map series of Central Europe and the Balkans, in scale 1:300 000, prepared by the Austrian officer Joseph Ritter von Scheda (see e.g. Boutoura et al., 2010). The *Handkarte* (or Scheda-karte) was produced in the years 1873-1876, during the *Franz-Josephinische Landesaufnahme* (1869-1887).

The Generalkarte and subsequent maps

Historical cartographic evidence suggests that the Austrian map sheets of the *Generalkarte* were copied in later cartographic products of Balkan countries. In order, however, to confirm this fact in a stricter manner and / or to investigate the faithfulness (or not) of the various copies, more analytical cartographic procedures have to be followed. This investigation becomes more interesting, since it seems from the work carried out so far that the degree of similarity between the consequent editions is strongly related to the location of the map sheet itself. For example, from the only one comparison carried out so far for two map sheets in Northern Greece² (see Kermanidou, 2009) it appears that the form of the terrain is very similar in the Austrian and the Greek edition. This is not always the case, however, as it results from comparisons carried out in this paper for other map sheets.

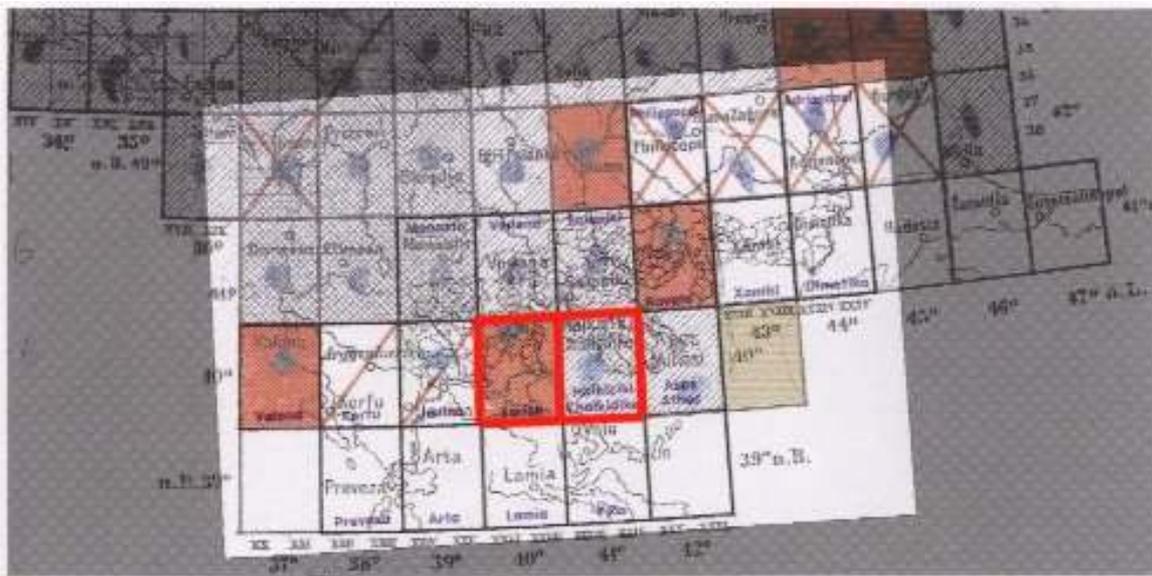


Figure 2. The sheets of the *Generalkarte* covering the Greek territories (source: Livieratos, 2003). The red frames indicate the two map sheets used here: *Larisa* (left) and *Chalkidiki* (right).

From the 282 sheets of the *Generalkarte*, eighteen (18) cover the actual Greek territory. Two of these map-sheets and their respective subsequent editions are used here, for the comparison process. More specifically, the sheets and the respective editions are (see also Fig. 2):

¹ Thessaly was incorporated in the Greek state in 1881.

² Map-sheets “Vodena” and “Saloniki”, both northern of the border of Fig. 3.

Map sheet *Larisa* (Fig. 4)

- Original Generalkarte edition (1901)
- Greek edition (1910). Editor G. Kontogonis, Athens

Map sheet *Chalkidiki* (Fig. 5)

- Original Generalkarte edition (1901)
- Greek edition (1910). Editor G. Kontogonis, Athens
- Bulgarian edition (1941)



Figure 3. The Greek -Turkish border before the Balkan wars (1901), as depicted in four sheets of the Generalkarte (source: Liviratos, 2003). The red frames indicate the two map sheets used here: *Larisa* (left) and *Chalkidiki* (right).

Apart from the comparative study between the different editions of each map sheet, all of them are also digitally compared to the respective modern Greek topographic maps (scale 1:250 000).

The map comparisons

The projective system of the *third* Austro-Hungarian mapping is the so-called *Austrian polyhedral*, a variation among the numerous projections of that type, originating from the sinusoidal (Sanson) projection (for a detailed description of the Generalkarte projective properties see Liviratos, 2003). The prime meridian is located in the island of Ferro (in the Canary Islands, at longitude $17^{\circ} 39' 46''$ west of Greenwich), and the reference ellipsoid is that of Bessel. The projection is neither conformal, nor equivalent; every map sheet in the tiling is a trapezoid, having its own reference system, independent of its neighboring sheets (op. cit.). The projective system of the Greek Topographic map (1:250 000), on the other hand, which is used here as the reference frame for the digital comparison process, is quite different (Hayford ellipsoid, ED50 Datum, UTM projection).

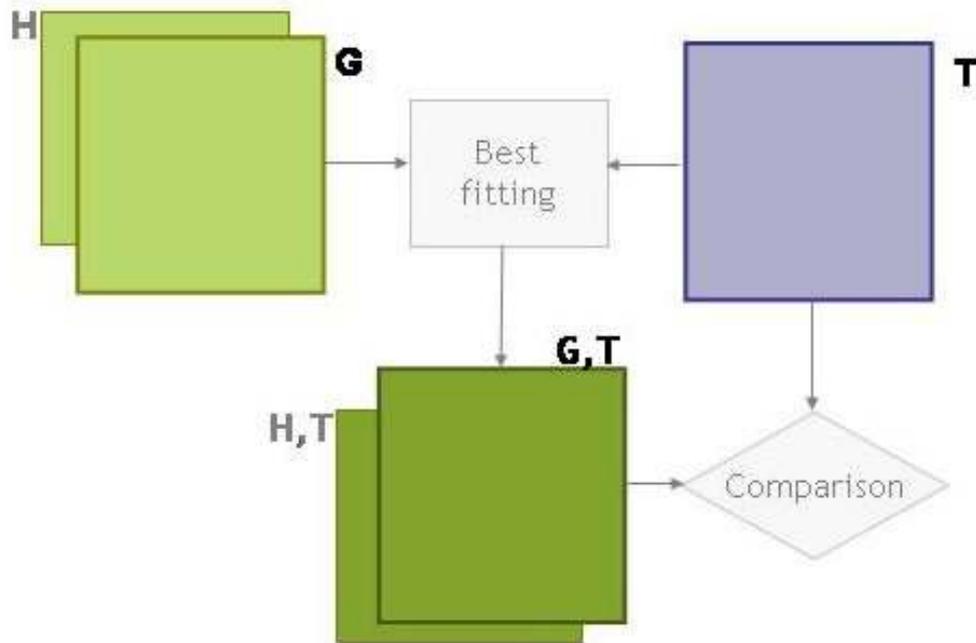
In order, therefore, to fit optimally the Generalkarte sheets to the (UTM grid of the) Greek Topographic map sheets for the comparison, a second order polynomial transformation was applied to the Generalkarte sheets. The numerical results of the least squares adjustments were quite satisfactory for all sheets, with the values of the standard errors (of evenly distributed control points used for the adjustments) ranging within acceptable limits. In Figure 6 this process is shown graphically: the different map sheets (**G** for *Generalkarte* 1901, **H** for *Hellenic* -i.e. Greek- edition 1910) are best fitted to the modern topographic map sheets **T** and the results are **G,T** and **H,T**, respectively. These best fitted sheets (i.e. **G,T** and **H,T**) are then comparable to each other and / or to **T**. Exactly the same procedure was applied for the Bulgarian edition, as well.



Figure 4. Map-sheet *Larisa*: Generalkarte 1901 (left) and Greek edition by G. Kontogonis 1910 (right).



Figure 5. Map-sheet *Chalkidiki*: Generalkarte 1901 (left), Greek edition by G. Kontogonis 1910 (middle) and Bulgarian edition 1941 (right).



G : Generalkarte 1901
H : Hellenic (Greek edition of Generalkarte) 1910
T : Modern Greek Topographic Map

Figure 6. The principle of the map comparison process (see text for explanation).

The results

After the maps were brought to a common geographic reference, it was possible to compare each one of them with any of the others, in order to detect possible similarities or variations between the elements of the sheets. Digital transparency was used in order to visualize combinations of respective sheets. A general remark that can be made at this point is that the original sheets of the Generalkarte might have striking similarities with their successive editions; this, however, depends on geographic location. For sheet *Larisa*, for instance, this is not the case: there is no good overall agreement between the Generalkarte 1901 edition and the Greek 1910 edition. It seems, also, that the 1910 edition is much closer to reality, because it agrees with the modern topographic map sheet (see Fig. 7). The case is quite the opposite for the *Chalkidiki* sheet (see Fig. 8).

More specifically, it was detected that for the sheet *Chalkidiki*, all elements of the 1901 copy were almost identical to the Greek 1910 and the Bulgarian 1941 editions. Some differences in the lower left corner area, which was actually on the other (i.e. Greek) side of the Greek-Turkish border (as in 1901), gave rise to an hypothesis that proved actually correct: that the parts belonging to the Greek state had somehow been 'revised' or 'updated' in the respective newer edition (1910) of the sheet, even though the rest of this same sheet was a copy of the old Generalkarte version. This is eventually what happens on the *Larisa* map sheet, where the area north of the aforementioned border is identical in the 1901 and 1910 editions (Fig. 11), while this is not the case south of the border, on the same sheet (Fig. 13). Moreover, the 1910 version of the sheet has many similarities

with the modern topographic map, especially south of the border (Fig. 14), in contrast to the 1901 edition (see also Fig. 7). These observations are graphically summarized in Figures 7 and 8; some indicative illustrations are given in Figures 9 to 14.

Some important events of Greek cartographic history seem to be echoed in the results of the above comparisons, such as the extended cartographic campaigns in the Greek state after the incorporation of Thessaly in 1881 and the topographic surveys after the re-tracing of the border in 1897 (see Livieratos 2009, for details).

Moreover, such comparisons emphasize the internationality of cartographic heritage: it would be interesting, for instance, to know from Bulgarian colleagues about the use of Generalkarte map sheets from the Bulgarian point of view.

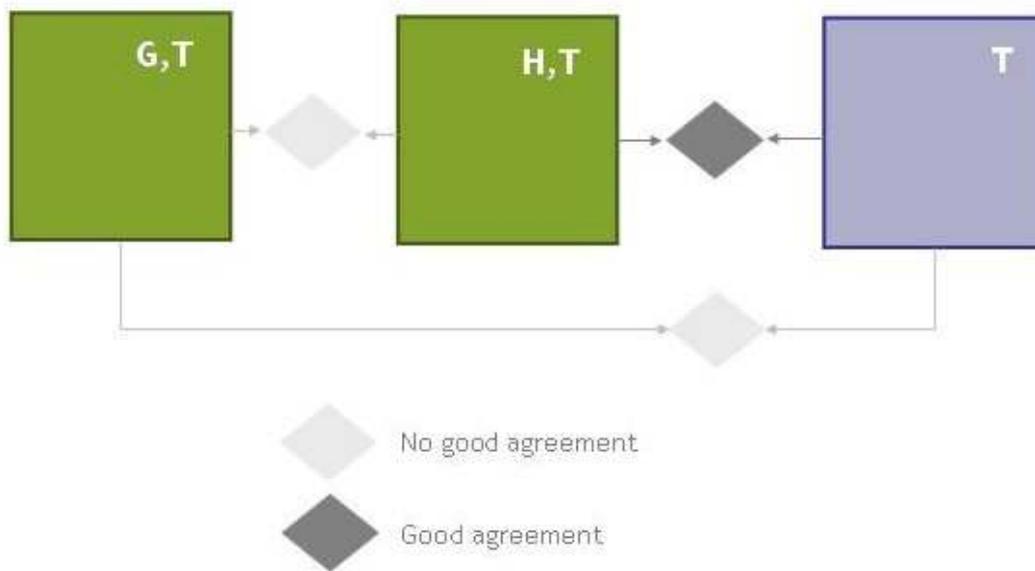


Figure 7: The results of the map comparison process for sheet *Larisa* (see text for explanation)

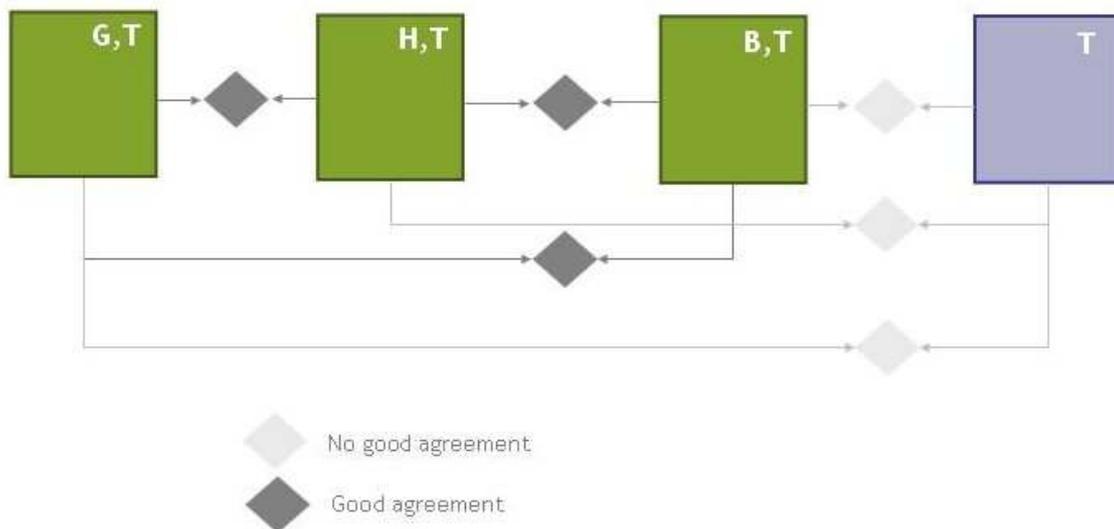


Figure 8: The results of the map comparison process for sheet *Chalkidiki* (see text for explanation)

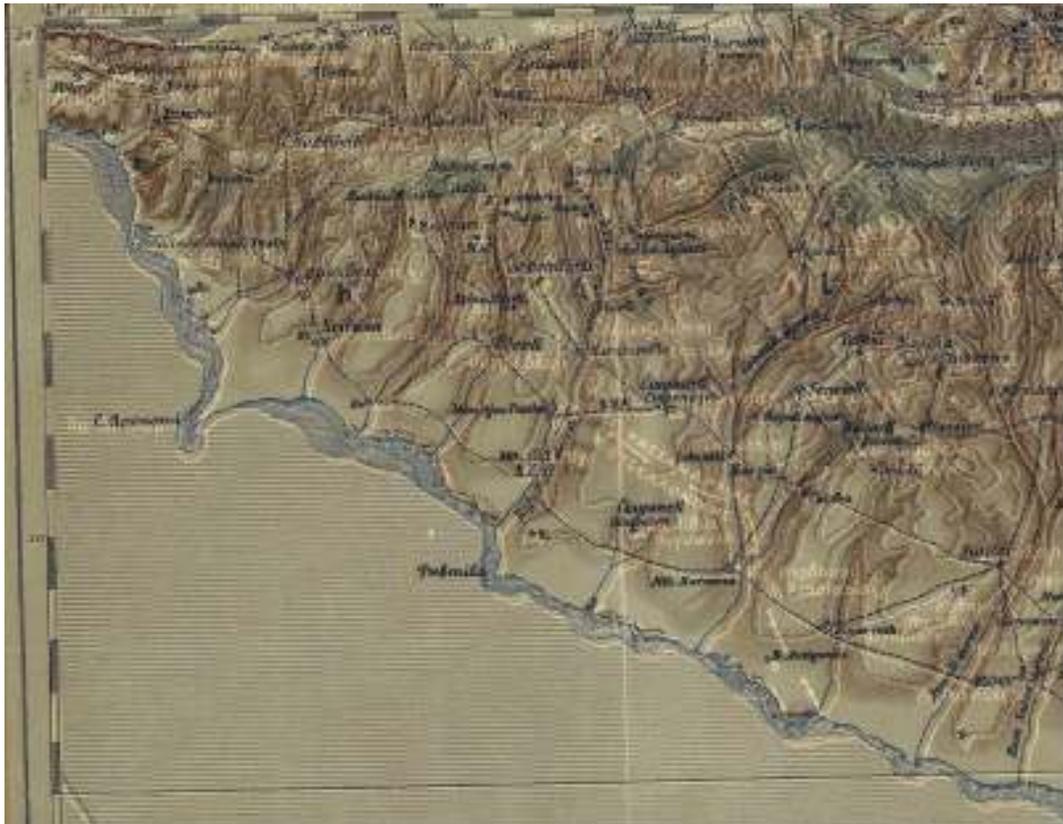


Figure 9: Map sheet *Chalkidiki* : the Greek 1910 edition over the Generalkarte 1901 edition

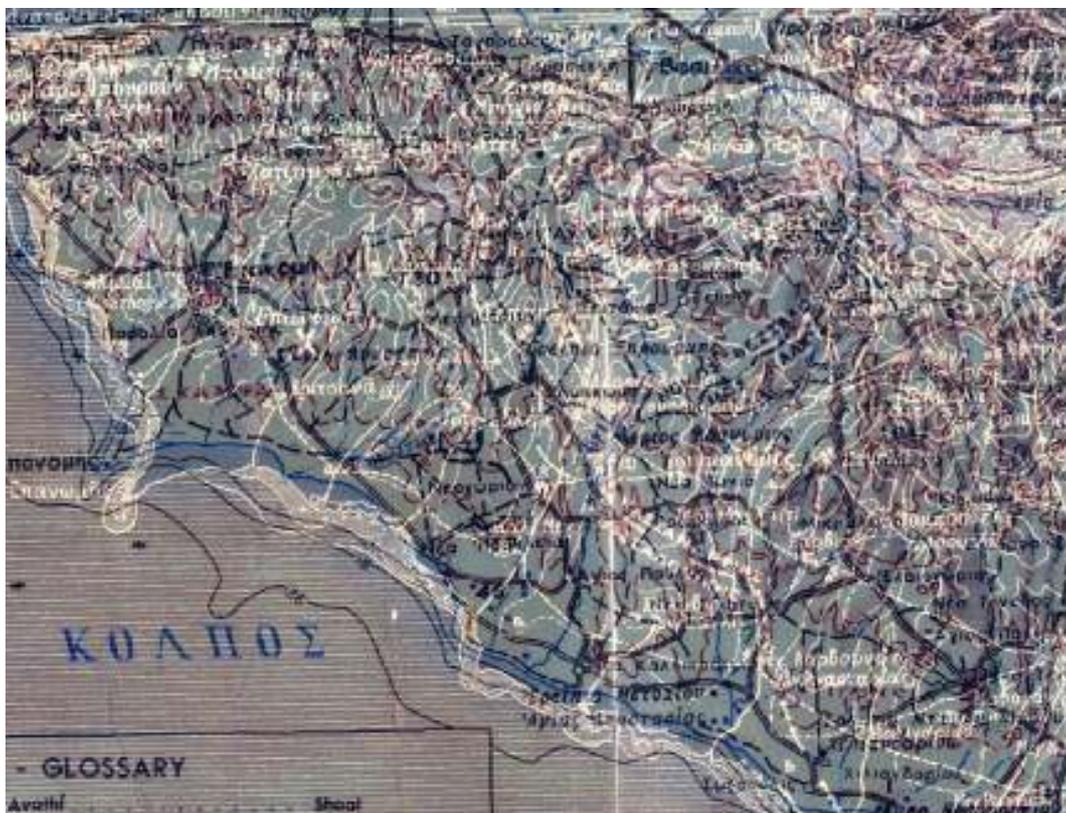


Figure 10: Map sheet *Chalkidiki* : the Greek 1910 edition over the modern Greek Topographic map.



Figure 11: Map sheet *Larisa*: the Greek 1910 edition over the Generalkarte 1901 edition (north of the border).

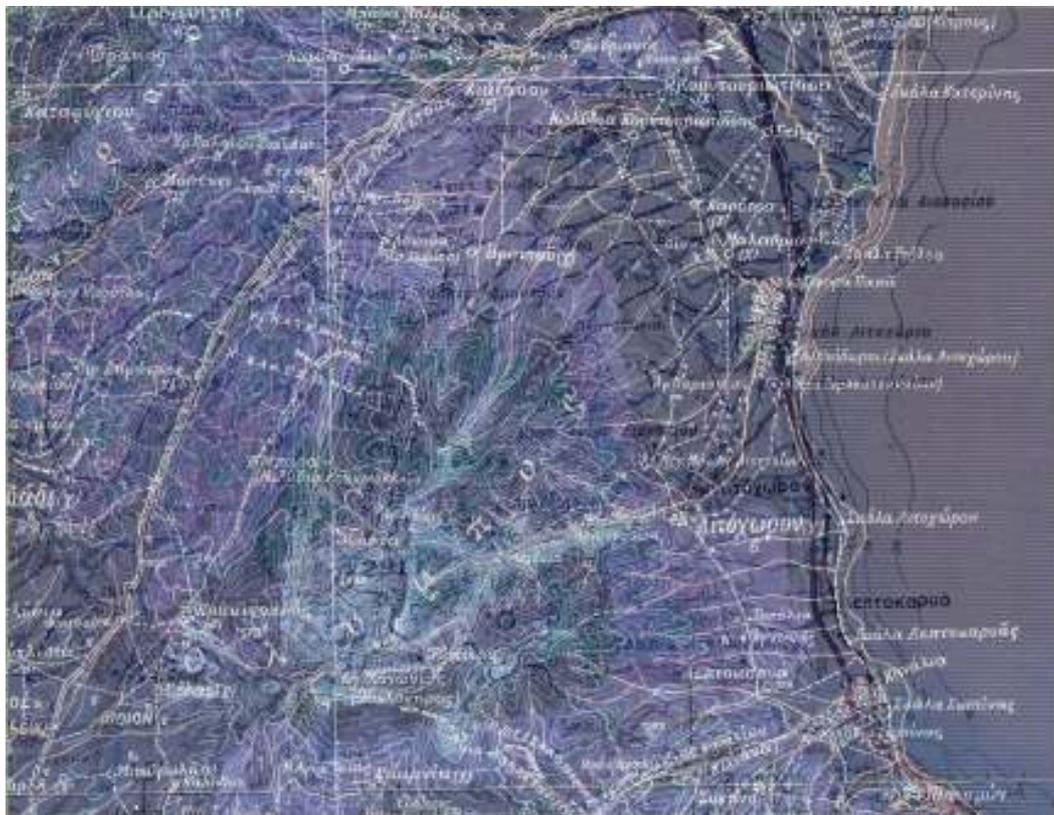


Figure 12: Map sheet *Larisa*: the Greek 1910 edition over the modern Greek Topographic map (north of the border)



Figure 13: Map sheet *Larisa*: the Greek 1910 edition over the Generalkarte 1901 edition (south of the border)



Figure 14: Map sheet *Larisa*: the Greek 1910 edition over the modern Greek Topographic map (south of the border)

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