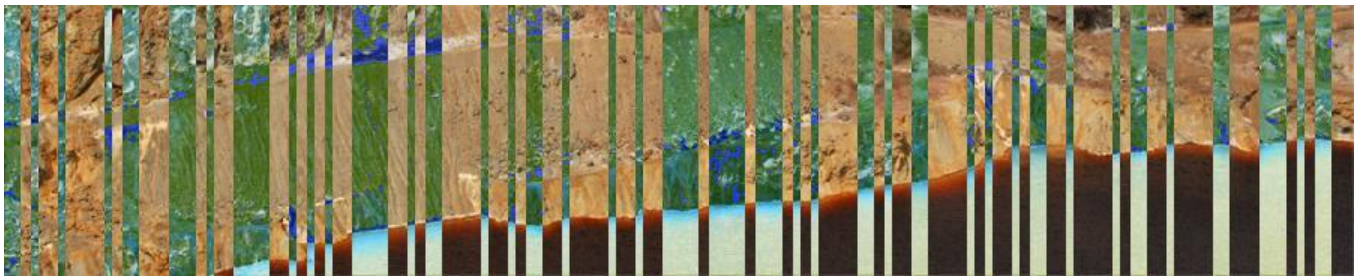


The Copper Resources of Temesa

Content

1. Problems with the geographical location of Temesa / Terina

> *…sailing over the wine-dark sea to men of strange speech, on my way to Temese for copper; and I bear with me shining iron (Odyssey I.183, cited from www.perseus.tufts.edu).*

In my essay "Homer über dem Eisernen Steg in Frankfurt" (homersheimat.de) I had explained why that "Temesa" mentioned in the just cited Odyssey verse cannot be identified with the Cypriot **Tamassos**, but should be seen in a place located on the west coast of Calabria. This is supported by an interpretation of the context in which the quoted Homer verses are placed, as well as certain geological arguments, to which I will return in more detail, and by several references in the "Geographica" of the ancient Greek historian Strabon (63 B.C. to 23 A.D.). Strabon we owe the clearest statements of a historian to this place. But as already stated at a colloquium on that Temesa in Perugia and Trevi 1981, Strabon's apparently so concrete geographical indications are by no means suitable for reliably locating the historical place (*Temesa e il suo Territorio*, henceforth quoted as TEMESA 1982, p. 41).

Strabon travelled and described an Italy whose 'boot foot' at the time of Homer was still marked by the great Greek colonization with the formation of "Magna Graeca". The conditions changed then profoundly with the expansion of Rome as well as Rome's wars with Carthage. Italy's southernmost region, which we now call Calabria, was then called Bruttium and – after Rome's previous expansion there – had been conquered by the Carthaginian commander Hannibal and had been designed as his inner-Italian operational base.

Previously there had been wars between all sorts of peoples in this area, for instance with the Lucians settled north of Bruttium. From the south, the city of **Lokris** intervened massively in these battles. It is one of the earliest Greek spin-offs from around 680 B.C. by Greek locals who had to sail around the entire Peloponnese to found it. In order to distinguish this new town Lokris from its place of origin (approximately in the area between Thermopylae and Lake Kopais) it was named "epizephyric" after the Italian promontory Zephyrium. The place name "Lokris" has remained until today (see map in Fig. 1). These Locri were already present during the Mycenaean storm on Troia – as Homer tells in his ship catalogue (contingent 4 under the leadership of the "fast" Aias with 40 ships; Iliad II.527).

In book VI of his *Geographica* Strabon describes his journey to southern Italy from a starting point at the **Silaris** River (today "Sele") a little north of the ruins of Paestum (at that time "Posidonia"), which are still impressive today. He travels south along the Italian west coast through the former land of the Lucians, which

is said to have had its border with Bruttium on the river Laus (gr. Laos) (cf. again the map in Fig. 1). Strabon's depiction soon leads to serious contradictions. On the other hand he reports that the capital of Lucania was **Petelia** (today Strongoli), which however was situated only a few kilometers north of **Kroton**, which can be found much further south and also on the east coast – thus deep in the Bruttiens area. Today's Crotone also started – like Lokris – as a very early Greek spin-off, which could be reached easily and directly from Attica.

Strabon now claims that **Temesa** (coming with him from the north) was "Bruttium's first city after Laus". Even to this location so far north, recent geological investigations could give indications of possible copper deposits, which must be inseparably connected with that Temesa (IGCP 369, GUARASCIO 1982). But a Temesa at this northern point could hardly have been attacked and conquered by Lokris, which (as already mentioned) lay far to the south. It is also said that after the local conquest of Temesa, the crotons, who had previously owned Temesa and exploited its copper mines vigorously, founded a replacement nearby and called this town **Terina**.

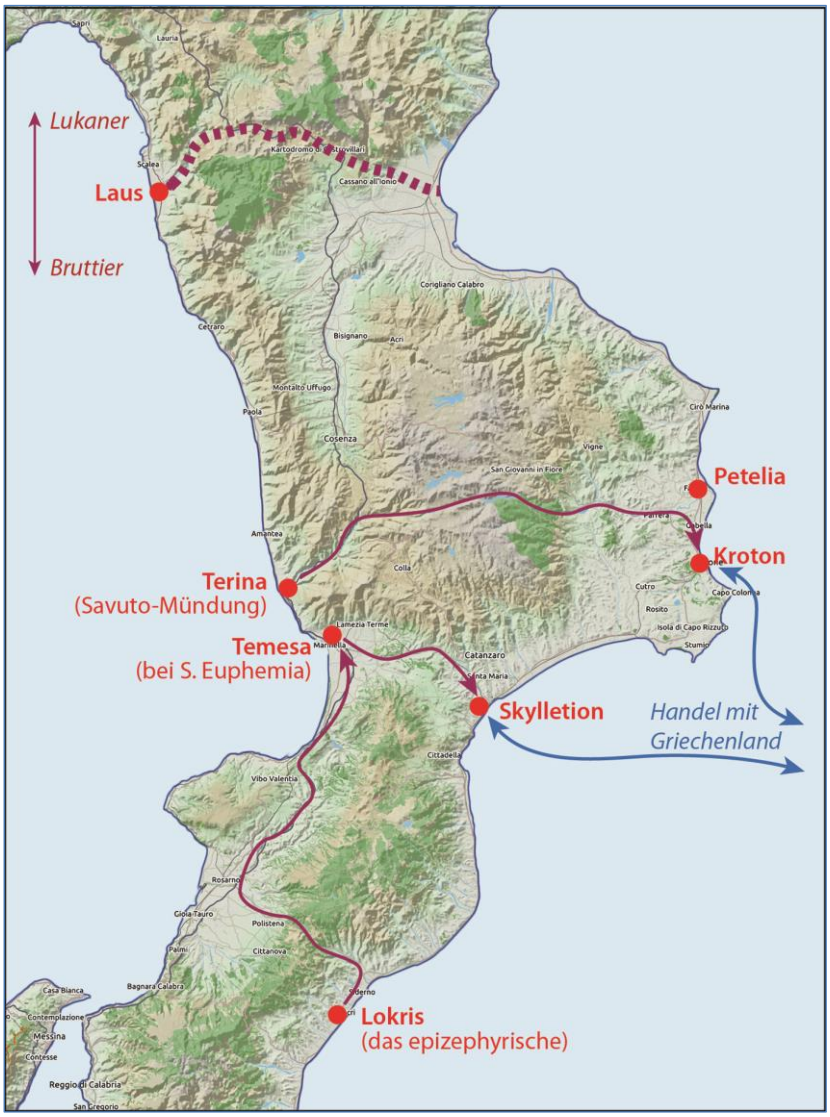


***Fig. 1**: Historical sites in the area of "Bruttium" (today "Calabria") mentioned in the text. Based relief map according to OpenStreetMap.*

We are therefore looking for two neighboring historical settlements within a distance reachable from Lokris and not too far from Kroton. Both requests do not apply to a location on the Lucanian-Bruttian border at the Laus-River.

One result of the 1981 colloquium was to concentrate on two conceivable locations for the city pair Temesa / Terina (*this localizations can also be found in Fig. 1*; cf. TEMESA 1982, Tavola 18; summarized in SPADEA 1991). The overall constellation, above all a necessary proximity to the conquerors from Lokris, would argue for the assumption that the more southern place on the flat plateau near St. Eufemia and shortly before the coast running further inland at that time would be the location of Temesa, while the plateau between the mouth of the Savuto River and today's Nocera Terinese, on the other hand, would be the alternative location Terina chosen by Crotone and to be even better fortified. This location would then have been connected to Kroton along the Savuto River in the western and the Neto River in the eastern part of the land crossing.

The incognito-Athene in the metamophosis of a merchant shipman, who speaks the cited verse Odyssey I.183, could have visited the port of Skylletion on her exchange voyage copper for iron, which we have to date back to the time of Homer and Magna Graeca, in order to load the copper that could easily be transported over the isthmus between the two bays of Euphemia and Squillace.

2. Maps of the geological environment

In the already quoted essay (about Homer at the 'Eiserne Steg' in Frankfurt) I was only been able to develop a hypothesis on the possibility of copper deposits: Recent geological mapping of this area (IGCP 369 Fig. 2) showed a small ophiolite occurrence at the Gulf of Euphemia. "Ophiolite" stands for oceanic crust, which – as the large example of Cyprus shows – is predestined for copper deposits (*cf. the investigations on "Mines in Cyprus" on homersheimat.de*). Fragments of such oceanic crust were postponed in Calabria by long complex tectonic processes and thus partially disclosed. Copper deposits in the vicinity of Temesa, which were shown to Strabo, appeared principally possible in the area of St. Euphemia from a geological point of view.

***Fig. 2**: The small green ophiolite island in the center of the map from the IGCP 369 project.*

The 1981 Temesa Congress also dealt with geological questions (GUARASCIO 1982). Massimo Guarascio's contribution to this congress draws on extensive preparatory work, the literature of which, however, is virtually unavailable in Germany and is written in Italian throughout. After that, there were probably extensive investigations in Calabria on behalf of the Italian energy holding ENI, which was interested in copper deposits in this area. So much can be said in advance: These investigations apparently did not reveal any real deposits (because one has never heard of this prospection again), but they nevertheless showed strong evidence of copper deposits. In this respect, they already fundamentally confirm the previous hypothesis!

Guarascio refers to data in five areas of the geological map of Italy, which can be seen in the leaf section overview in Fig. 3 (highlighted in red).

Sheet 220 Verbicaro also includes the area in which a Temesa would have to be sought immediately south of the Lucan / Bruttian border mentioned by Strabon. Also for this area the geological map from the IGCP 269 project shows a large ophiolite deposit, so that this localization is not excluded from the beginning (*from the part of the more detailed geological map 1:50.000, sheet 542 Verbicaro, which is already available, these hints cannot be confirmed without further ado, but the CGI 2011 shows a long ophiolite band, which extends into the country from Diamante – only approx. 12 km south of the Laus river! This should be pursued further on occasion*).

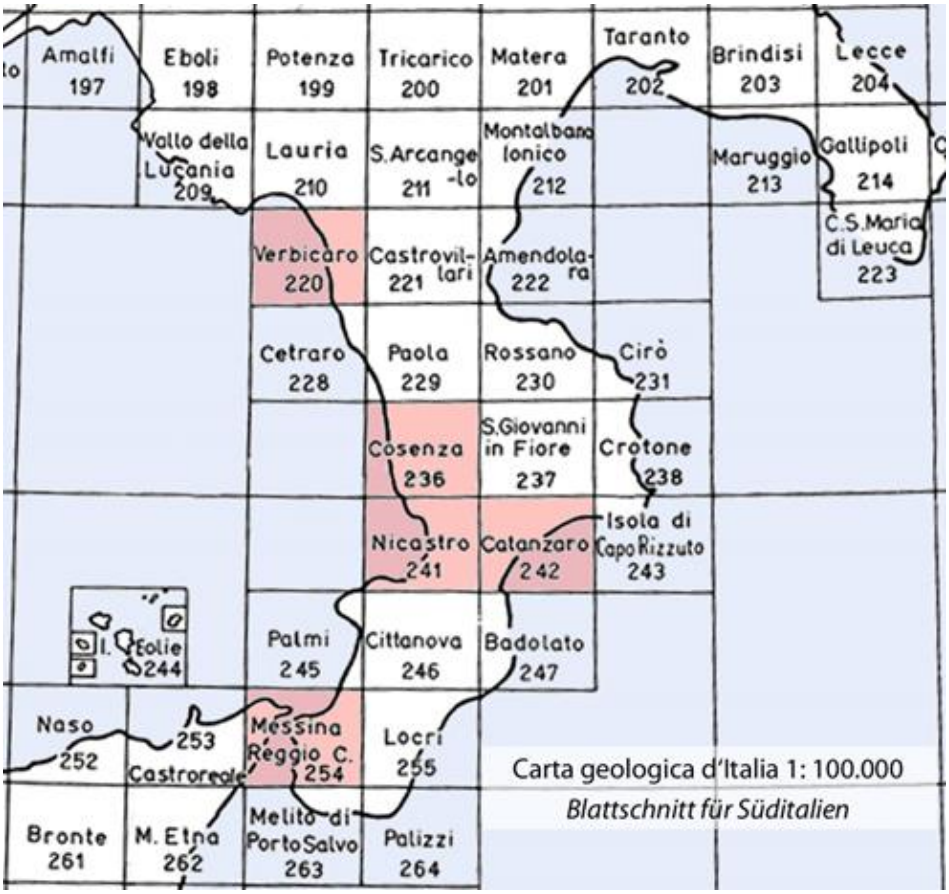


***Fig. 3**: Leaf section of the Italian geological map 1 : 100.000 with red highlighted leaves, which were analyzed in detail in the study GUARASCIO 1982.*

But I would like to concentrate here on the central area, where the 1981 Colloquium (TEMESA 1982) finally localized both Temesa and Terina and which with its flat isthmus seems predestined for copper transport from the west coast to the east coast to the ports of Skylletion or Kroton. This area is covered in its essential parts by the leaves 236 Cosenza, 241 Nicastro and 242 Catanzaro (*cf. Fig. 3 again for the location*).

Apart from a geostructural map in weakly differentiated shades of grey which is difficult to read and once again clearly different from similar other maps (GUARASCIO 1982, Fig. 4; *a little more on this further below*), the study at that time provided two map types for each of the five study areas, which are compiled in Fig. 4 for the sheet cut 236 Cosenza. These two exemplary maps are (like the others) only conditionally compatible with each other. If they are superimposed, these hand-drawn representations show significant deviations, starting with such obvious criteria as coastlines. For this reason alone, they can only provide approximate information.

The **first type of map** (in Fig. 4 above) shows a very fine mapping of the water systems – or rather of the valleys and gullies eroded by water. It looks as if gutters that have fallen completely and permanently dry are shown dotted.

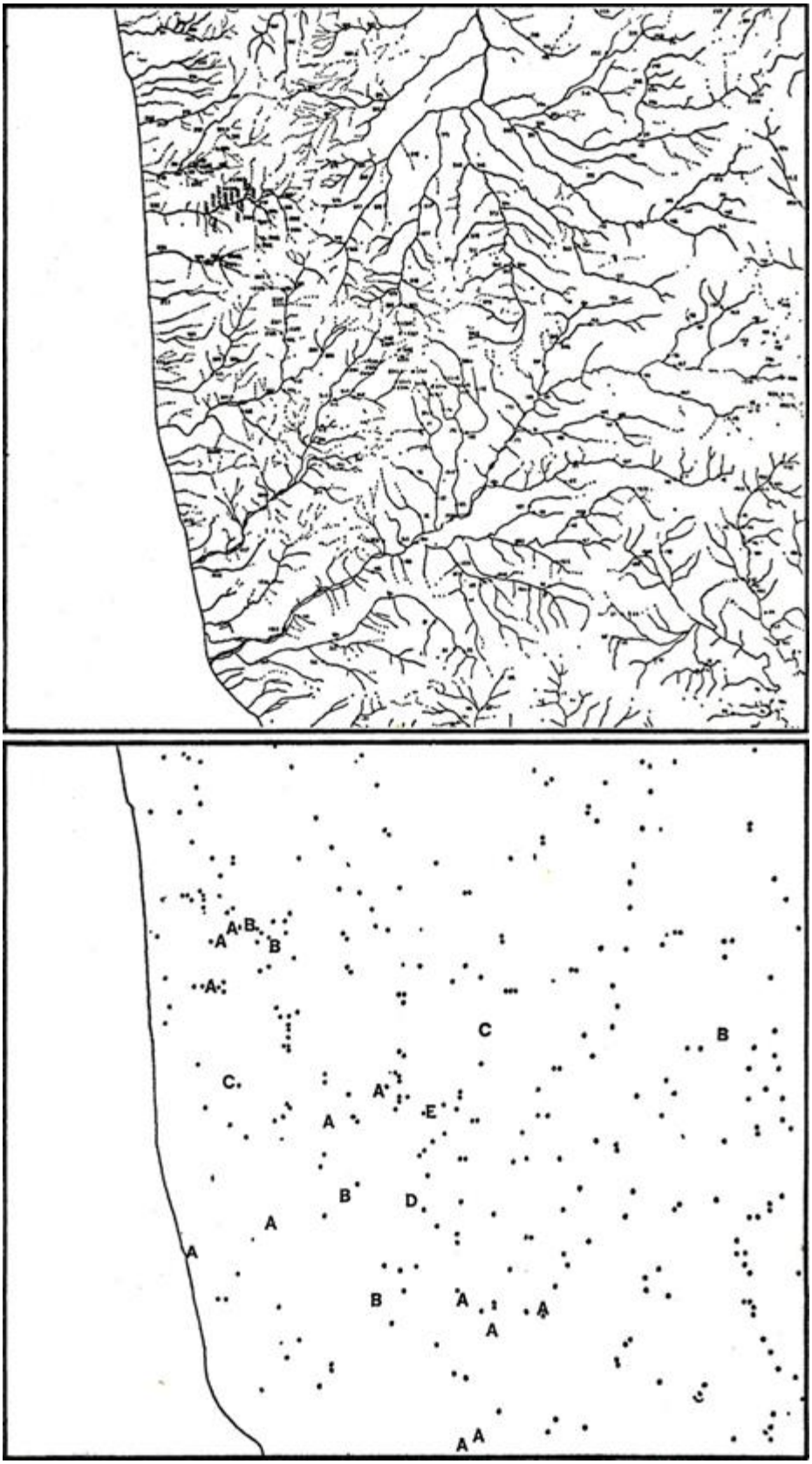


***Fig. 4**: Two map types for the geological investigations in TEMESA 1982 - a very fine hydrographic mapping of watercourses and valleys (above) and a point distribution with letters, both here in the space of the map sheet 236 Cosenza.*

This map has obviously been greatly reduced in size for reproduction in the conference proceedings. If you zoom in, you will see entries next to the water channels that look like inscriptions but are no longer legible at all.

The **second type of map** (in Fig. 4 below) shows an irregular distribution of dots, interspersed with a few capital letters in the range between A and E.

It may be hard to imagine the effort involved, but we should assume that the points in Fig. 4 below (and correspondingly in all other such maps allegedly produced for Calabria) locate locations of sampling. The samples taken there were subjected to a geochemical analysis, preferably on copper minerals. The study names positive findings "anomalies" and establishes a scale with the letters A to E, with which these "anomalies", weighted according to their intensity, can be approximately located. Thus, the letters indicate areas where from A = weak to E = strong copper occurrences can be inferred from surrounding sampling.

When the two cards were laid on top of each other, it became apparent that the distribution of points on the lower card corresponded with the already mentioned (illegible) inscriptions on the upper card. And now also quite weakly point-shaped line thickenings were noticeable in the upper map, with which apparently also the places of the sampling had been registered there. In the combination of both maps, these sampling locations could then be better identified – in detail, however, the point entries differed more or less clearly from each other (cf. Fig. 5).

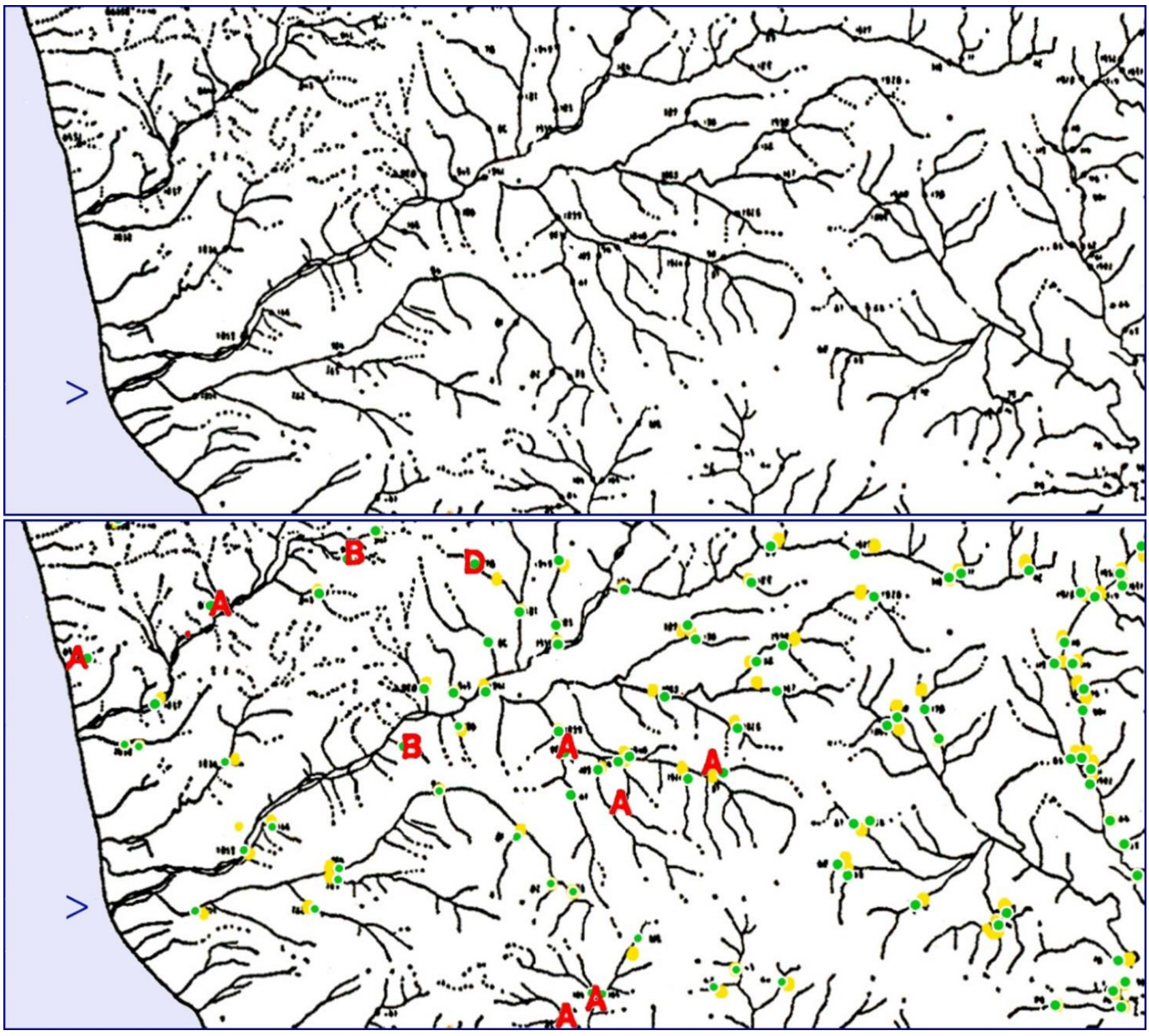


Fig. 5*: Above an enlarged section of the map of Fig. 4 above (= section of the boundaries of sheet 236 Cosenza) in the area of the mouth of the Savuto River into the Tyrrhenian Sea (marked by a blue angle), the sea is light blue colored. At the mouth of the Savuto River, Fig. 1 shows Terina.*

In the lower part, the dots from the map in Fig. 4 below are now superimposed in yellow color. From their position as well as in combination with the illegible inscriptions and slight thickenings in the water mapping, the sampling points could then also be identified in the water topographic map. They are now shown with green dots.

With the identification of the sampling points in Fig. 5, it is now quite clear that the chemically analyzed rock samples were taken almost without exception in gutters. This detailed mapping of the channels was therefore carried out in order to generate a uniform, simple and comprehensive system of outcrops. Because flowing water has most likely cleared existing rock from overlying earth and debris or sediment deposits, so that it is relatively easy to take samples. On the other hand, this approach does not rule out the possibility that bedload that the bodies of water have brought in from elsewhere may have been included in the samples. As the wide plain before S. Eufemia shows, the rivers brought a lot of material from the mountains and deposited it on the ground.

The study can only provide information on the evaluation of rock samples by means of capital letter entries (overlaid in red in Fig. 5 below). According to this, there are obviously large areas in which no copper could be detected – in Fig. 4 this applies in particular to the channel system in the right third of the image. Some 'anomalies' appear to be based on a single sample – such as the A in the upper left corner directly on the coast. Nevertheless, the letter entries in connection with the now identified sampling points give localization hints, which can and should be dealt with (especially on site).

3. Systematic containment of copper mineral outcrops

The approach taken by the copper explorers on behalf of ENI was primarily driven by the interest in area-wide prospection. The instrument should be a fine as possible grid of sampling locations. The results of geological mapping obviously played a less important role. From a geological point of view, copper mineral outcroppings in this region should be expected above all at the top of some mountain ranges (more on this below). However, this aspect was not included in the area-wide sampling, because the locations of these samples were limited to the trenches of the valleys without exception.

On the other hand, one can ask oneself whether geological mapping in southern Italy can provide better data at all. For example, the **Carta geologica d'Italia 1:100,000** referenced in Figs. 3 to 5 for sheet 236 Cosenza comes from terrain mapping carried out between 1888 and 1890! At that time, no plate tectonics was known and there was no term for "oceanic crust" or "ophiolite". And this is the hundred-thousander map that the Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA, on the web: carta_geologica_italia) still offers! It is only gradually being replaced by newer maps on a scale of fifty thousand, the fragmentary coverage of which can still be seen from an overview on the web. Unfortunately, the southern Italian area – both our and ENI's area of interest – has so far remained particularly fragmentary.

Nevertheless, this region has also been the subject of more recent investigations. As already mentioned, a first geological structural map could be included in the Temesa Colloquium of 1982. Later, in particular the Dutchman **J.P. Van Dijk** in a team of geologists dealt intensively with this area (among others VAN DIJK 2000) and further developed the geological structural model, the preliminary work of which was already a topic in the 1981 colloquium. The subject of these investigations is the geomorphology of the 'boot-tip' complex, which is tectonically characterized by overthrusting, warping, wrinkling and blanket formation. The aim of the model was to reconstruct the "palinspastic" positions of the units involved (TEMESA 1982 p. 127).

> *In **palinspastic reconstructions,** tectonically stressed or loaded stone complexes are mentally returned to their assumed starting position before the tectonic stress. In this way, a map or profile picture of the original geological situation can be produced (Murawski/Meyer, Geological Dictionary).*

Such modelling does not necessarily require detailed geological mapping.

Here we are still interested in the Calabrian ophiolite, i.e. oceanic crust, which was shifted from oceanic depths into the continental environment in the course of tectonic deformations. Their outcroppings suggest the most accessible copper deposits, which were possibly exploited in the late Bronze Age as well as in Homer's Iron Age in the vicinity of a lost historical site "Temesa". The view should be directed to the former surfaces of such ophiolite units, which usually consist of pillowlaves – worn out magmas, which have solidified into round forms at the ocean floar. On their basis, ore minerals may later have deposited on the ocean floor from rising hot waters.

But a precise localization of these ophiolite units is – as already indicated – only possible to a very limited extent with the available map material. Even more recent mappings show an astonishing "bandwidth" (Fig.

6). After all, it can be seen that the areas are getting smaller and smaller and are fragmented, where the southern Calabrian ophiolite was still quite compact in the first source (cf. Fig. 2).

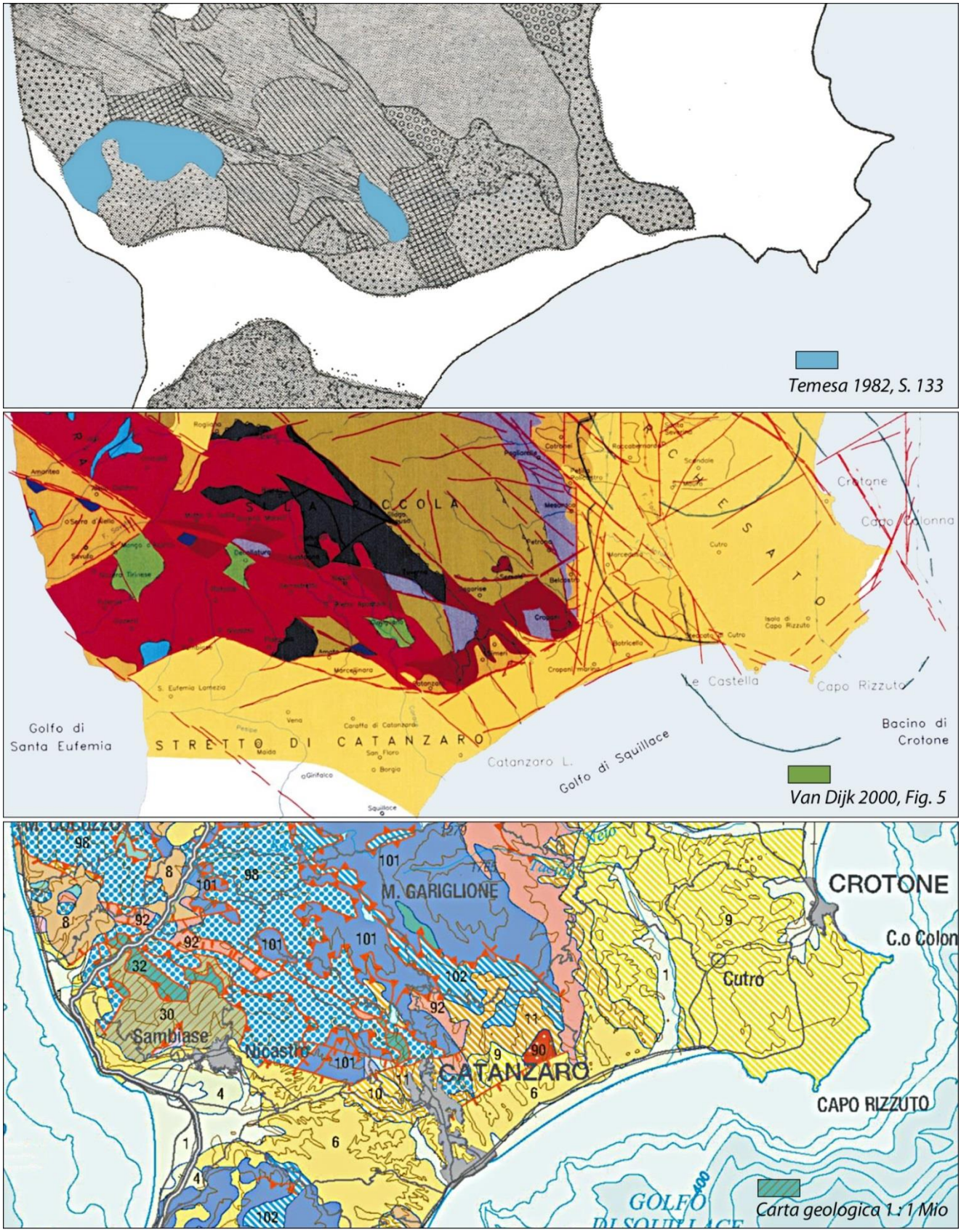


***Fig. 6**: Comparison of three geological and structural geological maps in the same section with regard to ophiolite deposits in the Catanzaro area.*

The top map is taken from the colloquium report TEMESA 1982. The ophiolite outcrops found there are blue-grey highlighted (also the surrounding sea areas light-grey).

The middle map is from VAN DIJK 2000. 'His' ophiolite islands are green and reduce in particular the large northwestern area from TEMESA1982 into two much smaller areas.

The lowest mapping comes from the Carta geologica d'Italia 1:1.000.000, edition 2011. Here the turquoise and hatched ophiolite areas (legend 32) shrank again, the middle one 'migrated' to the west.

The previous findings are now superimposed in Fig. 7:

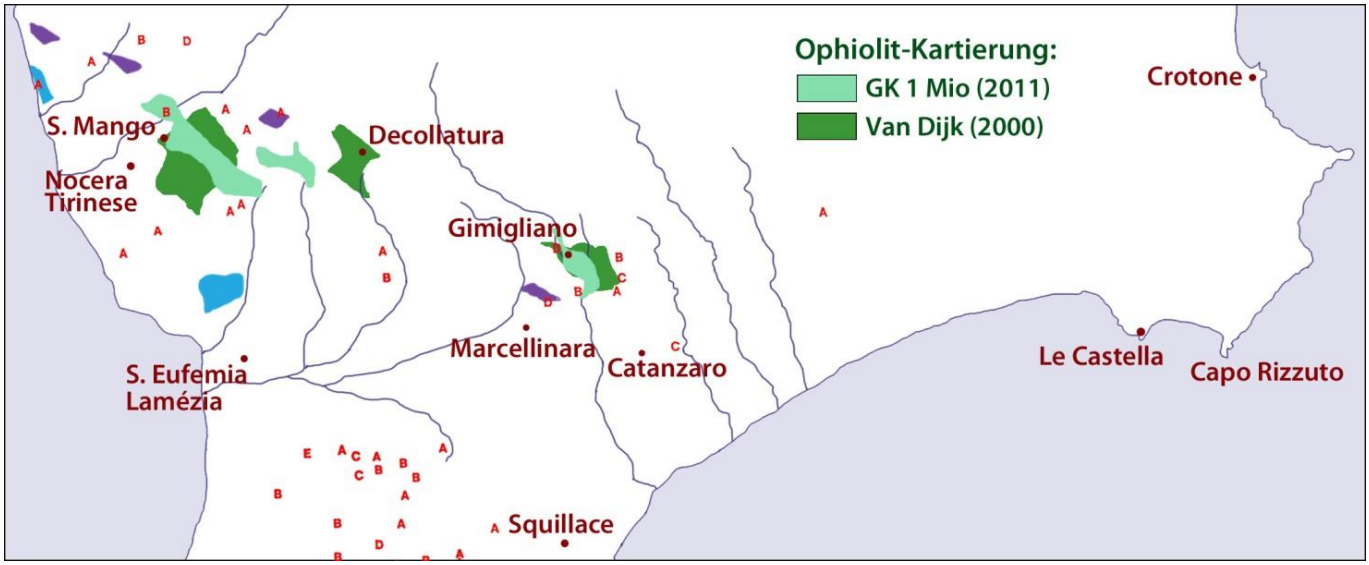


***Fig. 7**: The ophiolite mappings at VAN DIJK 2000 and in the geological map CGI 2011 (cf. Fig. 6) in a superposition, supplemented by the 'swarm of letters' of the areas of increased copper occurrence probability (TEMESA 1982; cf. Fig. 5).*

It becomes clear that no copper occurrence probabilities are evident in the rift between the Gulfs of Eufemia in the west and Squillace in the east. What causes the copper probabilities located with the letter swarm on the mountains south of the rift valley might have must remain open here. In any case, ophiolites were *not* detected there, but only highly metamorphic rocks (types 101 and 102 of CGI 2011), for which no copper 'anomalies' could be detected north of the trench fault in the same survey.

To the north of the trench fault, the letter arrangements show certain proximities to the mapped ophiolith occurrences - however disparate they may be.

Now the sections at VAN DIJK (Fig. 8) clearly show that ophioliths are mainly disclosed to terrain *heights* which were systematically excluded by the ENI mapping (there: concentration of sampling on valleys or former water channels). This seems to confirm the assumption that the ENI samples in the valleys have also collected erosion rock from the heights and thus cannot give any really reliable and precise indications of copper deposits. These three heights are:

1. A strip from the Savuto River via **San Mango d'Aquino** to the southeast.
2. The **Monte Reventino** with more than 1400 m altitude, west of Decollatura. In the geological section of VAN DIJK this mountain is explicitly referred to as an ophiolite massif, but in the area mappings this localization corresponds more to the representation in the Carta geologica than in the map of VAN DIJK himself. Here, the green ophiolite surface is placed further east into the depression around the village of Decollatura (cf. Figs. 6 and 7).
3. The area around **Gimigliano**. This place has given its common name to all the mentioned ophiolite deposits ("Gimigliano unit"). The sectional view suggests that the Corace River flowing to the Ionian Sea cuts through the ophiolite unit. A little southwest then follows Tiriolo, which sits enthroned on a small island-like Triassic-Jurassic limestone floe (dark blue in section).

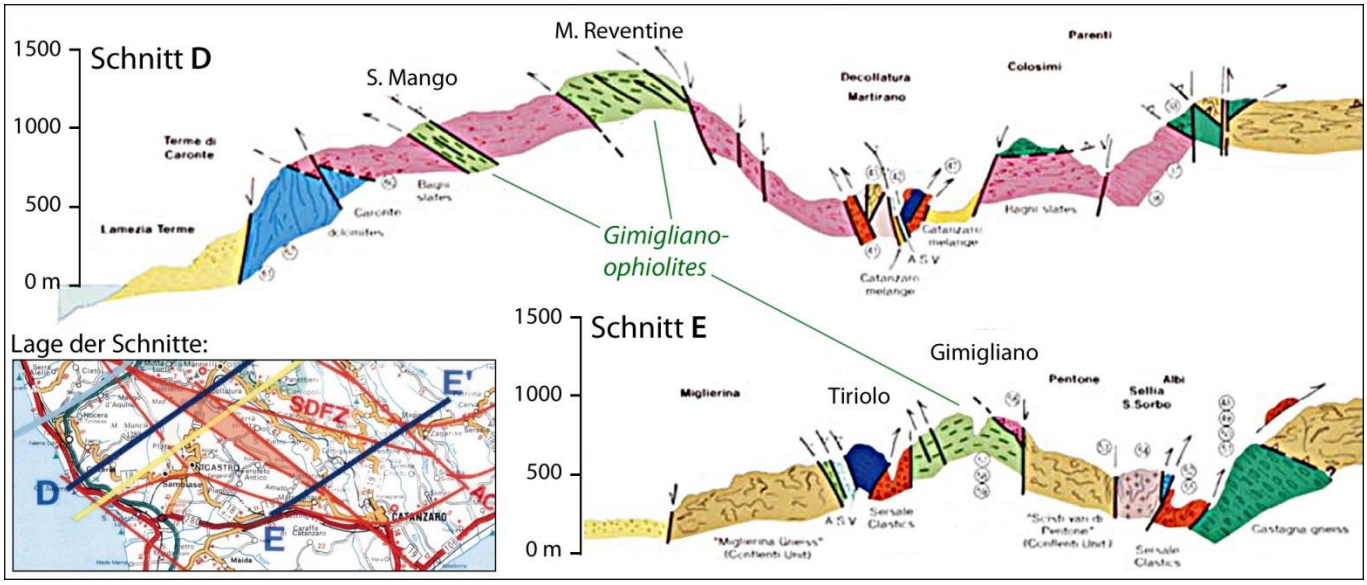


***Fig. 8**: Three ophiolite occurrences (light green and black dashed) in the schematizing geological sections D and E from VAN DIJK 2000 (see Fig. 6 and 7 for their area mapping). The blur already stresses the original Fig. 6; the height scales and some inscriptions were renewed for the sake of legibility for this figure.*

The already mentioned former surfaces of the ophiolite units with pillowlaves and possibly hydrothermally formed ore deposits are in the sections of Fig. 8 respectively the boundary surfaces directed to the right upwards respectivly to the east to the adjoining pushed over rock blocks. These would be the areas where copper ore outcroppings should be sought on site.

4. Historical literature references to copper ores

The geological survey of GUARASCIO in 1982 provides further evidence of copper ore outcrops. These indications would have resulted from the evaluation of older literature, which is hardly accessible in Germany. In addition, GUARASCIO 1982 does not make any individual allocations of certain literature sources from its 45-fold Italian-language list of individual outcrops.

Fig. 9 gives an overview of the places to be mentioned here. They are marked with graphic symbols which, due to their vague placement, cannot provide any concrete indications of localities that can be found on site. They mean

- ▲ filled triangle: documented digestion of copper minerals that has been verified on site,
- △ empty triangle: documented outcrop of copper minerals that has not been verified on site,
- □ empty square: polymetallic mineralization also associated with copper.

For our investigation area around the isthmus between Temesa and Skylletion the two outcrop areas above are of particular interest.

The outcrops 7 and 6, which are located near the phaeake palace suspected by Armin Wolf (WOLF 2009) near **Tiriolo**, are striking as "verified on site". If copper had really been found there, the Phaeake king could have had it mined directly in front of his royal seat.

No. 6 refers to **Catanzaro**, where today, in view of the extensive urbanization, there will certainly be nothing left to be found. After all, the ENI samples in a stream bed east of Catanzaro confirmed a high copper probability for this area with the capital letter **C** (cf. Fig. 7).

No. 7 refers to Tiriolo. But since this place is enthroned on a limestone rock (cf. Fig. 8, dark blue) it can only be a special location in its surroundings. GUARASCIO feeds us with the short explanation, "it was a lenticular vein with chalcopyrite in unity with Filadici schists of the Stilo unit".

One should also pay attention to Gimigliano in the northeast, where the area-wide sampling provided copper clues and where one of the three southern Calabrian ophiolite occurrences is disclosed.

Of particular interest is the fact that some outcrops are also reported for the area north of the Temesa localization respectively around the Terina location on the Piano delle Tirena. No. 16 corresponds with the near-coastal A in Fig. 5 (which was probably based on only one sample), No. 11 in Nocera Tirinese may also have become obsolete due to the development.

The outcrops 17 and 18 remain. 17 marks approximately the eastern edge and thus the surface of the ophiolite unit there and is therefore very interesting, while 18 already beyond the ophiolite height there addresses the place Platania in the next valley, for which the other sources did not provide any findings.

If one concentrates on the area of No. 17 between San Mango d'Aquino and Martirano Lombardo, some disturbance areas are already noticeable with the help of Google Earth, which should be examined more closely on site. They are marked blue-grey in Fig. 10. The grey-blue areas north of the mountain road between San Mango and Martirano are also illustrated in Fig. 10 by a Google Earth image.

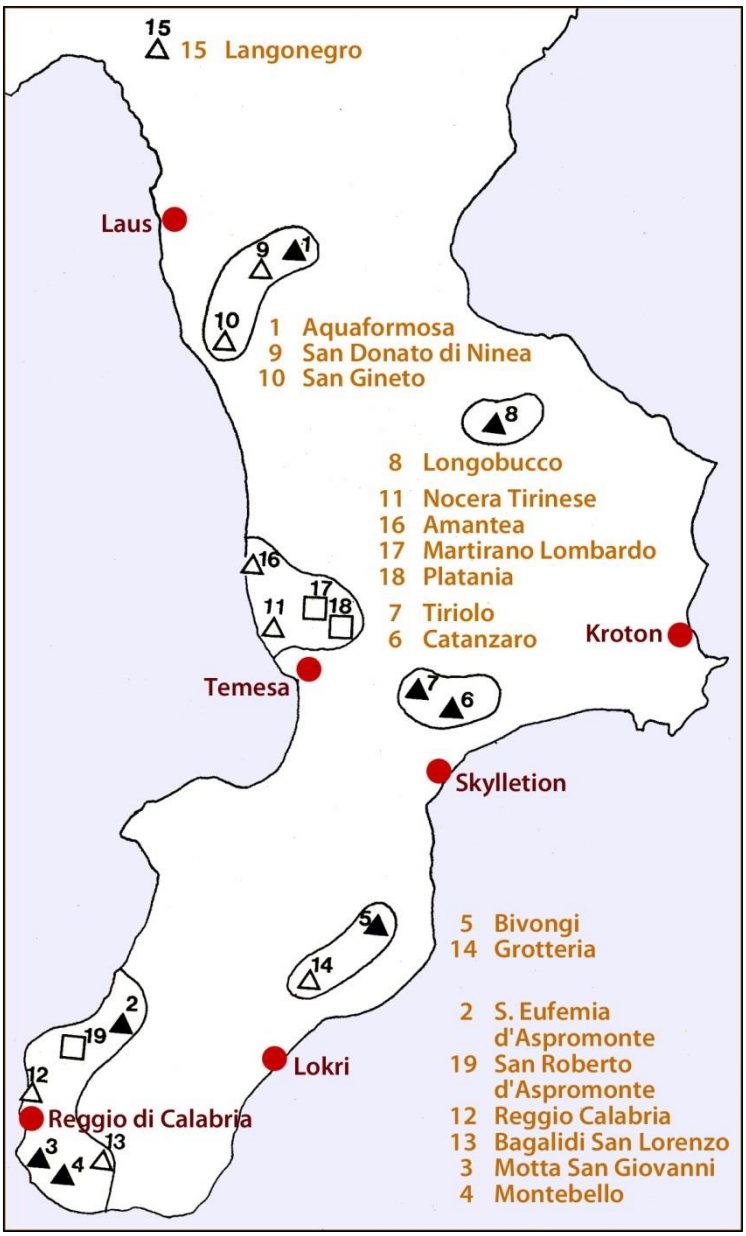
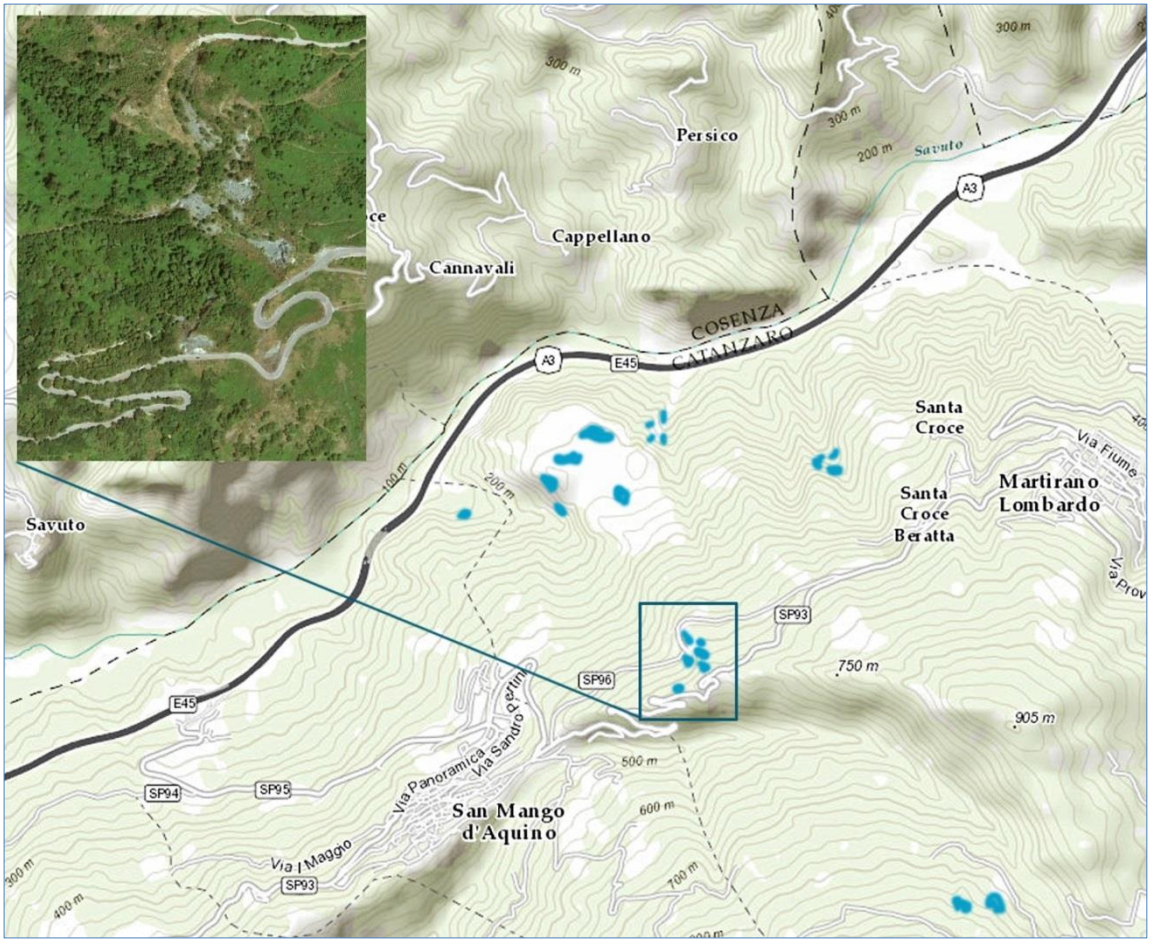


***Fig. 9**: Locations of copper ore outcrops after a literature review in GUARASCIO 1982, Fig. 1. Some of the locations from Fig. 1 are added as red dots, furthermore the outcrop names to the location numbers meant by it.*

These copper deposits lie on the slopes of a narrow mountain range that extends to the west almost to the sea and widens at its end to a plateau (Fig. 11). The area of this plateau is called "**Piano della Terina**" in the archaeological sources used here. This makes it clear that this plateau, which is easy to populate and fortify, is believed to have historical Terina. It was situated just 2 kilometers from the sea on a 150 to 180 m high hill with steep slopes almost all around. According to an estimate by Spadea (TEMESA 1982, p. 82), between 2000 and 3000 people could have lived on the approx. 20 hectares of plateau area, which today are unfortunately overshadowed by agricultural use. Archaeological excavations, however, date back a long time (Paolo Orsi 1915/16). They had provided certain indications of a settlement. However, the agricultural management of the area may have destroyed these traces since then, although from a satellite perspective one still thinks one can see remains.

The area between the populated end of the plateau and the coast in the fertile alluvial land of the Savuto and Grande waters flowing around the plateau offered sufficient agricultural land to supply the inhabitants. If the copper mines, which were once exploited by the inhabitants of Terina, could be found in the further course of this mountain range according to fig. 10, then everything would be together.

***Fig. 10**: Naked grayish-blue areas, which are visible in Google Earth by a targeted search in this area of a South Kablabrian ophiolite outcrop and which should be examined for copper minerals – or even historic copper mines – on site.*



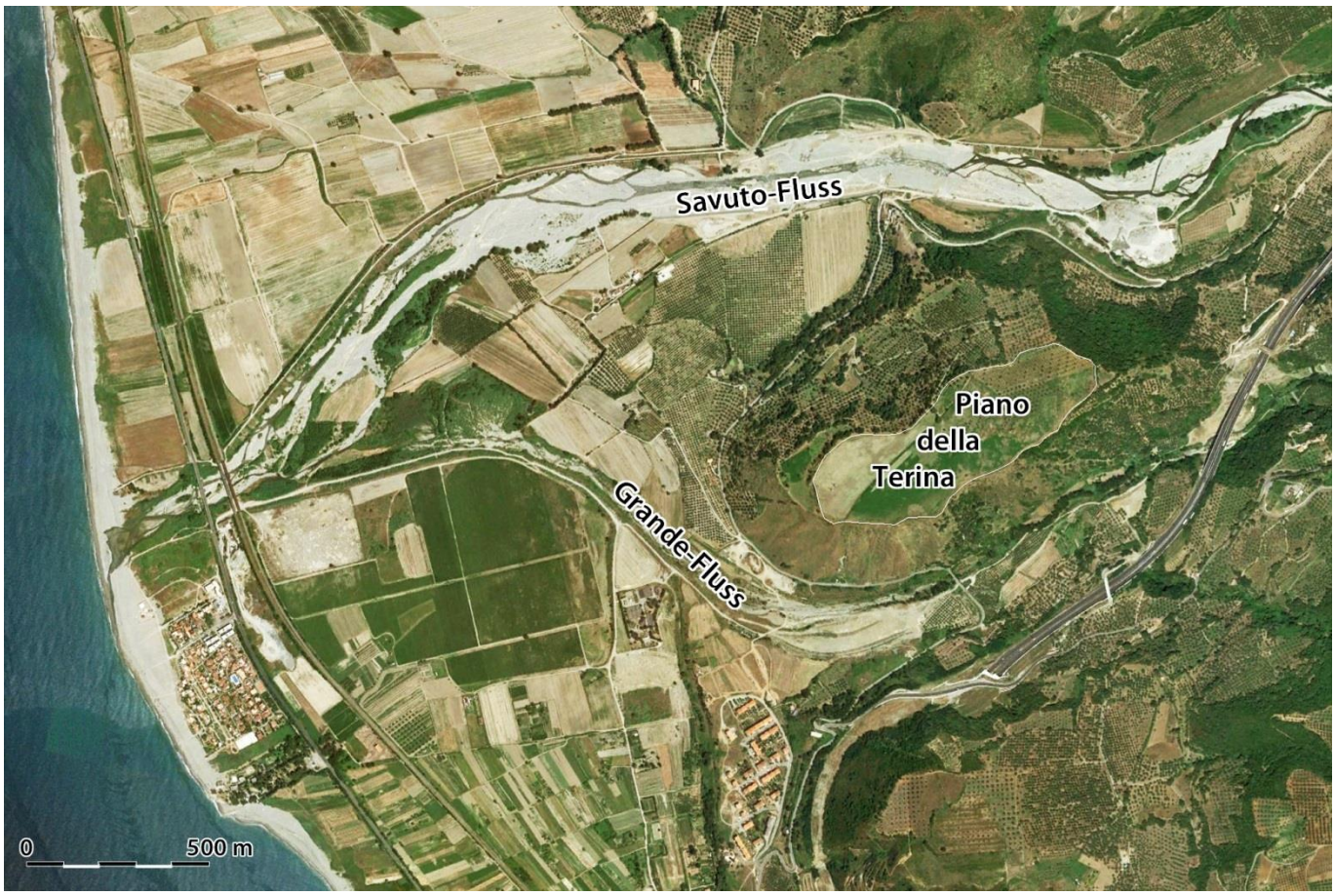


***Fig. 11**: The "Piano della Terina" – the end of a narrow mountain range whose eastern part showed Fig. 10, possible site of the historic mining settlement of Terina.*

Literature

TEMESA 1982	Istituto di storia antica dell'Università degli studi di Perugia, editi a cura di Gianfranco Maddoli: Temesa e il suo territorio. Atti del colloquio di Perugia e Trevi (30-31 May 1981), Taranto 1982
SPADEA 1991	Roberto Spadea, Il territorio a sud del Savuto: ancora su Temesa e Terina, in: Cahiers du Centre Jean Bérard, Èpéios et Philoctète en Italie, 1991, pp. 117-130 Summary of archaeological finds in the area between the rivers Savuto and Amato, also available online at: http://books.openedition.org/pcjb/374.
GUARASCIO 1982	Massimo Guarascio (Università di Trieste, Istituto di Miniere), Un contributo di dati e metodi della ricerca geomineraria in archaeologia: Il caso di Temesa; in: TEMESA 1982 P. 125-142
IGCP 369	The "International Geological Correlation Program (IGCP)" was a UNESCO research program, which among other things dealt with the Thetis Sea, the remains of which we see in the Mediterranean Sea. Project 369, entitled "Comparative Evolution of Peri-Tethyan Rift Basins", produced a geological map showing an ophiolite fragment in the Gulf of St. Euphemia. This fragment is not noticeable in this dominance neither in the European Geological Map (International Geological Map of Europe and Adjacent Areas 1:5 Mio. – IGME 5000) nor in the 1:1 Mio. geological map covering the whole of Italy. The IGCP project materials published on the web at that time are no longer available online.
VAN DIJK 2000	J.P. Van Dijk et al: A regional structural model for the northern sector of the Calabrian Arc (southern Italy), in: Tectonophysics 324 (2000) S. 267-320 This article in the ELSEVIER online journal costs 35,95 € – which is twice as outrageous, because for the already excessive price you get washed out and hardly readable maps. Some library systems offer free access for registered users, e.g. that of the Darmstadt University Library.
CGI 2011	Istituto Superiore per la Protezione e la Recerca Ambuientale (ISPRA), Carta geologia d'Italia 1:1,000,000, 2011 edition (accessible online at http://www.isprambiente.gov.it/)
WOLF 2009	Armin Wolf, Homers Reise. Auf den Spuren des Odysseus. Böhlau-Verlag 2009; on Temesa in particular p. 38 f; cf. also the map in Fig. 9.

Michael Siebert, February 2017 (translation July 2019)