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PRELIMINARY CLASSIFICATION OF GEOLOGICAL SITES OF ALBANIA

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ABSTRACT

Based on GILGES (Global Indicative List of Geological Sites-after Cowie, J. W., 1993. Report of World Heritage) classification and on the conditions of Albania there are defined of about 200 geological sites of local, national and regional importance. For recognition and classification of geological sites we've used features and geological data based on knowledge and detailed geological studies of Albania, in different fields of geology. There are used detailed maps and for preliminary classification we've had in consideration scientific and didactic value of sites, method of comparison with analogues sites in other countries, complex evaluation of site, geographical distribution all over Albania and at least specific features such originality, unique values, typical special, aesthetic features, curative and historic values etc.

KEY WORDS: Albania, geological heritage, geological site, criteria, methods, classification.

1. INTRODUCTION

Since the ancient times, Albanian people appreciated and preserved natural monuments such as cold springs, high trees next to the springs, olive-trees as useful plant, beautiful natural places etc.

In many regions, there are known and used sites with good curative climate (Serjani and Hanaj, 1995)thermal springs for curative purpose (Eftimi, 1971) etc.

But only, during this century, with consolidation of Albanian state, were established some laws for preservation and conservation of animals, forests and local and national parks in different our towns.

Nevertheless of intensively development of geological works and studies during 1950-1990 period, the Geological Heritage aspect was never treated. But numerous detailed investigation led to the geological deciphering and compilation of geological, hydro-geological, tectonic, metallogenic maps of 1: 200000 scale. Further more they led to the prospection of many deposits of mineral ores and industrial minerals, which on the other hand helps directly to the knowledge and evaluation of geoconservation aspect.

Due to the key position of Albanides in the Eastern Alpine Mediterranean Chain and their accidental mountainous relief in Albania, there are found many outcrops, sections and sites with unique or special features, with scientific, didactic values. Hydrografic network and abrasive action of the Ionian and Adriatic seas influenced in formation of geological sites of specific geomorphology and rarely beauties.

For the first time, the question of the geological sites in Albania was treated in Subregional Meeting in framework of ProGEO in Sofia (May, 1995) where were presented the preliminary list of geological sites of Albania of national and regional importance (Serjani and Cara, 1995), and the presentation of the geological sites of external zones of Albania (Serjani, 1995).

In the First National Conference "Geology, Environment and Civil Society" which was held in Tirana, on 21-22 November 1995, were presented contributions: on geological heritage in Albania (Serjani, 1995);

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(Dobi et.al., 1995).

The problems of geological conservation in Albania, were treated completely in contribution: "Criteria and Principles used for Classification and Selection of Geological sites of Albania"(Serjani et. al., 1997/a), presented to the ProGEO'97 Meeting in Tallinn, Estonia. From the above mentioned authors was sent to the Lesvos Symposium (Greece) the paper on Bulqiza chromite deposit as a rare unique site (Serjani et. al., 1997/b).

Keeping on the further attempt for knowledge scientific classification natural geological sites in Albania, the author compiled this paper illustrating with maps of Albania, where are signed geological sites according to kinds types, importance and practical values. This preliminary list of geological sites in Albania is based on the geological works and studies of Albanian geologists and on the experience of authors.

2. METHODS OF CLASSIFICATION OF GEOLOGICAL SITES OF ALBANIA

The methods and criteria for classification and selection of geological sites are treated before in publications of Gea-Group (1976); Gonggrijp and Bockschoten, (1981); Gonggrijp (1992); Wimbledon (1996); Zagorchev (1996); Tzankov (1996). But especially have to remember collective works of Lapo et al., (1992), on the methodical principles of study of natural geological monuments of Russia and Wimbledon et al., (1996) on the world geological heritage as an global competitive inventory.

For compiling the preliminary list of geological sites in Albania and their classification, the authors are based in the following distinctive features:

a)-rarity;
b)-representativness;
c)- diversity;
d)- scientific value;
e)- didactic importance;
f)- aesthetic representativness (geotouristic value);
g)- accessibility;
h)- clarity of representativness;
h)- irreplacibility;
i)- vulnerability;
j)- size;
k)- actuality of soundness;
l)- danger and
m)- ability for conservation.

On the other hand for evidence of geological natural sites we applied the following main principles:

1)- The level of acknowledgment.
2)- Scientific value.
3)- Grouping according specific values.
a)- (natural view (aesthetic feature);
b)- unique features(in Alpine Chain);
c)- original features(for magmatic rocks);
d)- typical features (in sedimentological geology;
e)- special features (in tectonical-structural and plate tectonic aspect).
4)- Up-to-date didactic and health-resort value.
5)- Methods of comparison of values of Albanian sites with similar and analogous in Eastern Mediterranean Chain.
a)- within the same tectonic zone; b)- between external and internal zones.

Mediterranean basin or between Euro-Asiatic and African Plates.
in geographical aspect comparison is done as following:
a)- comparison of geological sites in local level; b)- national level; c)- in Balkan level; d)- in European level;
6)- complex evaluation of geological sites.
7)- geographical distribution of geological sites all over Albania.
a)- Northern high mountainous region (Albanian Alps; b)- Eastern mountainous region (Kukesi, Peshkopi, Librazhd, Prrenjas); c)- Southeastern and Southern mountainous region (Korça-Erseka-Leskoviku-Kurveleshi Plate); d)- Western lowland and Adriatic coastal region.

3. PRELEMINARY CLASSIFICATION OF THE GEOLOGICAL SITES OF ALBANIA

According to some important publications (Anon, 1995; Wimbledon et al., 1996; Lapo et al., 1993) etc. and based on the numerous works and studies of Albanian geologists and at least on the experience of authors and in collaboration with D. Marku (macropaleonologist), K. Gjata (petrologist), V. Bezhani (geologist), A. Xhomo (stratigrapher), M. Koçi (mineralogist), A. Pirdeni (micro-paleontologist) and Ll. Dimo (geologist), we have compiled preliminary classification of the geological sites of Albania. Below is presented the short classification of each type of geosites:

1)- Stratigraphical geological sites (Fig. 1).
Besides numerous stratigraphic sections of local and national character have to note full sections of regional scientific and didactic values such as:**a)**- Stratigraphic section of Paleosoic formations (the oldest formations in Albania) with a lot of *graptolites* in Korabi zone; **b)**- Stratigrafic section Tirana-Dajt-Kroi i Molles, which crosses formations of Pre-Adriatic Depression-Kruja and Krasta-Cukali zones. In this section outcrops the single partial section in Alpine Chain of "Derja suite" of Barremian-Aptian age; **c)**- Mali i Gjere pattern didactic full section of Mesozoic carbonate-siliceous formations of Ionian zone; **d)**- Full unique section of Eocene formations in Bitincka (Korça region); **e)**- Mollase Miocene formation section of Morava in Korça inner depression.

2)- Paleoenviromental geological sites (Fig. 1).
In this type are included outcrops of sedimentary formations with different kinds of macroffosils such as: levels with *ammonites, rudists, megalodontes, lithiotis, miliolidea*, terrigenous sections with a lot of pelagic *bivalves* and some sections with typically defined microfauna etc.
Here we can name the following geological sites with special importance: **a)**- Kçira paleotological site, where, since the 1911 year were examined ,for the first time by F. Nopça and G. . Arthober 5 families, 5 subfamilies and 49 new species of Triassic *ammonites*; **b)**- Kopliku (Shkoder) paleontological site with a lot of Piachesian and Astian macroffosiles. Here are examined last years by D. Marku 63 species of *bivalves*, 90 species of *gastropodes*, 3 species of *skakopodes* and tow species of *ekinodermates*; **c)**- Drenova section (Korça), where, since a century before (1896 year), for the first time by Openhein was determined *Barbatia Albanica*; **d)**- Tortonian section in Guret e Zes (Patos), Zverneci sedimentological site of mollase terrigenous formations with a lot of different textures, structures, figures of sedimentation etc.

3)- Paleobotanic sites (Fig. 1).
Here we've separated traces of lithificated plants into the coal beds of Korça-Pogradeci and Memaliaj basins, some limestone beds with *stromatolites* and *radiolarite* beds (Fig. 1).

4)- Geological sites of magmatic, metamorphic and sedimentary rock complexes (Fig. 2). Due to the large widespreading of above mentioned rocks and especially of ophiolite complex in Albania there are many geological sites linked with them such as: petrologic sections of ultramfic and volcanic rocks, complex of parallel dykes, eglogites, outcrops of metamorphic and volcanic rocks in Ionian zone as single [illegible] external zones.

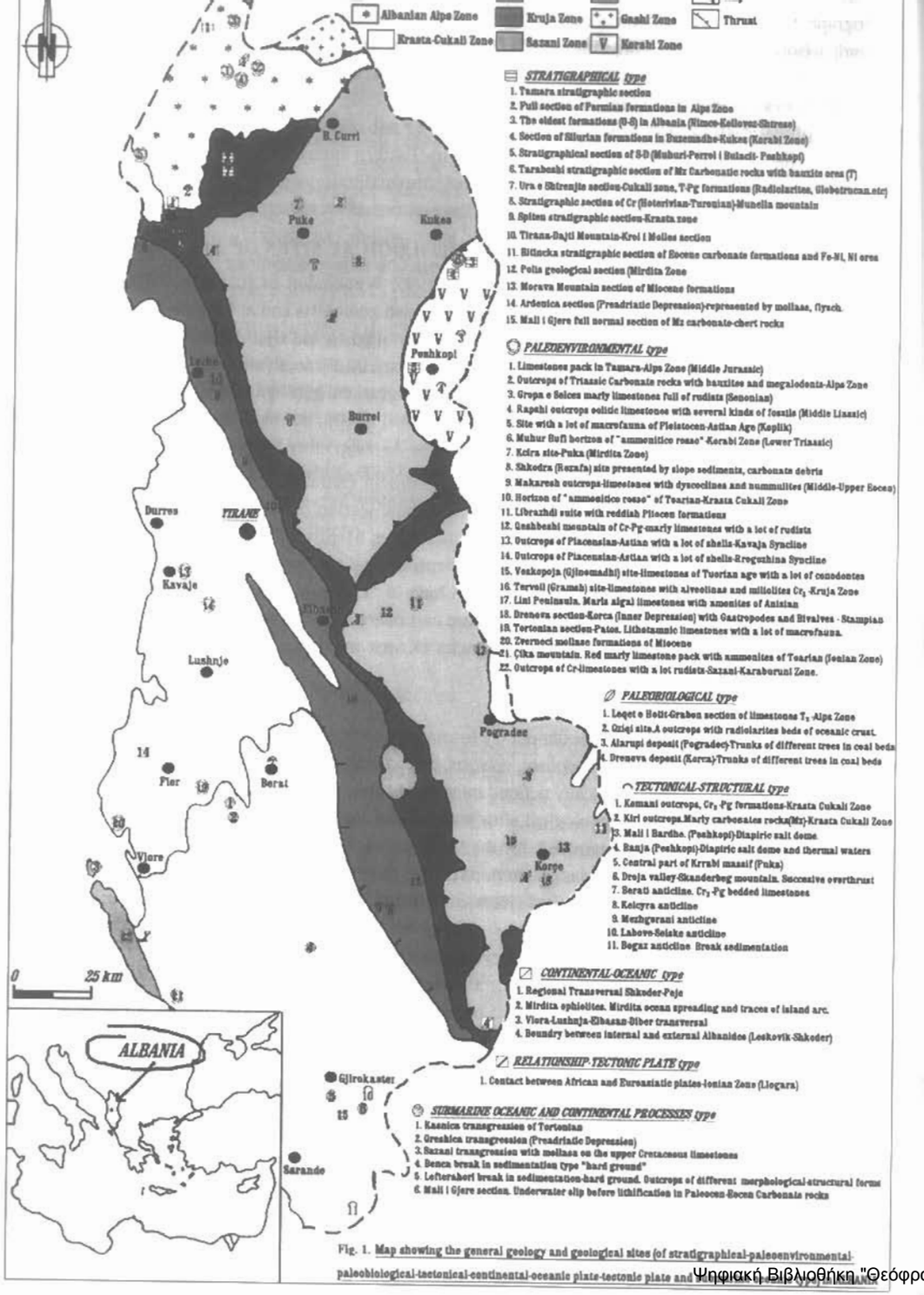

Fig. 1. Map showing the general geology and geological sites (of stratigraphical-paleoenvironmental-paleobiological-tectonical-continental-oceanic plate-tectonic plate and [illegible]

Here are included typical parageneses of Platinum-Group-Elements (PGE), copper elements associations, titano-magnetites, iron-nickel and nickel-silicate associations, nice outcrops of pillow lavas in volcanic rocks of Mirdita zone, macrocrystalline gypsum outcrops of Mesinian age in Vlora, Kavaja etc.

6)- Metallogenic or economic sites-deposits (Fig. 2).

In Albania, there are discovered and prospected a lot of ore deposits and nonmetalic minerals deposits, but, we've included in this group of geological sites only unical ones with regional importance deposits such as: **a)**- Bulqiza chromite deposit with specific folded morphology of large orebody; **b)**- Shkalla chromite orebody with special vertically pipe form of about 1200 m deep; **c)**- Kalimashi-2 chromite deposit- a large plate form of the orebody; **d)**- Unique in Europe Selenica Asphalt Deposit; **e)**- Gusmari massive phosphorite deposit of deep sea formation quite different from the terrigenous glauconite deposits; **f)**- Unique Gorishti oil deposit in Mesozoic carbonate structure.

In some cases, along with metallogenic value, these sites are of historical importance such as Selenica ancient asphalt mine, Rubiku copper deposit, Gjegjani copper deposit, Drenova coal mine, Memaliaj coal mine etc.

7)- Tectonical-structural geosites (Fig. 1).

These geological sites are distinguished by typical structural features caused by tectonic events. The most beautiful are: **a)**- Komani site with a lot of nice foldings of Cretaceous-Eocene clay limestones of varies colors; **b)**- Nice outcrops of folded ultrabasic rocks in Krrabi massif (Puka); **c)**-Large high and white domes of salt rocks in Peshkopia (Korabi zone).

8)- Geological sites of continental and oceanic dimensions (Fig. 1) such as: the traces of oceanic spreading in Mirdita zone; regional transversal deep fault Shkodra-Peja (Scutari-Pec); regional fault between inner and external zones with overthrust character etc.

9)- Tectonic-plate relations (Fig. 1).

It is known only one such as in Llogara. Just in this place outcrops, on the surface the contact between Adria Microplate (Promontory of African Plate Sazani Apulian-Paxos tectonic zones) and orogen-Euro-Asiatic Plate (Ionian zone). To the north and to the south, this contact of subduction character is plunged respectively below Adriatic Sea and Ionian Sea.

10)- Geological sites which belong to the submarine oceanic and continental processes (Fig. 1).

There are many transgressions and breaks in sedimentations with clear presentation and didactic character such as: Greshica and Sazani transgressions of Tortonian sandstones on the Paleocene and upper Cretaceous limestones, submarine Jurassic gaps in sedimentation hard-ground type in Bença, Bogazi, Lefterohor etc.

11)- Geological sites of complex values (Fig. 3).

This is the widest group of sites in Albania. Here are included all geological sites with complex features: geomorphologic, geological, hydrogeological, touristic etc. There are known many karstic lakes on the surface of Evaporite diapirs and on the surface of ophiolitic massifs at high levels (1500-2500 m above the sea level), many aesthetic cold springs, karstic caverns, deep canyons, many aesthetic and touristic-good climate places in mountainous regions and especially in Ioninan zone, Riviera and Adriatic coast etc. Among them, we can name touristic-geological-geomorphological sites of Lura lakes, Ksamil icelands, Llogara, Divjaka, Karavasta swamp with varies fowls, Gurra (Lekdush), Horovoda and Dragobia fantastic canyons etc.

12)- Historical geological sites (Fig. 2).

Here are separated traces of ancient mines and caves of copper and asphalt deposits, caves of ancient inhabitations, outcrops of discussions and controversies in Albanian geology etc.

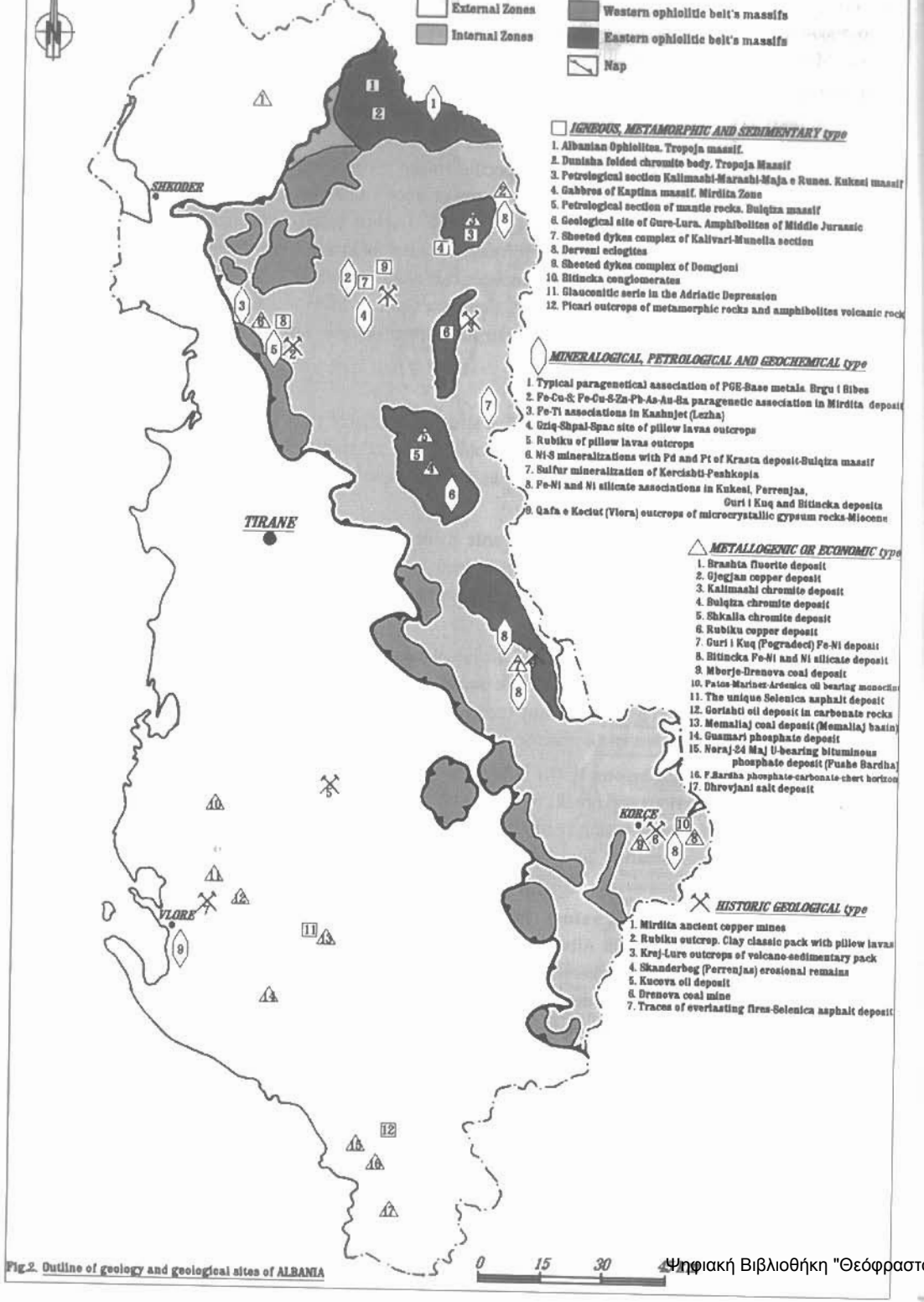

Fig.2. Outline of geology and geological sites of ALBANIA

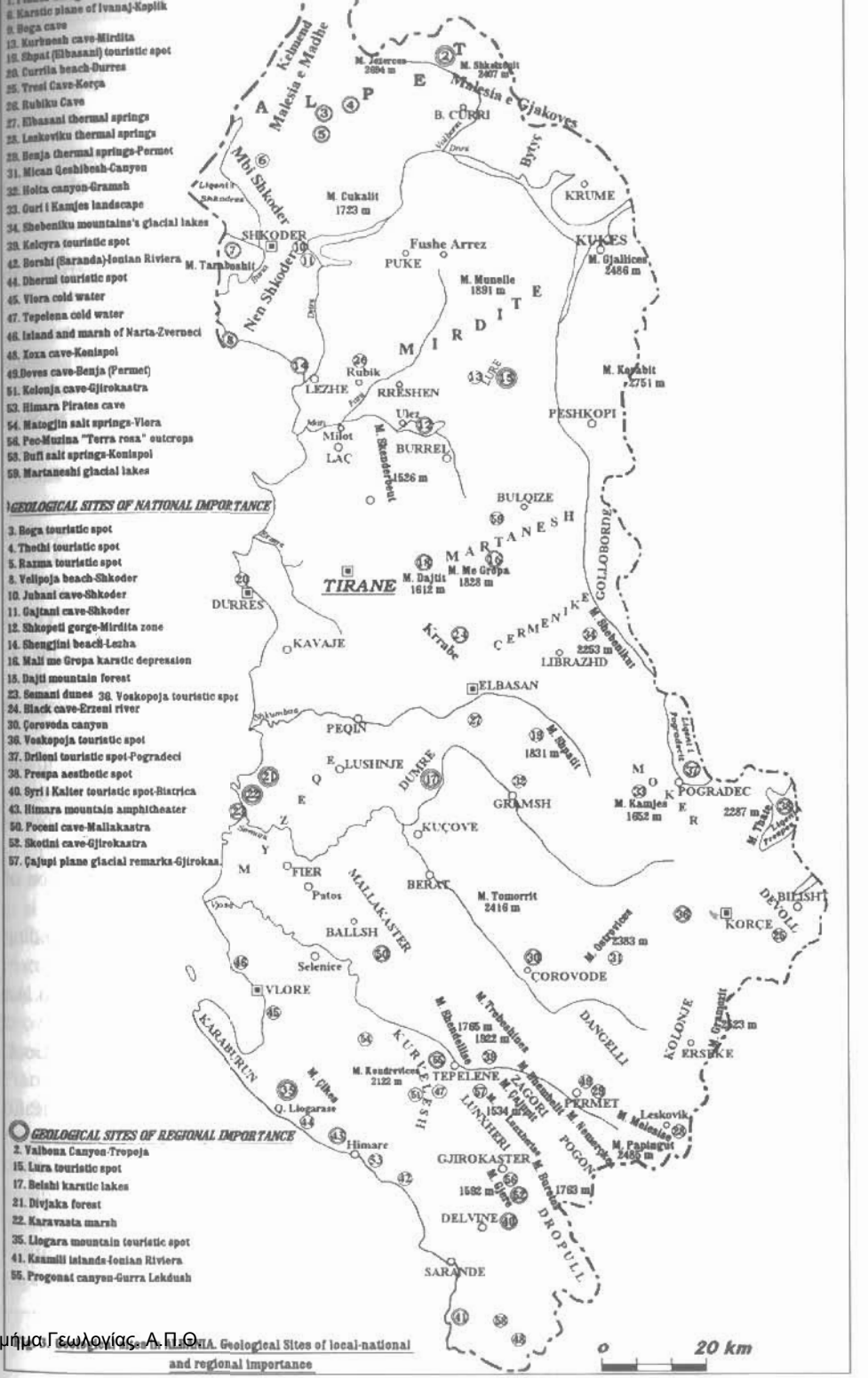

Fig.3. Outline of geology and geological sites of ALBANIA. Geological Sites of local-national and regional importance

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