International Workshop on Groundwater Systems in Europe, 22 - 23 August, 2013 Berlin

Hydrogeological Mapping in Albania

From the IHME contribution to larger scale national maps

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The hydrogeological mapping of Albania is not an history of some outstanding scientific achievement.

It is, instead, a simple history of some young and devoted specialists who loved their work and put all their enthusiasm in realizing an important goal:

The compilation of the Hydrogeological Map of Albania, sc. 1:200.000.

The experience gained during the compilation of IHM of Europe scale 1: 1.500.000 was by all means a very important factor enabling the successful completion of this goal.

1. Some geographical data

- Surface 28.748 km^2
- Population 3.2 million

- Average elevation 708 m asl
- The highest peak, Korabi 2751 m asl

- Average Temperature 14-16˚ C
- Average precipitation 1450 mm/y

- Hydrographic surface 43.305 km^2
- Average surface flow 1308 m^3/s
- Average underground flow 288 m^3/s

2. Some geological data

- Albania has a rather complicated geological construction: The northern Albania extends to Dinarides, and the remaining part of the territory extends southwards to Hellenides
- The territory of Albania is characterized by a variety of geological formations ranging from Ordovician to Quaternary in age; they comprise sedimentary, and magmatic types with rather frequent metamorphic rocks.
- The inner tectonic zones consist of magmatic and metamorphic rocks with some carbonate structures and molasses intermountain depressions.
- The outer tectonic zones consist of carbonate structures and wide areas filled with flysch formations; in the lower western part of the country is situated the Adriatic depression filled with thick molasses sediments

3. Start of hydrogeological investigation in Albania

- The organized hydrogeological investigations in Albania started in 1958 with the creation of the "Hydrogeological Enterprise," the first and the only specialized institution in the field of Hydrogeology in Albania.
- In 1963, with the proposal of the specialists of the Hydrogeological Enterprise, a general plan for the hydrogeological prospecting of all the territory of Albania started.
- The were the main goals of the hydrogeological prospecting:
  - ✓ Water supply groundwater investigations;
  - ✓ Compilation of the Hydrogeological Map of Albania scale 1:200.000.

4. Hydrogeological prospecting of Albania

- **The hydrogeological prospecting of Albania lasted 12 years, from 1963 to 1974.**
- **The activities of the hydrogeological prospecting :**

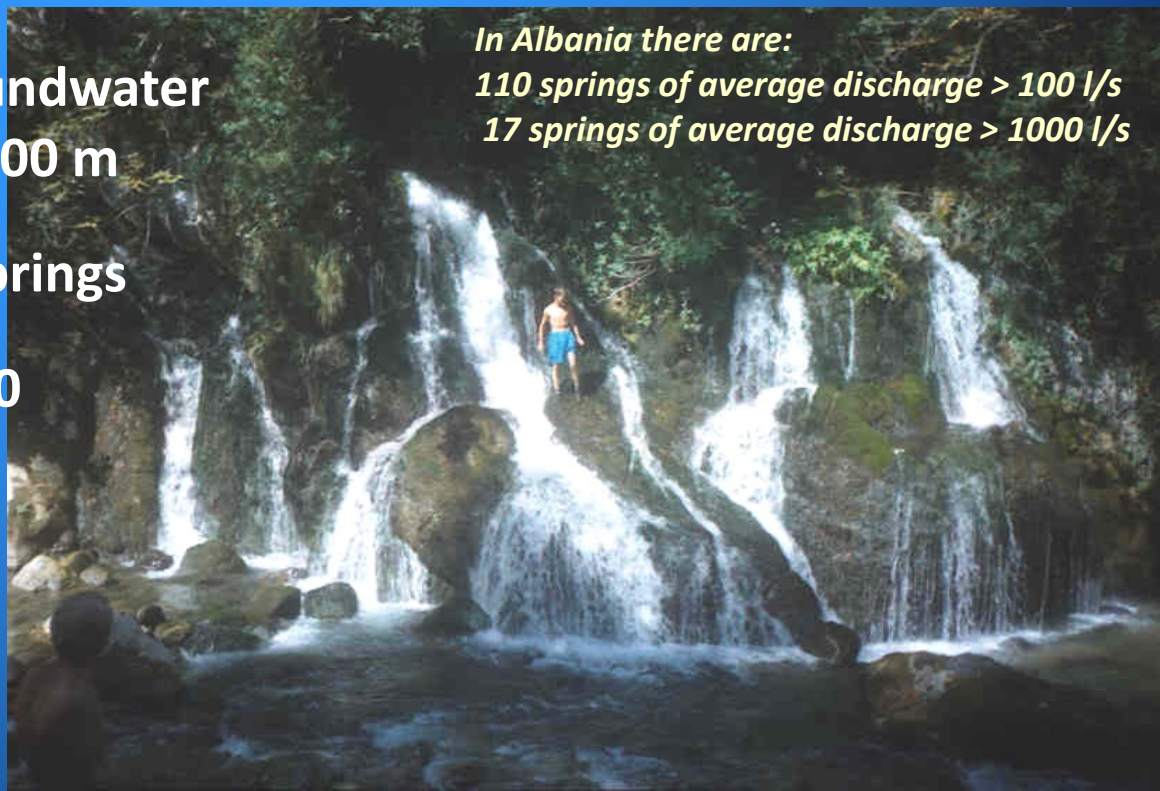
  a) prospecting of the low elevation areas by groundwater wells;
  b) inventory of the springs of the mountain areas;
  c) collection of hydrogeological data from the mining dewatering;
  d) water chemical analyses;
  e) groundwater monitoring.

- **The capacity building of the Hydrogeological Enterprise:**

  a) 12 engineer hydrogeologists and 10 technician hydrogeologists
  b) 5 old fashion drilling machines (rotary and cable tool);
  c) a chemical laboratory;
  d) a mechanical shop;

5. Main results of the hydrogeological prospecting of Albania

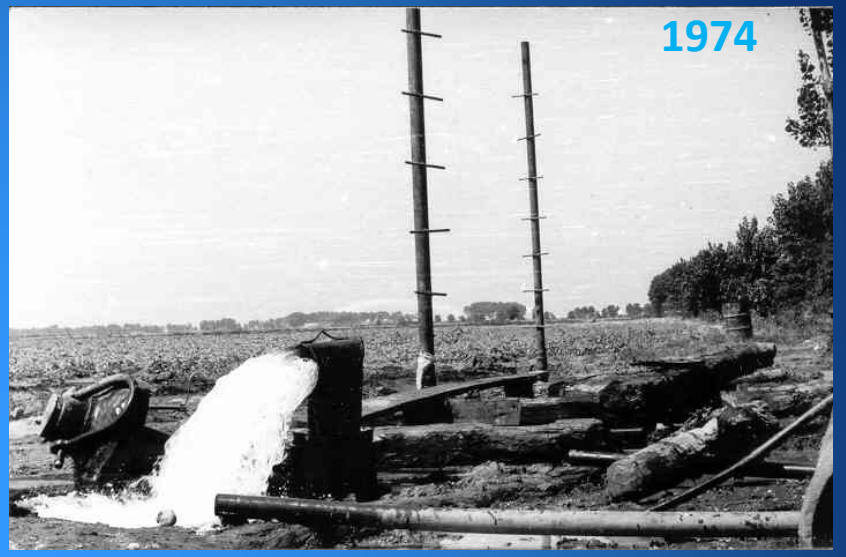
- Investigated groundwater basins;
  - 13 basins of gravelly aquifers ≈ 2500 km2
  - 2 basins of Neogene molasses ≈ 4700 km2
- Investigation of 25 karst massifs ≈ 6500 km2
- Drilling of about 1300 groundwater boreholes of depth 30 to 400 m
- Inventory of about 2500 springs
- Performance of about 3000 water chemical analyses



In Albania there are:
110 springs of average discharge > 100 l/s
17 springs of average discharge > 1000 l/s

6. Photos documenting the hydrogeological prospecting of Albania, 1964-1974

The construction of an artesian well free flowing about 100 l/s in Fushe Kuqe alluvial basin; the authorities are satisfied …



An artesian well with the piezometers, Lezha basin

A pumping test and the piezometers

A historical picture near the monitoring wells in Korça's intermountain artesian basin

7. Start of the hydrogeological mapping

- The team for the compilation of the hydrogeological Map of Albania scale 1:200.000 was established in 1974 .
- At the end of 1974, Albania was invited by Prof. Karrenberg to collaborate for the compilation of the the Albanian share (sheet D6 Athina) of IHM of Europe scale 1:1.500.000.
- At that time of a total self isolation of Albania, this was the first chance to participate in an important international activity and to gain experience on hydrogeological mapping, an important facet for the compilation of hydrogeological map of Albania scale 1:200.000.
- It was decided that the map team was to work contemporary on two maps of 1:200.000 and 1:1.500.000 scales.

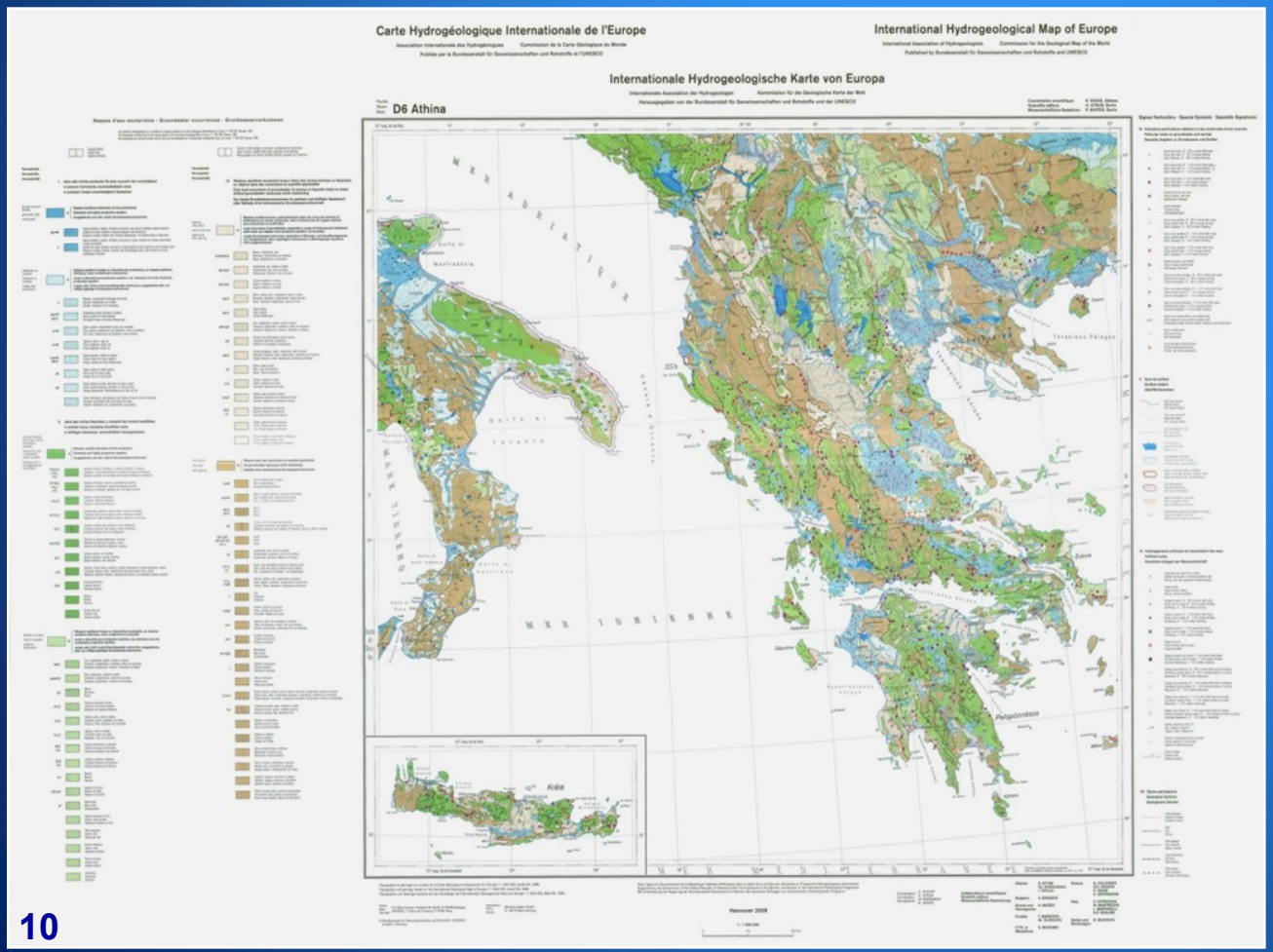
8. Review of the hydrogeological maps

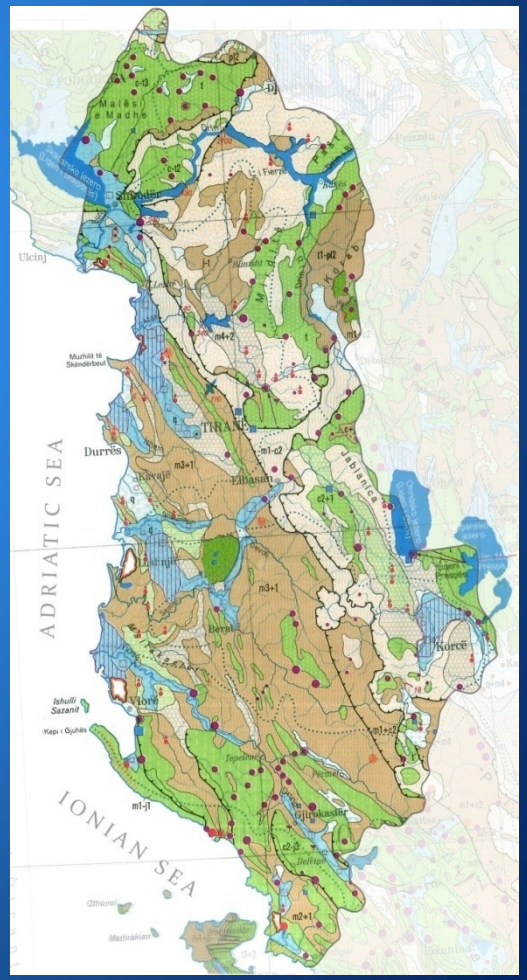
- **The hydrogeological maps differ in content, representation, scale and format, but the two main types of maps could be differed in:**
  - ✓ *General hydrogeological maps;*
  - ✓ *Special hydrogeological maps.*
- **The principia of the compilation of the hydrogeological maps is determined by the main element cartographically depicted on the maps:**
  - ✓ *maps of geological principle;*
  - ✓ *maps of hydrogeological zoning;*
  - ✓ *maps of hydrogeological principle.*
- *IHM of Europe sc. 1:1.500.000 is a general hydrogeological map:*
  - ✓ *The colors show the hydrogeological classification of the rocks*
  - ✓ *The basic elements shown on the map are the hydrogeological units:*
  - ✓ *The aquifers are classified based on:*

"Lithology and petrography of rocks – permeability – productivity"

9. Compilation of the hydrogeological map scale 1:1.500.000

The compilation of Sheet D6-Athina lasted more than 40 years. During this time span, the draft map of Albanian share and the related text were corrected several times to better fit with the neighbouring countries and to be adopted to the new geological maps of the country.





10. Could the principles applied for the compilation of IHM of Europe sc. 1:1.500.000 also serve for the compilation of maps of larger scales?

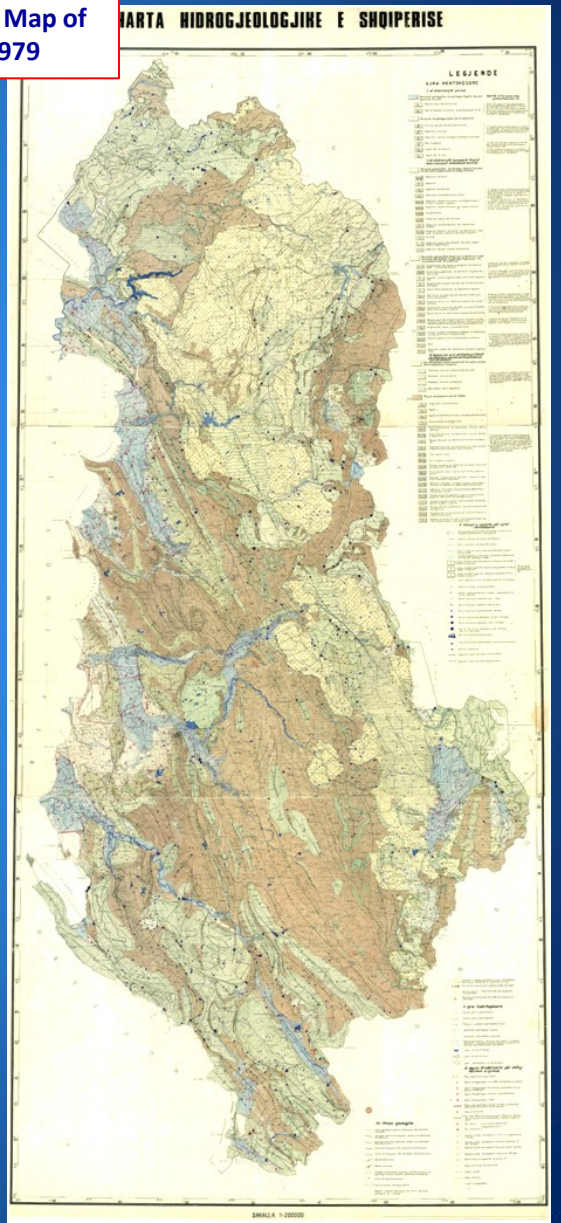
- The principles applied by the IHM of Europe scale 1:1.500.000 could also serve for the compilation of larger scale maps.
- The general larger scale hydrogeological maps keep the same structure as the maps of scale 1:1.500.000, but are richer in documentation:
  - ✓ *The classification of the aquifers could be detailed;*
  - ✓ *The number of the "Group of Rocks" rest the same;*
  - ✓ *The number of the "Aquifer Classes" could be increased;*
  - ✓ *The number of the "Hydrogeological Units" could be increased;*
  - ✓ *Data points and ornaments could be enriched, particularly those related to groundwater chemistry.*

The Hydrogeological Map of Albania scale 1:200.000 was decided to be based on principles as IHM of Europe scale 1:1.500.000

11. Compilation of the hydrogeological map of Albania scale 1:200.000

- The map team was poorly supplied.
- The work started with the compilation of a hand-writing hydrogeological data base.
- The first draft (hand-painted) of the hydrogeological map was finished in 1979.
- The second draft (hand-painted), based on the new geological map of Albania sc. 1:200.000, was finished in 1983.

First Draft of Hydrogeological Map of Albania (hand-painted), 1979



12. Publication of the Hydrogeological Map scale 1:200.000

- The HM of Albania sc. 1:200.000 was published in 198 (in Albanian and in English)
- The map clearly identifies the hydrogeological characteristics of Albania, such as:
  - The location of different aquifers and the delineation of the hydrogeological structures like gravelly basins, karst massifs, basins filled with molasses, magmatic rocks massifs with fissure and areas poor in ground water;
  - The location of the important water supply drilling areas and big springs;
  - The groundwater quality for drilling areas and of the springs; thermomineral springs and areas of seawater intrusion.
- The map can be successfully used not only for planning purposes, but also for the solution of many practical problems of groundwater use.

13. Comparison of the HM of Albania of different scales

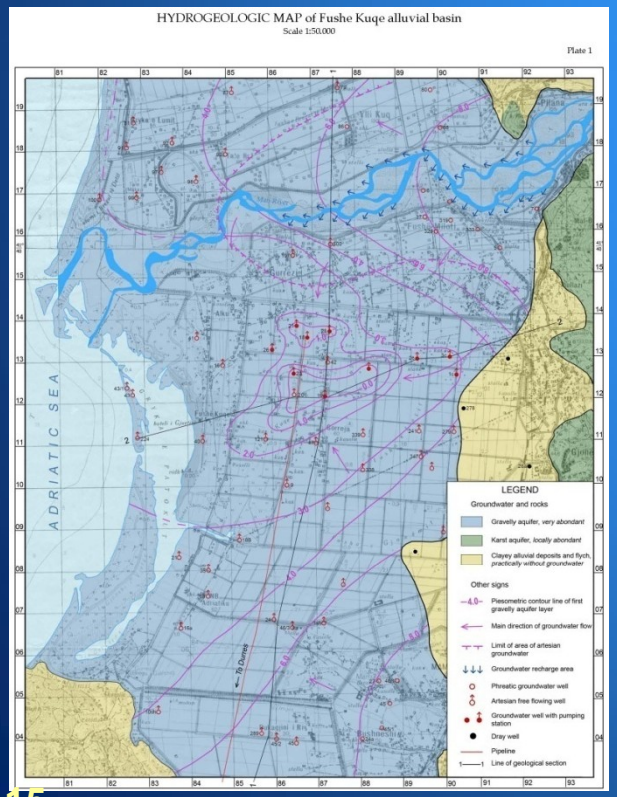
- The hydrogeological classification of rocks is more detailed on the map sc. 1:200.000:

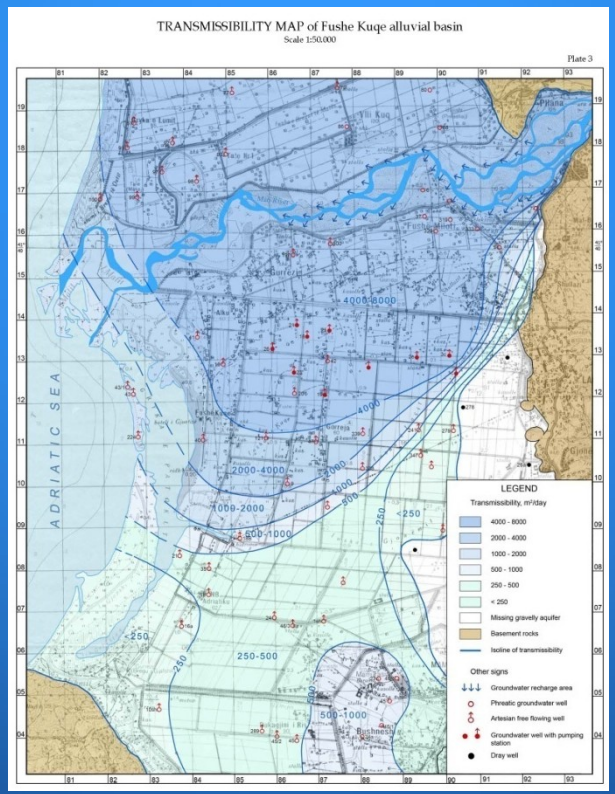
Map scale	*1:1.500.000*	*1:200.000*
• Group of rocks	3	3
• Aquifer classes	6	7
• Hydrogeological unites	17	45 (may be are to much?)
• Class of springs	3	6

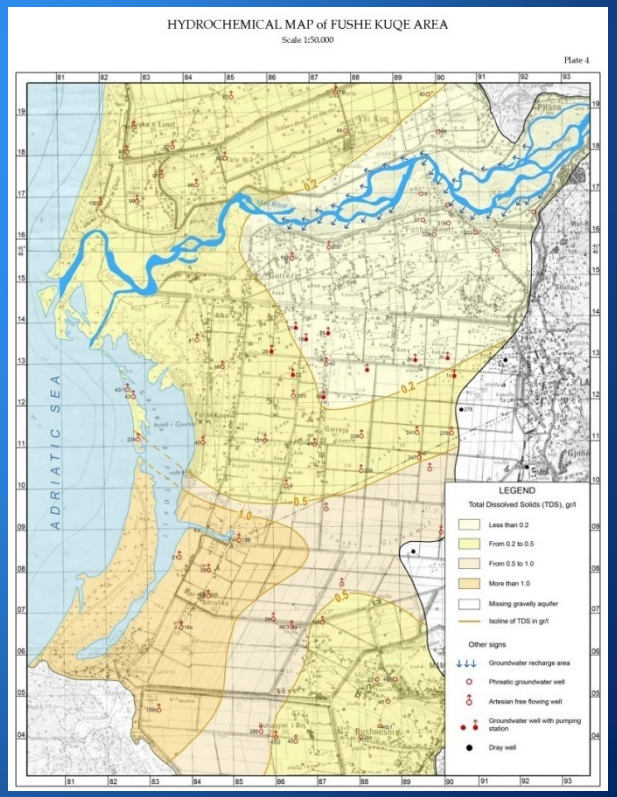
- New signs on the map scale 1.200.000:
  - Part of the stream totally infiltrated in the gravelly aquifers
  - Limit of very intensive karst area
  - The river drains intensively the groundwater
  - The river recharges intensively the groundwater
  - Discharge from mine workings classified in three discharge groups
  - Some hydrochemical data on thermomineral springs and water wells, etc.

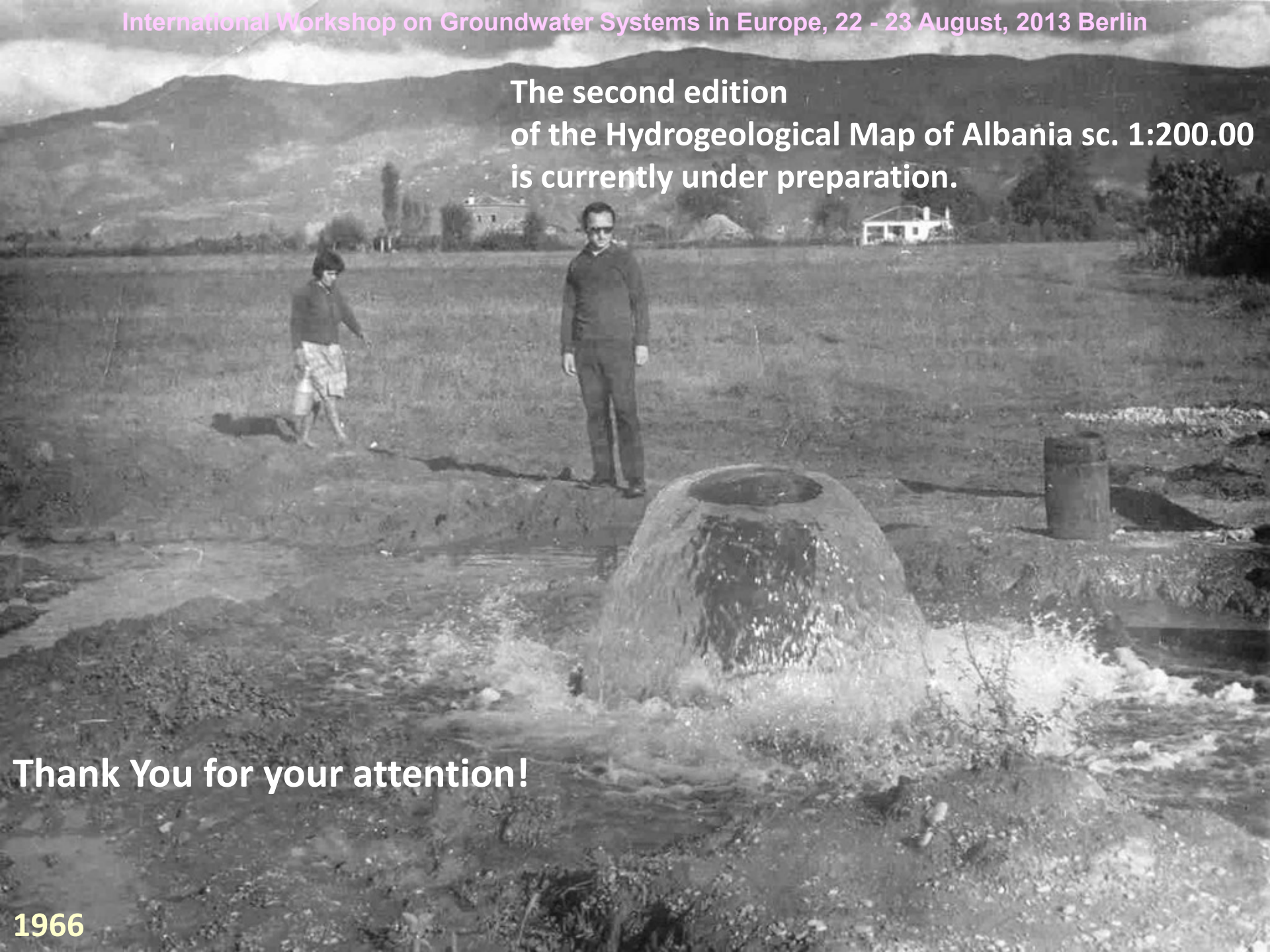
14. Compilation of the larger scale special hydrogeological maps

- Special hydrogeological maps scale 1:50.000 or 1: 25.000 usually are compiled for the solution of practical problems related to the groundwater exploitation of the gravelly aquifers. These maps are focused on the basins, which are depicted in a general manner on the map scale 1:200.000.
- Special maps are very different according to the problems of the investigated basins, but the three types of maps shown below appear to be the more important ones.









The second edition
of the Hydrogeological Map of Albania sc. 1:200.00
is currently under preparation.

Thank You for your attention!

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