3 Resilience of hydrothermal systems against natural and anthropogenic disturbances. Management of the RESILTHERM project

The RESILTHERM project is coordinated by the "Emil Racoviţă" Institute of Speleology (ERIS), which will have in consortium only one partner, the Institute of Biology Bucharest (IBB), both institutions belonging to the network of research institutes of the Romanian Academy.

"Emil Racoviţă" Institute of Speleology (ERIS, www.iser.ro, www.geochem.iser.ro) ERIS is one of the most prestigious research institutes of the Romanian Academy. Perfectly balanced between geosciences and biosciences, the research activities performed in the ERIS result in the better understanding, characterization and as a consequence protection of the subsurface environments in general, and of the karst systems in particular. The top research performed in ERIS, would not be possible without the strong infrastructure represented by new, modern laboratories well equipped for extensive geochemical and biological/biochemical studies.

The interdisciplinary character of the proposed project fits to the main features of the research activities performed in the ERIS, since it combines hydrogeology, geochemistry, analytical chemistry and microbiology. The ERIS researchers involved in the proposed project are accustomed with addressing topics from different fields, since they have a broad expertise in both chemistry and biochemistry, as well as in microbiology. Since they are not depending on their first speciality, the involved ERIS scientists are familiar with issues related to almost all these fields, therefore the proposed project can only be a success.

The scientific visibility of ERIS and its researchers is best reflected by the scientific grants and projects as well as by the numerous scientific papers published in high impact journals. Permanently concerned about their professional improvement and eager to make their results known, ERIS researchers are also regular participants to international conferences and workshops.

Institute of Biology Bucharest (IBB, www.ibiol.ro) is one of the most important institutes of the Romanian Academy, the Institute of Biology is characterized by a strong infrastructure enabling top research to be performed in its laboratories. Out of the several departments of the IBB, the proposed project involves only the Department of Microbiology, department that already had a previous collaboration with the ERIS (CO). Biodiversity of both bacteria and archaea is addressed by the IBB microbiologists, by the use of state of the art methods and techniques. The IBB scientists are very visible among the national and international scientific community since they participate to important conferences and publish in very highly rated journals.

Since no previous attempts of assessing the hydrothermal systems resilience exist, we devised a specific work-plan which we think is appropriate for reaching the proposed objective. The basic principle is to develop a model which would be able to describe the complexity of the geo- and biogeochemical processes that are continuously taking place within the aquifer, and

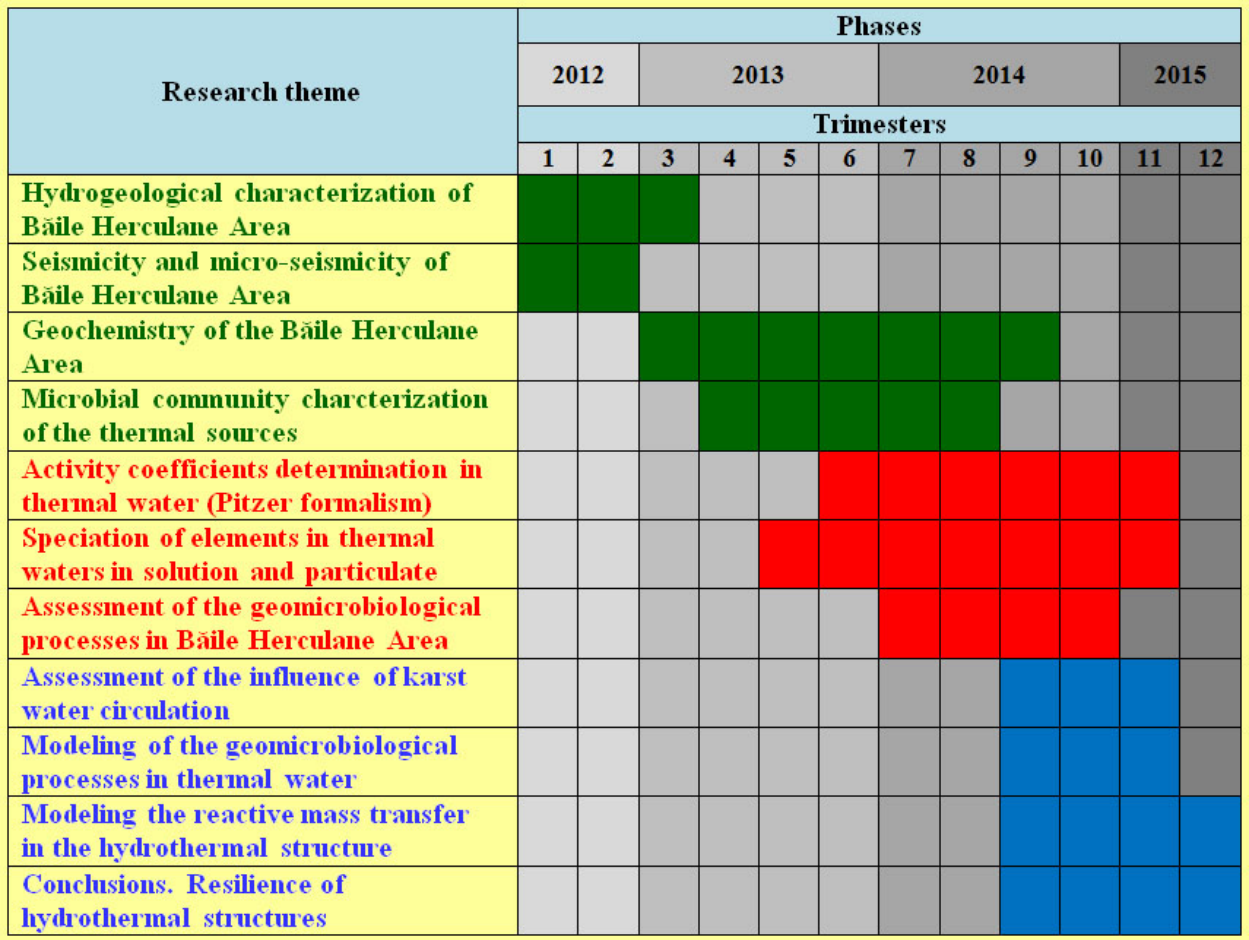

Fig. 3.1 – Research topics addressed by the RESILTHERM Project and timetable. (As amended by the Addendum No. 1 of May 2013.)

based on that model, to further outline the system evolution under the effect of disturbing factors which are liable to be characterized. By knowing the cause which controls the direction and the dynamics of the system processes, we shall be able to quantify the system ability of coping with changes having intervened, otherwise stated, to provide a measure of the system resilience.

Although this idea is very simple, a maximum rigor is required in assessing the hydrothermal system characteristics. It would be unrealistic to assume that during the project time-frame a disaster will occur in that area, and thus easily detectable changes in the system properties will be induced. Therefore, the system characterization must take into account two distinct issues. On the one hand, the analysis must not neglect specific processes playing a certain part in controlling the system state, like for instance geomicrobiological processes, elements transport by means of colloidal matter, etc. On the other hand, the experimental data acquisition has to be conducted by means of highly performant techniques.

The project activities shall be performed in four phases, which due to financial reasons cover the number of months of the civil years during which the work-plan is extending. The first phase is five months long and is dedicated to preparatory activities for the experimental work, to establishing the work protocols, and to the critical analysis of the already existing data about the BHA. During the second phase (12 months), there will be mainly collected chemical and microbiological information about the system. The third phase (12 months) is essentially dedicated to processing and interpreting the acquired experimental information and to developing assessment models. During the last (7 months) conclusions are formulated and part of the rich experimental material having been acquired is further utilized for a series of practical applications.

Due to the complexity and the broad interdisciplinary character of the project, we decided to

categorize the research activities into several typological topics. According to their nature, those research topics range into three distinct types, namely: I – descriptive topics (written in Fig. 3.1 in a green colour); II – topics displaying obvious fundamental research features (written in red); III – synthesis topics (written in blue), in which results obtained in the framework of the first two topic types are simultaneously utilized in order both to reach an improved knowledge status, and to provide an immediate applicability to the entire research program.

In Fig. 3.1 there are indicated the research topics which we aim to address, as well as the time-interval allotted to each one of them. From various reasons (e.g., complexity, difficulty, the necessity of monitoring the discharged water chemistry for a period longer than an entire hydrological cycle, etc.), the time for completing a topic cannot be always restricted to the exact duration of a phase.


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