

UMR 8148 "IDES"

Report on the Ph. D. thesis submitted by

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"Isotope hydrogeology and geothermal applications to clarify the origin,
the sustainability and the character of groundwater flow.

Examples of the Bohemian and the Aquitaine sedimentary basins"

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The thesis is dedicated to the study of two large multi-layered aquifer systems, that of the Bohemian basin, in the Czech Republic, and that of the Aquitaine basin, in France, by using isotope-hydrology methods (for both aquifers) and in-situ temperature measurements to assess geothermal gradients and heat fluxes (only for the Bohemian-basin aquifer).

It is an article thesis, based on four stand-alone articles (published, in press, or accepted for publication), of which Hana JIRÁKOVÁ is the first author :

- Palaeorecharge conditions of the deep aquifers of the Northern Aquitaine region (France). *Journal of Hydrology*, 2009.
- Carbon isotopes to constrain the origin and circulation pattern of groundwater in the north-western part of the Bohemian Cretaceous Basin (Czech Republic). *Applied Geochemistry*, 2010.
- Insight into palaeorecharge conditions of European deep aquifers. *Hydrogeology Journal*, accepted for publication.
- Geothermal assessment of the deep aquifers of the northwestern part of the Bohemian Cretaceous Basin (Czech Republic), *Geothermics*, in press.

This makes the referee's task much easier, as each article was peer-reviewed before the thesis is submitted. The scientific quality of the core of the thesis was already controlled.

Therefore, this report will be short as I shall limit my comments to the way the thesis was built around these four articles.

Its structure is quite classical, with an introductory chapter stating the general objectives of the work, which dealt with the sustainable management of water resources from deep confined aquifers, a second chapter presenting in details the investigation sites, a (short) third chapter introducing the used methodology, a fourth chapter reporting the results of

isotopic and geothermal investigations (including the four articles), and finally a fifth chapter summarizing the main conclusions and perspectives of the work.

I did not find any problem in the interpretation of the data. The argumentation is consistent and the obtained results are valuable for improving the knowledge of the studied sites, but also for the general progress of concepts about the hydrogeochemical and hydrodynamical functioning of deep confined aquifers.

The bibliography is adequate, almost complete and up-to-date.

I shall make only two criticisms, mainly concerning the conclusions :

- The thesis shows evidence that the candidate deeply involved herself in every stage of the work and demonstrates that she masters each of the methods that were used. Therefore, I was somewhat surprised that there is no true methodological conclusion to the thesis. It would have been nice to get a summary of the candidate's opinion about the actual perspectives that are opened by her work, in place of the rather banal considerations that conclude the thesis.

- More particularly, the title raises the expectation that the work combined isotopic and geothermal methods, and this was also written several times in the thesis. This was not really the case. Even if both methods have been used for studying the aquifer system of the Bohemian basin, their results, which were discussed in two different papers, were juxtaposed rather than combined. No attempt was made to develop an integrated approach or, at least, propose in the perspectives some research tracks that could lead to improve the integration of the two methods.

However, even if some minor criticisms can be made, there is no doubt that the scientific content of the work, corresponding to four articles that were published or accepted in high-level journals, largely meets the international criteria for a doctoral dissertation.

Thus, in conclusion, I consider the amount and quality of the work as more than sufficient to recommend the defence of the thesis as it stands.



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