



Review of Cumulative Dissertation

*Geochemical and isotopic constraints on the composition of the upper mantle
beneath the Bohemian Massif*
written by Julie Erban Kočergina

The PhD thesis authored by Julie Erban Kočergina, titled “Geochemical and isotopic constraints on the composition of the upper mantle beneath the Bohemian Massif” is a cumulative dissertation that contains two published peer-reviewed articles, and one submitted publication that is currently under review. In all three contributions, the student is the first author. The contribution of the student to individual papers is given in the introductory section. The thesis consists of three chapters, a conclusion section, and an appendix containing the aforementioned reprints and the manuscript. The dissertation is well structured and Ms. Erban Kočergina quoted an appropriate number of bibliography sources. The thesis is written in clear and concise language. The figures and schemes are properly selected to illustrate individual topics. The language is comprehensive and coherent yet not completely free of typos or inconsistencies – see below.

The papers presented in this cumulative dissertation include:

1. Sample preparation and chromatographic separation for Sr, Nd, and Pb isotope analysis in geological, environmental, and archaeological samples authored by Yulia V. Erban Kočergina, Vojtěch Erban, and John M. Hora, which appeared in 2022 in *Journal of Geosciences*. In this paper, the author addresses improvements in sample processing before Sr, Nd, and Pb isotope analyses and illustrates the application of these procedures to real materials.
2. Highly siderophile element geochemistry of metasomatized sub-continental lithospheric mantle: Clues from the mantle xenoliths in the western edge of the Bohemian Massif authored by Yulia V. Erban Kočergina, Tomáš Magna, Lukáš Ackerman, and Petr Špaček which is currently under review in *Chemical Geology*. Here the Re-Os and HSE systematics with Os isotopic compositions provide insight into the geological history and development of the tectonic structures in the western continuation of the Ohře Rift.
3. Rhenium–osmium isotopes in pervasively metasomatized mantle xenoliths from the Bohemian Massif and implications for the reliability of Os model ages authored by Yulia V. Kočergina, Lukáš Ackerman, Vojtěch Erban, Magdalena Matusiak-Mańek, Jacek Puziewicz, Patricie Halodová, Petr Špaček, Jakub Trubač, and Tomáš Magna published in 2016 in *Chemical Geology*. This paper addresses the geological processes in northern part of the Bohemian Massif based on Os isotopic systematics and Re-Os concentrations.

Since the presented papers have been (or will be) subject to comprehensive peer reviews I refrain from their further evaluation and discussion.

Comments, questions, and remarks

What is the reason why the research on metasomatized mantle xenoliths is divided into two separate papers?

What was the reason for summarizing Re-Os data for materials from the Bohemian Massif to an over two-page table (table 1) instead of giving that information directly to the text?

I would appreciate seeing an outlook about further applications, potential strategies to improve the performance of the analytical protocols, and a few words or a paragraph that presents directions for further research.

On p. 12, the $^{176}\text{Hf}/^{177}\text{Hf}$ ratio is mentioned though the Lu-Hf system is more thoroughly explained on the next page including the epsilon definition for this system.

In the text, there are some typos: in the equation on p. 11, the problems introduced by the text editor remained overlooked; typographic inconsistencies in typesetting superscripts occur in the equation defining the epsilon parameter on p. 13; number 10,000 on p. 14 is divided into two lines; word “orogeny” is used instead of “orogen” on several occasions in the text (e.g., on p. 18); Mosldanubian should read Moldanubian (p. 32); vapour pleasure should be vapour pressure (p. 43); sulfure should be sulfur; in some cases, there are also errors in typesetting references where parentheses are either missing or excessing.

Conclusion

First of all, it should be mentioned that Ms. Kočergina is also a co-author of 10 additional papers (see pp. X-XI), which are topically related to those presented in the thesis and have been published in reputable peer-reviewed journals within the period 2016-2022 but are not included in this thesis. These papers together with the three where she is the first author attest to the very good scientific performance of the student and her research proficiency.

Ms. Kočergina’s dissertation represents a significant and influential piece of work. The high quality of the individual papers and the overall presentation of the research make this dissertation a valuable contribution to the field of isotope geochemistry. As the presented PhD thesis meets the standards expected for such a qualification work, I am recommending the dissertation for defense.

Praha, September 30, 2024

Roman Skála