

University of Cologne



University of Cologne • Albertus-Magnus-Platz • 50923 Köln

To
Přírodovědecká fakulta Univerzity Karlovy
Studijní oddělení
Albertov 6, 128 43 Praha 2

**Faculty of Mathematics
and Natural Sciences**

**Institute of Geology and
Mineralogy**

Zülpicher Str. 49 a
50674 Cologne

Prof. Dr. Patrick Grunert

**Professor of Micropaleontology
and Paleoecology**

Phone +49 221 470-76319

Fax +49 221 470-1663

Email pgrunert@uni-koeln.de

Subject: Referee report on Ph.D. thesis of Mr. Filip Scheiner

Cologne, August 21, 2019

To whom it may concern:

Please receive this letter in return to your invitation to act as a reviewer on the Ph.D. thesis submitted by Mgr. Filip Scheiner to the Faculty of Science, Charles University of Prague. You will find my assessment of the thesis in the next paragraphs.

The thesis entitled “*Geochemical markers from foraminiferal tests as a tool for reconstruction of paleoceanological environments: a case study from the Miocene of the Central Paratethys*” presents Mr. Scheiner’s research on the applicability of inorganic and organic geochemical proxy methods to middle Miocene deposits of the Central Paratethys. The thesis consists of a comprehensive summary and discussion of key findings and four accompanying publications in peer reviewed scientific journals.

Mr. Scheiner’s thesis clearly demonstrates dedication, diligence and accuracy in his approach towards natural sciences and his ability to accomplish meaningful scientific work. His work showcases firm competence to tackle challenging research questions through innovative methods, to acquire and analyze multi-proxy datasets, and to provide new perspectives in his field of research.



I am particularly impressed by the broad spectrum of proxy methods he applied (stable isotopes, trace elements, biomarkers) which shows versatility, a strong willingness to learn the necessary and rather different laboratory methods, and a firm grasp on the integration of multi-proxy datasets. I want to emphasize that geochemical work on Paratethys deposits is still rare and that the topic of his thesis was quite challenging. The marginal, epicontinental setting and poor preservation often inhibit the acquisition of meaningful datasets and comprehensive interpretations. His work capitalizes on the access to well-preserved fossil material that allowed for an in-depth evaluation of various geochemical proxy methods otherwise rarely applied to the Central Paratethys. Few studies on the Central Paratethys before have approached combined isotopic and trace element analyses with such detail and care like Mr. Scheiner did. I thus consider the research presented in his thesis an important step forward in our understanding of the Central Paratethys realm. His Ph.D. work will certainly remain an important touchstone for future geochemical work in epicontinental seas such as the Paratethys. In conclusion, his thesis clearly demonstrates that he is deserving a doctoral degree.

While I enjoyed reading Mr. Scheiner's thesis, there are some areas that I hope he will be able to elaborate on during his thesis defense.

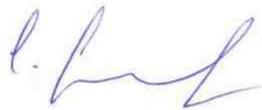
- The good preservation of foraminiferal shells is emphasized many times in the thesis. While I have no doubt that Mr. Scheiner checked all shells carefully and his results do look consistent, I'd like to see some images of the shells.
- In chapter 4.3, Mr. Scheiner reports on cyclical variations in water temperatures (see also Scheiner et al., 2018). Given the proposed timeframe of < 50 kyrs for the studied interval of the LOM-1 core, I would be interested in the potential frequency of these cycles and what may drive them.
- While Mr. Scheiner chose species-specific transfer functions to calculate water temperatures from Mg/Ca (chapter 2.2.2), he relied solely on the transfer function of Shackleton (1974), developed for the benthic foraminifer *Uvigerina*, to calculate $\delta^{18}\text{O}_{\text{seawater}}$ (chapter 2.2.1). I would be interested to

know why he chose the latter when there are species-specific equations for many benthic and planktic foraminifera.

- Scheiner et al. (2019) explain a marked increase in CaCO_3 content at ~10 m in the LOM-1 core with a shallowing and increase in mollusk shell production. I would be interested if there are changes in foraminiferal shell production (e.g., specimens per gram, benthic or planktic) in the LOM-1 core in general and if he considers changing sediment accumulation rates as another factor contributing to changes in CaCO_3 content.

I would like to express my appreciation for Mr. Scheiner's diligent and profound work. I wish him all the best for his future research career!

Sincerely,

A handwritten signature in blue ink, appearing to read 'P. Grunert', with a stylized flourish at the end.

Patrick Grunert