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Geoscientific Instrumentation Methods and Data Systems Discussions

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# *Interactive comment on* "Automated mineralogy based on energy dispersive X-ray fluorescence microscopy ($\mu$-EDXRF) applied to plutonic rock thin sections in comparison to Mineral Liberation Analyser" *by* Wilhelm Nikonow and Dieter Rammlmair

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Dear referee,

we are thankful for your helpful comments and remarks on our manuscript and appreciate your time and effort for the review. Below you will find our responses to the comments and our changes to the manuscript.



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Discussion paper

1. The manuscript is original and it has the potential to become a useful contribution; however, it is too long and difficult to follow, but can be easily shortened by removing the irrelevant data (and information; the authors should evaluate the meaning and need of each sentence and method applied in the manuscript). The sentences are very long and the English should be checked.

Response: We have edited our manuscript and worked on the length and the language. In order to shorten the manuscript we omitted the paragraph in the introduction about development and history of automated mineralogy and left only the most important information and references regarding MLA. We also tried to clarify and shorten sentences where possible. Furthermore, we removed Fig. 4 (Modal mineralogy according to ENVI and MLA classification) and the corresponding remarks in the results section. Even though it shows a great correlation, the error matrix is more informative, since it shows differences and accuracy for each mineral class.

2. If there are some discrepancies in the minerals percent in every measurement method, what is the suggested method for future data measurement?

Response: As always in geosciences, the preferred method depends on the scope of the analysis and the necessary data resolution. We have addressed the options and opportunities of both methods in the last paragraphs of our discussion and conclusion and have added more detailed information and application suggestions for the relevant technique. Furthermore, it is not necessarily only a question of which method to use, but it can be a big advantage to use both methods, first $\mu$-EDXRF and then, if a higher resolution is needed, MLA. Our suggestions are to use $\mu$-EDXRF as a first step of a series of geoscientific analyses including thin section microscopy, MLA or other geochemical analyses, since it is fast and non-destructive. That means, having the $\mu$-EDXRF information with an intact sample remaining, the decision, where to take thin sections, or which part of the sample should be analyzed geochemically can be done more systematic and more targeted.

3. 3.1. Page 3, line 32: "a polarized microscope "instead of "a polarization microscope"

Response: Corrected to “polarized light microscope”

3.2. Page 3, line 23: This sample was measured in GXMAP mode, where the whole sample was mapped with a distance of 6 _m. What do you mean?

Response: The information on the two mapping modes and their function are now explained in a clearer structure and with more details as follows in chapter 2.3 and in table 1: “For this work, two modes of MLA were applied: (1) samples 424 and 342 were measured in the XBSE mode, where grains are classified and separated according to their grey level in the BSE image. Then each separated grain is measured in the center with the X-ray detectors and classified chemically using a predefined mineral database. For the sample 484 the XBSE mode was not suitable, since the grey values of hornblende and biotite were too similar for a correct grain separation. Therefore, this sample was measured in (2) GXMAP mode. In this mode, grains are not separated by their grey values, but the whole sample was continuously mapped with an EDX-analysis every 6 $\mu$m. The details of the SEM image acquisition are listed in Table 1. A detailed description of the functionality of MLA and the measuring modes can be found elsewhere (Dobbe et al., 2009; Fandrich et al., 2007; Gu, 2003)."

3.3. Figs.2 and 4: Image scale was not shown.

Response: The sample sizes of Figs 3 and 5 were given in the image captions. For better visibility, scales have been integrated into both images.

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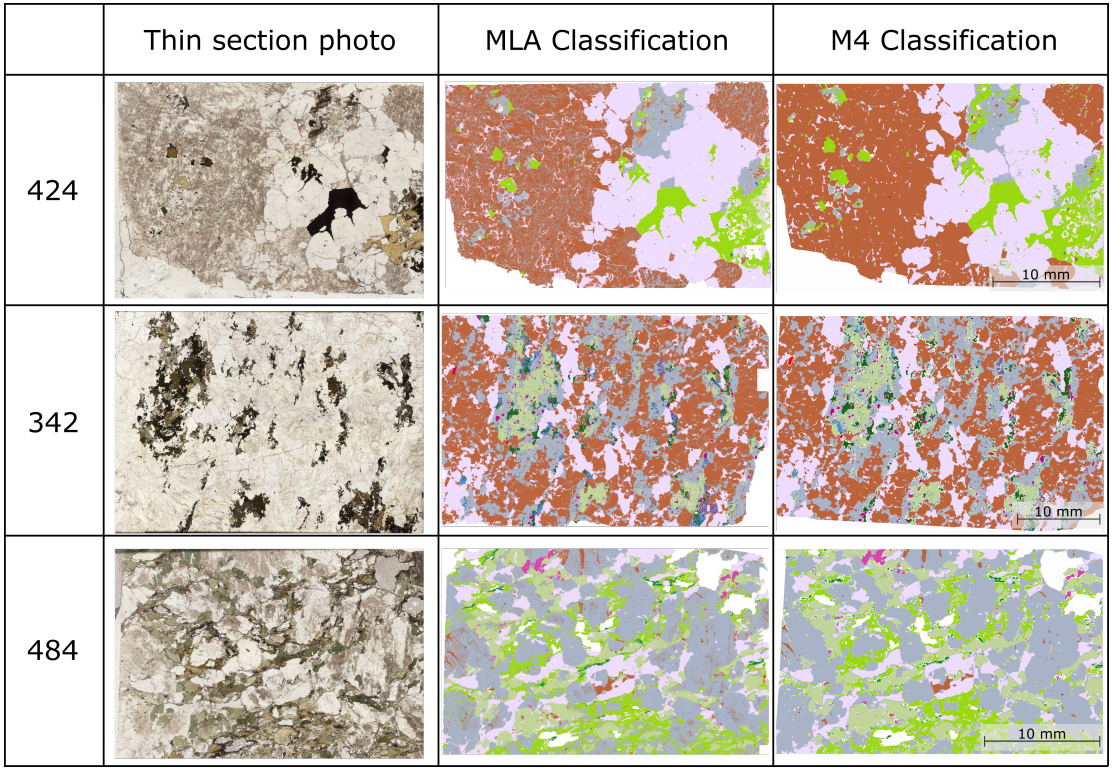


**Fig. 1.** New Fig. 3: Thin section scan and classification results from Mineral Liberation Analyzer (MLA) and M4 Tornado - ENVI.



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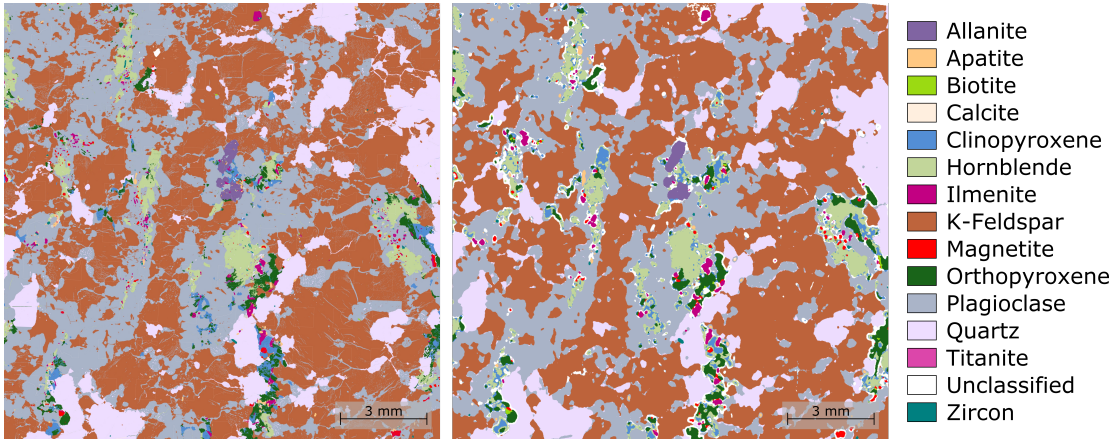


**Fig. 2.** New Fig. 4: Detailed view of a section in the upper right corner of sample 342: Mineral distribution map from MLA (left) and ENVI (right).



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