

Trace element determination in Ca-heavy matrices: comparing ICP-MS based strategies and protocols

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Trace element determinations are of great importance in geochemical research. With a wide array of techniques and protocols available, possibilities extend further than ever before. However, the adequacy of results greatly depends on multiple factors, such as the sample type, sample matrix, the amount of available material, pre-treatment protocols, the used analytical technique, and the selected reference materials. Bioarchaeological samples, such as excavated skeletal remains, prove to be especially challenging to measure using mass spectrometry, as these require extensive pre-treatment procedures, and display a heavy, Ca-rich matrix. Here, an assessment is provided of both the correlations and variations of trace element concentrations between HR-ICP-MS, MC-ICP-MS, and ICP-QQQ. Albeit intended for isotopic analyses, MC-ICP-MS instruments can also be used to determine concentration levels. However, the accuracy of these concentration results is often not deemed to be sufficiently high. Here, such concentration analyses, along with results from well-established concentration determination protocols relying on HR-ICP-MS and ICP-QQQ are constrained in detail. In addition, these measurements are all carried out at the same laboratory (AMGC, VUB), in a cutting-edge in-house clean lab, with newly acquired instruments. Preliminary results indicate an overall excellent correlation between HR-ICP-MS and MC-ICP-MS results, exceeding initial expectations. These highly promising results may allow the potential expansion of the possibilities of MC-ICP-MS instrumentation, especially for bioarchaeological applications, and when working with Ca-rich matrices. A combined, simultaneous assessment of Sr isotopes and concentrations based on the same analytical technique would consequently allow for significant gains in time and sample throughput.