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LA-ICP-MS lab work University of Milan

The Postgraduate Student Bursary awarded by the Mineralogical Society facilitated lab work at the Department of Earth Sciences at the University of Milan completed in May 2024. The samples analysed as part of this PhD research are from the Kula Volcanic Province (KVP) in Western Türkiye, a monogenetic volcanic field experiencing three periods of Quaternary basaltic volcanism. The PhD aim is to identify the tectonic model through textural and geochemical analysis and determine the main compositional factors that have changed throughout the three stages of volcanic activity.

This work involved trace element analyses of the main mineral phases (clinopyroxene, amphibole, olivine, and plagioclase) performed using an Analyte excite 193 nm ArF excimer laser coupled with a Thermo Fisher Scientific iCAP-RQ mass spectrometer. The operating conditions were the following: 6 J/cm^2 fluence, 40 µm (clinopyroxene, amphibole and olivine) and 65 µm (plagioclase) spot size and 10 Hz repetition rate. The acquisition time was 60 seconds on the sample and 40 seconds on the background. The elements analysed included Li, Be, B, Sc, Ti, V, Cr, Mn, Co, Ni, Cu, Rb, Sr, Y, Zr, Nb, Cs, Ba, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Hf, Ta, Pb, Th, and U.

The data from this access will be used to explore the elemental changes in individual crystals and to see how these mineral phases have changed throughout the eruptive history at the KVP. This approach is a great way to show variation in elements from the core to the rim of crystals which can be used to provide insights into magma mixing, magma mingling, crystal growth, and crystallisation pathway.

Overall, this work facilitated hands-on experience using LA-ICP-MS, with knowledge gained on the fundamental principles of this method, including the types of standards used to generate good analysis, how to acquire precise quantitative elemental analysis, and how to perform data reduction to choose the best interval for background and signal measurement.