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High precision $^{40}Ar/^{39}Ar$ dating of distal tephra layers from the fucino paleolacustrine sequence using ATONA amplifiers array

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The capacity to accurately and precisely date distal tephra layers interlayered within lacustrine, marine as well as terraces and sedimentary records remains a challenging task. The ability to provide such independent age control is a powerful tool utilized within the numerous fields of the Quaternary Sciences and is crucial to insure the accuracy of past climatic, environmental changes reconstruction in particular. The continuous improvements made over the last decades both on the chemically fingerprinting and direct radio-isotopic dating of middle to upper Pleistocene tephra using $^{40}Ar/^{39}Ar$ method allowed to address questions that were previously unapproachable.

We present in this contribution recent improvements of the $^{40}Ar/^{39}Ar$ laser single crystal technique based on the detailed study of a Middle Pleistocene sedimentary sequence from the Fucino paleolake (Central Italy) covering the 200-350 ka time period. Mass spectrometric measurements were achieved using an NGX 600 MS equipped with an ATONA® amplifiers array (ISOTOPX, LSCE, France) and applied to 300-500 microns single sanidine and leucite crystal. A total of 7 tephra layers including well known eruptions already dated in proximal setting such as the Ovieto-Bagnoregio Ignimbrite (331.9 ± 1.0 ka, 2s) or the Magliano Romano Plinian Fall (313.0 ± 2.0 ka) have been successfully dated, despite the modest size of Argon isotopes beam measured (i.e. typically 40 000 cps equivalent for the ^{40}Ar on the ATONA® Amplifier).

Our results prove that ATONA® amplifiers array is capable of providing high precision ^{40}Ar isotope measurements even for Middle Pleistocene single K-feldspars crystal below 500 mm. These findings open numerous opportunities in particular to improve the tephrochronology of marine records in the Mediterranean realm allowing to validates/confirms the high precision $^{40}Ar/^{39}Ar$ age on tephra layers found within distal sedimentary sequences.