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ATTA-3: The Next-Generation Instrument for ^{81}Kr-Dating YUN DING, Phys Div, Argonne National Lab (ANL) & EFI, Univ of Chicago (UofC), Z.-T. LU, Phys Div, Argonne National Lab & EFI, UofC, K. BAILEY, P. MUELLER, T.P. O'CONNOR, Phys Div, ANL, R.W. DUNFORD, L. YOUNG, Chem Div, ANL, A.M. DAVIS , EFI & Dept of Geophys. Sci., UofC, N.C. STURCHIO , Dept of Earth & Environ Sci, Univ of Illinois at Chicago, W. JIANG, S.-M. HU , Hefei National Lab, Univ of Sci & Tech of China — Atom Trap Trace Analysis (ATTA) has been used to analyze two rare isotopes: ^{81}Kr (half-life = 230,000 yr, isotopic abundance $\sim 10^{-12}$) and ^{85}Kr ($\sim 10^{-11}$), in environmental samples. Radiokrypton dating enabled by the ATTA method can now be used to determine the ages of old groundwater in the range of 50,000–1,000,000 years. The present apparatus (ATTA-2) has an overall counting efficiency of 0.01% and, for ^{81}Kr dating, requires a water sample of at least 1,000 liters. We are developing a new apparatus (ATTA-3) to trap and count ^{81}Kr atoms with the goal of reaching a counting efficiency of 1%. The required sample size could be reduced down to 10 liters of water or ice. ATTA-3 would enable a wide range of applications in the earth sciences. This work is supported by NSF, Division of Earth Sciences, under Award No. EAR-0651161, and by DOE, Office of Nuclear Physics, under Contract No. DE-AC02-06CH11357

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