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Dating of groundwater with ^{85}Kr, ^{39}Ar, and ^{81}Kr

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The noble gas radioisotopes ^{85}Kr, ^{39}Ar, and ^{81}Kr are ideal tracers for environmental water and ice samples. Together with ^{14}C, they cover an age range from a few years to 1.3 million years. ^{81}Kr-dating, a concept pursued over the past five decades has become available recently to the earth science community at large due to the development of the Atom Trap Trace Analysis (ATTA) method [1,2]. In order to meet the increasing demands from the earth science community, we have established a new laboratory dedicated to radiokrypton and radioargon dating. For ^{85}Kr- and ^{81}Kr -dating, we can measure samples as small as 1-2 μL STP of Kr gas, which is contained in about 10-20 kg of water or ice. This allows us to perform radiokrypton dating not only on groundwater but also on glacier ice and ocean water. A setup for ^{39}Ar is currently been commissioned requiring a sample size of 1-2 mL STP of argon, corresponding to a few kg of water or ice. Here, we will present our latest developments on radiokrypton and radioargon dating, including ATTA systems, degassing devices for groundwater, purification systems for dual krypton/argon output as well as examples of groundwater studies in semi-arid regions.

[1] Z.-T. Lu, Tracer applications of noble gas radionuclides in the geosciences, *Earth-Science Reviews 138, 196-214*, (2014)
[2] W. Jiang et al., An atom counter for measuring ^{81}Kr and ^{85}Kr in environmental samples. *Geochim. Cosmochim. Acta 91, 1–6*, (2012)

http://atta.ustc.edu.cn/en-us/events/attaprimer.html