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The Trace Radioisotope Analysis Center at Argonne National Laboratory

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The new Trace Radioisotope Analysis Center (**TRACER**) at Argonne National Laboratory can perform state-of-the-art radiokrypton dating for the earth science community at-large. Due to the simple production and transport of ^{81}Kr (half-life = 230,000 yr), it is an ideal tracer for old water and ice with mean residence times in the range of 10^5-10^6 years. Likewise, the anthropogenic isotope ^{85}Kr (half-life = 10.8 yr) is a valuable tracer for young groundwater. In recent years, significant advances to the Atom Trap Trace Analysis (ATTA) technique, developed at Argonne National Laboratory (ANL), have enabled routine radiokrypton dating of both isotopes. ATTA is an atom counting method that uses laser cooling and trapping to achieve unprecedented counting efficiency and isotopic selectivity. TRACER at ANL features a new, high-throughput ATTA instrument that can measure up to 250 ^{81}Kr or 1500 ^{85}Kr samples per year and a dedicated gas purification system for separating krypton from the degassed samples. We also maintain a second ATTA instrument dedicated to research and development. Both ATTA instruments can currently handle samples as small as 1 μL of Kr gas (STP), which can be extracted from 10 L of water or 5 kg of ice. At TRACER, we continue to investigate new applications of radiokrypton dating and improve the ATTA technique. In this light, we will report on progress toward measuring the absolute abundance of ^{81}Kr in the atmosphere, as well as determining natural sources of ^{81}Kr subsurface production. This work is supported by the U.S. Department of Energy, Office of Science, under Contract No. DEAC02-06CH11357.