Surface Geochemical Exploration Surveys for Helium and Uranium Deposits

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Abstract

Soil gas geochemical surveys were carried out over helium deposits in Utah, Colorado and an emerging helium play in southern Tanzania to evaluate the surface geochemical expression of helium deposits and prospects using these methods. Real-time radon analytical methods were tested over known uranium mineralization in the Athabasca Basin of northern Canada and San Jorge Basin of southern Argentina to test their effectiveness for detecting shallow uranium mineralization. These particular radon detection methods had not been previously used in uranium exploration. High contrast helium anomalies were evident in soil gas samples directly over the Harley Dome in eastern Utah based on a 2013 soil gas survey conducted by IACX. About 16% of the soil gas samples were anomalous in helium based on breakpoints on frequency distributions. 83% of the anomalous samples were within 1 part per million of background concentrations requiring very precise (RSD=+/-1.5%) mass spectrometry to have any confidence in these low contrast anomalies. In southeast Colorado, both light hydrocarbons and helium are anomalous in 9% of samples collected over a 5,100 foot deep Morrow channel sandstone-hosted helium and hydrocarbon deposit in southeast Colorado. An orientation survey was carried out over the subaqueous O2-Next uranium deposit in the Rabbit Lake Uranium District at the east edge of the Athabasca Basin in northern Saskatchewan, Canada. Lake-bottom sediments were collected over and around the O2-Next uranium mineralization (28 samples) and an additional 14 samples were collected in a known background area. The samples were degassed and analyzed onsite for radon (222Rn) using a Pylon AB-5R alpha scintillometer, which was a new method for underwater uranium exploration developed by the author. The lake

sediments at the south end of the O2-Next deposit were anomalous in both radon and uranium, and one clay-rich sample contained extreme concentrations of uranium (193 parts per million) and radon (6,154 pCi/L) and it also had anomalous levels of Cu, Pb, Ag, U, Bi, Ca, Mg, B, K, W and Hg. In the San Jorge Basin of southern Argentina, radon flux monitors were deployed over uranium mineralization for periods of six hours during the day and then the data from these were processed in the evening to obtain real-time radon flux results. Radon anomalies were spatially associated with out-cropping and sub-cropping uranium mineralization and the results were available much quicker than using traditional Track-Etch Detectors.