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**GROUNDWATER AGE DATING AND RECHARGE MECHANISM OF  
ARUSHA AQUIFER, NORTHERN TANZANIA: APPLICATION OF  
RADIOISOTOPE AND STABLE ISOTOPE TECHNIQUES**

**Nyamboge Chacha, Karoli N. Njau, George V. Lugomela & Alfred N. N. Muzuka.**

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## ABSTRACT

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The continuous abstraction of groundwater from Arusha aquifers in northern Tanzania has resulted in a decline in water levels and subsequent yield reduction in most production wells. The situation is threatening sustainability of the aquifers and concise knowledge on the existing groundwater challenge is of utmost importance. To gain such knowledge, stable isotopes of hydrogen and oxygen, and radiocarbon dating on dissolved inorganic carbon (DIC), were employed to establish groundwater mean residence time and recharge mechanism.  $^{14}\text{C}$  activity of DIC was measured in groundwater samples and corrected using a  $\delta^{13}\text{C}$  mixing method prior to groundwater age dating. The results indicated that groundwater ranging from 1,400 years BP to modern is being abstracted from deeper aquifers that are under intensive development. This implies that the groundwater system is continuously depleted due to over-pumping, as most of the sampled wells and springs revealed recently recharged groundwater. High  $^{14}\text{C}$  activities observed in spring water ( $98.1 \pm 7.9$  pMC) correspond with modern groundwater in the study area. The presence of modern groundwater suggests that shallow aquifers are actively recharged and respond positively to seasonal variations.